E. DEISTER.

ORE CONCENTRATOR.

APPLICATION FILED SEPT. 25, 1909.

1,040,288.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

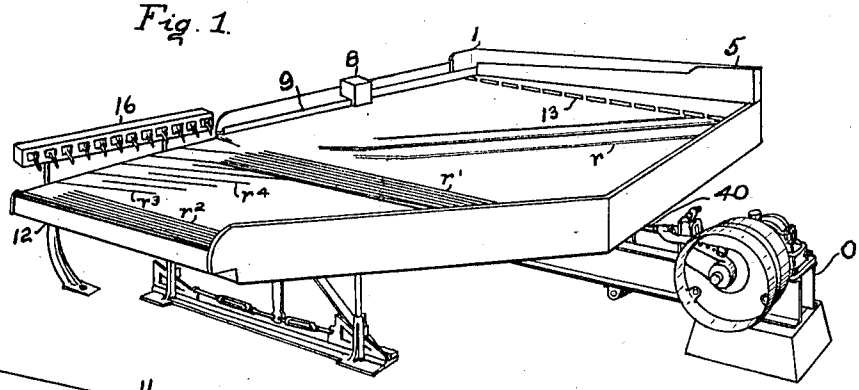
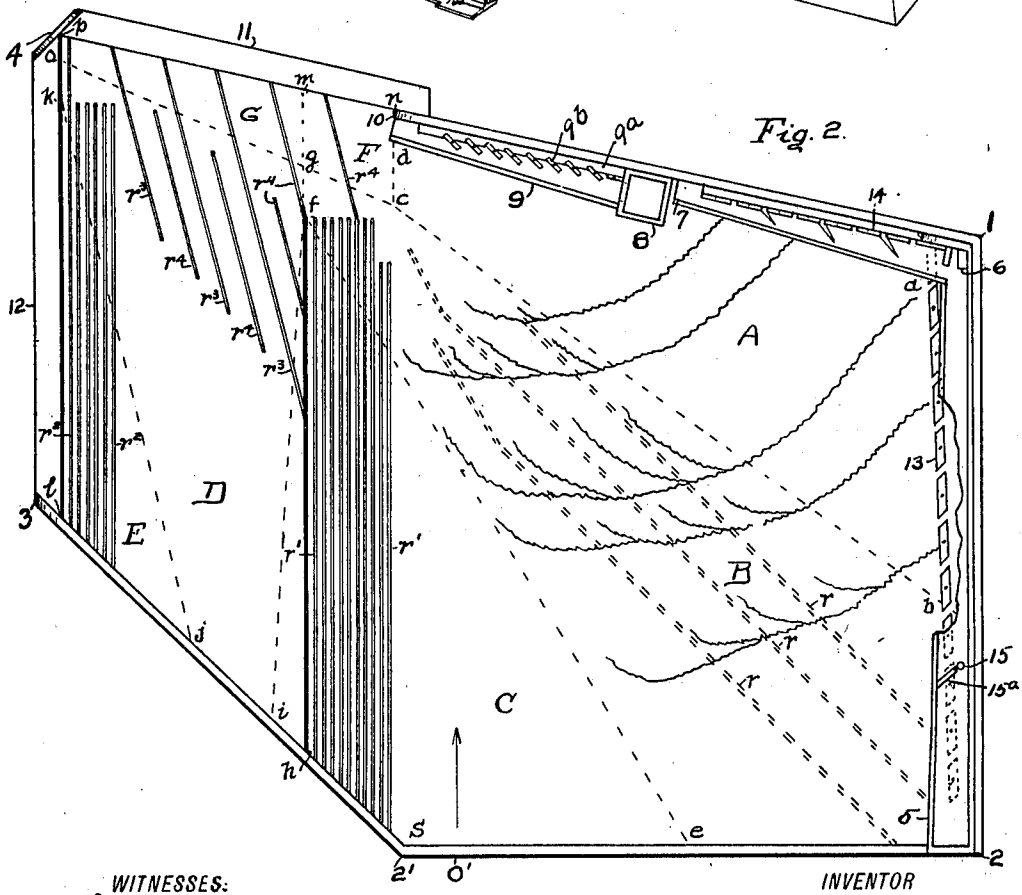


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

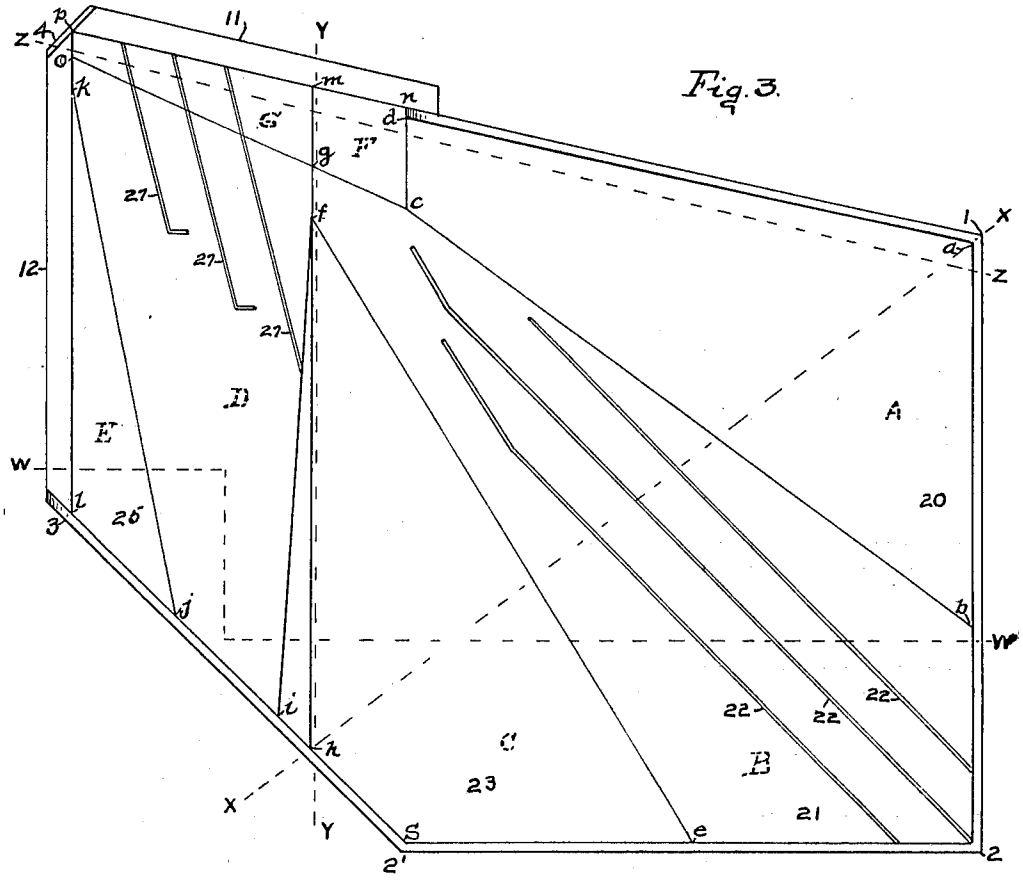
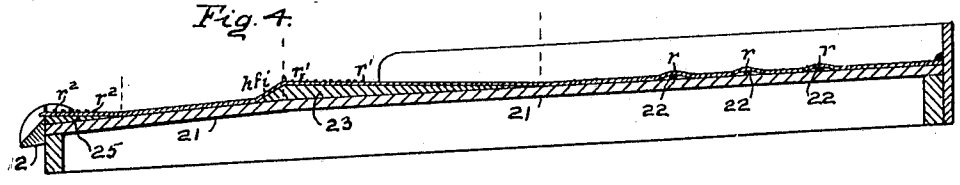


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

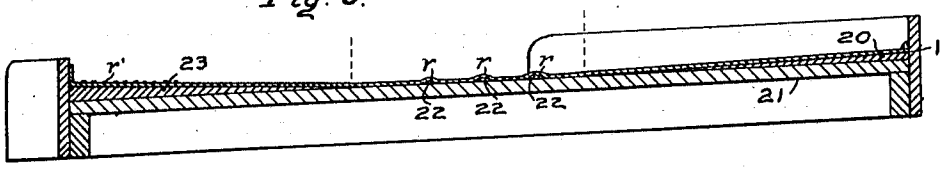


Fig. 6.

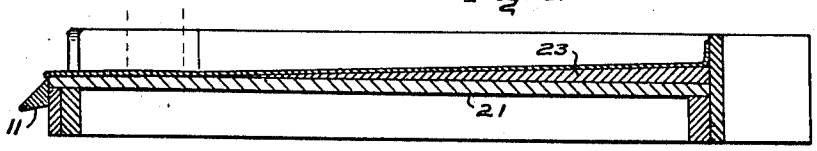


Fig. 7.

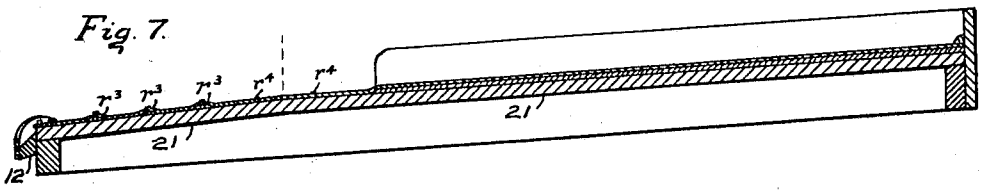
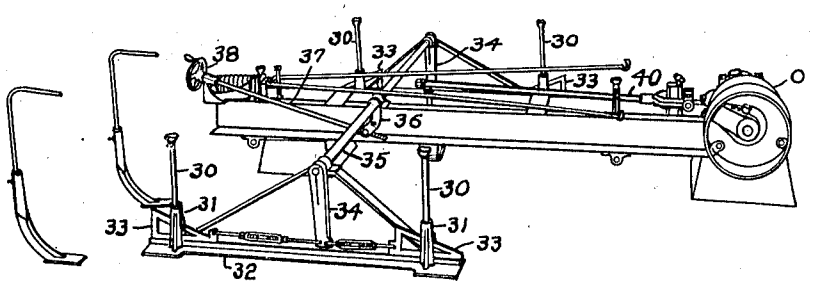


Fig. 8.



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UNITED STATES PATENT OFFICE.

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

ORE-CONCENTRATOR.

1,040,288. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed September 25, 1909. Serial No. 519,522.

To all whom it may concern:

Be it known that I, EMIL DEISTER, a citizen of the United States, residing at 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 devices for the concentration of ores and especially to devices for the concentration of ores in a finely divided state.

My present invention is an improvement upon the invention described in my application for Letters Patent filed June 24, 1907, Serial Number 380,564, and it consists in the novel construction of parts fully described hereinafter and illustrated in the drawings in which—

Figure 1 is a perspective view of the table as a whole; Fig. 2 is a top view; Fig. 3 a top view of the table without its linoleum covering; Fig. 4 a cross section on the line *w—w* of Fig. 3; Fig. 5 a cross section on the line *x—x;* Fig. 6 a cross section on the line *y—y* and Fig. 7 a cross section on the line *z—z*, all of Fig. 3, and Fig. 8 a perspective view of the table adjusting mechanism and support.

Like letters and numerals indicate like parts in all the figures.

Fig. 1 gives a general view of the table and the relations of its parts. References will be made later to the details shown in it which do not appear in the other figures.

Fig. 2 is the main figure of the drawings and a description of the apparatus and its operation can be most conveniently given by references to it. The body of the table is a solid structure without hinge or flexible joint in any part. It is designated as a whole by the numerals 1, 2, 3, 4, which refer to outside corners. In the following description the side 1—2 will be referred to as the head of the table, 3—4 as the foot, or tailings side, 1—4 as the front side and 2—2′—3 as the rear side. The mechanism shown as O in Fig. 1 communicates at O′ in Fig. 2 an oscillating or reciprocating movement (both terms will be used) to the table in the direction of the arrow in a manner well known. The table is mounted on adjustable supports by means of which its elevation at each of the four corners 1, 2, 3 and 4 can be varied.

The surface of the table is divided into a number of coterminous planes or sections differing from one another in their relative inclinations, which are designated in Fig. 2 as A, B, C, D, E, F, and G, with broken lines separating them by boundaries indicated by small letters. Thus section A is *a b c d;* section B is *b e f g c;* section C is *e h f;* section D is *i j k o g;* section E is *j l k;* section F is *c g m n* and section G is *g o p m.* The table is covered with some flexible, waterproof material, such as linoleum, which I prefer.

At *r r r* are flat, rounded, wave-shaped riffles which are formed by strips of wood inserted under the linoleum, as shown in cross section in Figs. 4 and 5.

At *r′ r′* are riffles located in section C and extending a short distance into section B, as shown. These riffles are formed of thin strips of wood placed on the surface of the linoleum in the usual manner. At r^2 r^2 are similar riffles located in sections E and D, as shown. Both these last named sets of riffles are shown in cross section in Fig. 4.

At r^3 r^3 r^3 are three riffles of peculiar construction formed by first placing a strip of wood under the linoleum to produce a rounded, wave-shaped elevation of the surface like those in section B, and then placing on top of that elevation another strip of wood. The construction is shown in cross section in Fig. 7.

At r^4 r^4 r^4 r^4 r^4 are five riffles formed of thin strips of wood placed on the top of the linoleum in the usual manner.

The feed box 5 extends along the head of the table at a little elevation above its surface and with a descent sufficient to produce a flow of the pulp from 5, where it is introduced, to a hole 6 in the bottom of the box where it passes through to the surface of the linoleum. An extension of the feed box continues from 6 to 7 with a slight descent toward 7. From this extension pulp flows through openings on the outer side and falls upon the linoleum close to its outer edge. To guide the flow of pulp to the openings pointed grooves are cut in the bottom of the box, as shown.

At 8 is a splash box through which water is supplied to the dressing water launder 9.

From 10 past 1, 2 and 2′ to 3 the table is bordered by a board forming a water-tight joint with the edge of the table and high enough to inclose all the material placed on the table in its operation. From 10 to cor-

ner 4 is the concentrates discharge space, and from 3 to 4 the tailings discharge. There may also be, if the material being worked calls for it, a middlings discharge space between *k* and the corner 4.

At 11 and 12 are two aprons bordering the concentrates discharge space and the tailings side of the table, respectively, by which the concentrates and tailings are guided into boxes or other suitable receptacles.

In its operating position the corner 1 is the highest part of the table. Section A is a plane surface sloping from the corner *a*, (which is the corner of the table inside the inclosing board) toward the line *b c*, and also from the head of the table toward the foot, but with a steeper slope from *a* to the line *b c* than in the other direction. The section B slopes from the side *b c* to the side *e f*, but with less steepness than the slope of section A, toward *b c;* and it also slopes from the head of the table toward the foot. Section C is nearly level in the operating position of the table, but has a slight inclination from the line *e f* and also from the point *f*, to the corner *h*. In consequence the corner *h* is the lowest point in the section. Along the lower side of that section is a dam or high riffle *h f*, tapering toward *f* to a height just above the adjacent riffles *r' r'*, the top of which in the operating position of the table is level from *h* to *f* and high enough to flood the riffles *r' r'* and form a shallow pool covering the section C approximately to the line *e f*. Below the dam *h f* is a triangular space *h f i* which forms a sort of apron to that dam; its object being to enable the linoleum to pass from section C to the lower level of section D without a too sharp flexure. A cross section of this section is shown at *h f i* in Fig. 4. Section D, bounded by *i j k o g*, has as its highest point the corner *g*, from which it slopes toward the line *j k*, which is practically level. There is a slope from *g* to *i*, but *i* is higher than *j*. Space E is practically level. Along its outer edge is a dam or high riffle extending from *l* to the corner of the table at *p*. In the operating position of the table the top of this dam is practically level, but with respect to the surface of the table it is highest at the end *l* and feathers to an edge at *p*. Its effect is to flood that part of the riffles r^2 r^2 lying in section E and cover section E with a shallow pool extending approximately to the line *j k*, and deepest in the region of the corner *l*. Space F is practically level in the line of reciprocation, but slopes slightly from *c n* to *g m*. Section G is also practically level in the line of reciprocation, but slopes sharply from *g m* to *o p*.

At 13 is a series of cleats or short strips having beveled ends, as shown, and forming a partition by which is inclosed a passage for the flow of pulp along the head of the table from the upper corner of section A where it is delivered through the hole 6 in the feed box. These cleats are pivoted to the table, leaving spaces between their ends, as indicated. The pulp flows down the channel thus formed behind them and out through the spaces between their ends. By turning any one of them on its pivot the opening above it can be enlarged so that a greater quantity of pulp will flow out at that point. In this way the distribution of pulp over section A can be regulated.

At 14 is a series of cleats similar to, but smaller than those at 13, which form the rear side of the extension of the feed box. Pulp flows through the openings between these and falls upon the linoleum close to its outer edge. To direct the flow of pulp to the openings pointed grooves are cut in the bottom of the feed box extension, as shown.

This table is designed particularly for the treatment of fine slimes, in which the particles of mineral are extremely small, and its operation will be described first with reference to material of that kind. As soon as the pulp begins to flow across section A a process of stratification begins, augmented by the jarring effect of the oscillating movements of the table, in which the particles of mineral settle to the bottom of the layer and cling to the surface of the table, while the grains of sand and lighter material roll over them in their onward flow. The tendency of the oscillating movements of the table is to cause the particles of mineral to creep along its surface in the direction of the arrow in the drawing. But during the flow of the pulp across section A this tendency is overcome by the force of gravity, and the material flows in lines substantially perpendicular to the line *b c* at an angle of approximately forty-five degrees to the line of oscillation. But when it crosses that line into section B the effect of gravity upon its movement becomes relatively less and the effect of the oscillation relatively greater, because of the flatter slope of section B. The effect of the oscillation is less upon the sand and lighter parts of the material than upon the mineral. In consequence these two constituents of the pulp tend to part company after crossing the line *b c*—the lighter part to continue in a direction induced by the slope of the surface over which it is passing, and the mineral particles to be turned aside from that course by the influence of the oscillating movements of the table to a direction more nearly in the line of the oscillation. The riffles *r r r* assist this tendency by means of the troughs between them down which the particles of metal creep toward the concentrates discharge. In this way a considerable part—usually the larger part of the mineral is separated from the pulp without crossing

the third of the riffles *r r r*. A greater or less part, however, of the metallic particles will cross the last of those riffles and continue across section B, turning all the time, more and more toward the direction of oscillation indicated by the arrow. In the meantime the sand, which is the next heaviest constituent of the pulp after the mineral, in its flow across section B, in which it passes over the layer of metallic particles, encounters the pool of water in section C formed by the dam *h f*. This checks its onward movement, and it settles to form a bar in the edge of the pool along the vicinity of the line *e f*. This, in turn, checks the movement of the mineral, which then, under the controlling influence of the oscillating motion, creeps along the edge of the bar toward the concentrates discharge in a path nearly parallel with the riffles *r r r*. The course thus taken by the metallic particles is shown in a general way by the fine, undulating lines crossing sections A and B. This circuitousness of travel is an advantage because it prolongs the time during which the treatment of the material continues, and so promotes a more perfect separation of the mineral from the other constituents of the pulp.

While altogether the greater part of the mineral is separated from the other constituents of the pulp by the processes so far described, a portion of it continues its travel across the space C in the pool formed in that space. The riffles *r' r'* under water tend to arrest this movement and operate to conduct the relatively small portion of the mineral which reaches them toward the concentrates discharge under the controlling influence of the oscillation of the table. The water which passes over the dam *h f* carries with it the greater part of the lighter parts of the pulp, including the sand, into section D. No considerable amount of mineral crosses this dam. If any should, it is arrested by the riffles r^2 r^2 and conducted by them to the concentrates discharge. The function of the pool of water in section E adjacent to D is mainly to assist in the final process to be now described.

By virtue of the actions which have been already described in connection with sections A and B the concentrated mineral is directed toward the space between the ends of the riffles *r' r'* and the upper end of the concentrates discharge. At this place the surfaces of sections A, B and F coincide. From this point on the principal operation to be performed upon the mineral is what is known as "cleaning up", which is the separation from the mineral of the sand which has found its way to that point and conducting it to the tailings discharge. This is effected first upon section F, which is, as stated practically level in the direction of oscillation. This gives the mineral a free and rapid passage across that section under the influence of the oscillating movement, until it reaches the edge of the concentrates discharge and passes across the apron into the concentrates box, or other receptacle provided for the purpose. This cleaning up is continued further on section G and the outer end of section D. As stated, the slope of section G from *g m* to *o p* is relatively steep, but its surface is practically level in the direction of oscillation. In consequence of this the separated mineral is driven rapidly toward the edge of the concentrates discharge while the rapid flow of water from *g m* to the foot of section G effectually washes off the sand which may lie on the top of the separated mineral. One advantage of the steep inclination of section G is that a less amount of water is required than would be if the inclination were less. The riffles r^3 r^3 r^3 assist in this process by furnishing protecting troughs leading to the concentrates discharge along which the separated mineral travels without being washed down the steep slope of section G. This effect is supplemented by riffles r^4 r^4 r^4 r^4 r^4, which promote also the movement of the separated mineral toward the concentrates discharge. All these riffles are very shallow, and are preferably placed at an angle to the line of reciprocation.

A sprinkler is shown at 16 in Fig. 1, which is attached to or fixed alongside the table in front of the concentrates discharge space, the function of which is to sprinkle water in fine streams upon the surface of the table close to its edge along that space. The object of this is to supplement and aid the action of the oscillating movements in driving the mineral toward the edge of the concentrates discharge by keeping the surface near the edge of the table clean and covered with a layer of water in motion.

A sand bar is formed in the pool produced in section E, which also serves to arrest the movement of any mineral which may find its way into section D, although this is ordinarily a negligible quantity. These bars, it may be noted, while continuously present during the operation of the table in greater or less development, are all the time changing in the material in them. There is a continual accession of fresh sand along their fronts and a continual washing away of sand from their tops.

It will be seen that the operation of this table in the manner described depends upon effects produced by the relative inclinations of the sections described combined with the oscillating movements of the table. Thus it is necessary that section A shall have such inclination as that substantially all the material delivered upon it shall pass across it toward line *b c* and not down it toward the

line *c n*, and this notwithstanding the modifying influence of the oscillation of the table; and also that section B shall be of such less inclination than section A that when the material reaches it in crossing the line *b c* the influence of the oscillation shall preponderate over the influence of gravity to such extent as to turn the stratified mineral down section B along the riffles *r r r* and along the sand bar which forms in the edge of the pool in section C.

While, as stated, this table is designed specially for the treatment of fine slimes, and will ordinarily be used for that purpose, it will sometimes happen that in consequence of imperfect classification of the material, or other cause, it will be necessary to treat pulp upon it containing particles of both sand and metal coarser than those found in what is properly called fine slimes. Such coarse particles respond more quickly and in greater degree to the influence of the oscillating movements of the table than finer particles. They tend, therefore, to travel down section A toward the concentrates discharge instead of crossing that space toward the line *b c*. This is objectionable, because in that short distance of travel the separation of the mineral from the gangue will be incomplete, and an undue proportion of sand will be precipitated upon the cleaning up sections F and G. In order to treat this kind of material the operator will raise corner 1 of the table more or less, so as to increase the pitch of inclination of section A, and so augment the relative force of gravity upon the material passing over it. It will sometimes happen, also, that the pulp to be treated will be poor in mineral and contain an undue proportion of gangue. In that case use may be made of a hole in the bottom of the feed box not heretofore referred to, but shown at 15 in Fig. 2.

At 15ª is shown a thin cleat nailed on the bottom of the box to direct the flow of the under layer of pulp to the hole 15. In the ordinary use of the table this hole is stopped by a pin, but in the case of very poor pulp it may be opened to discharge part of the pulp upon section B.

The skilled operator will soon learn to adapt the table by suitable adjustments of elevation of its different parts, and the supply and distribution of pulp, and of water upon it, to make it conform under varied conditions of working as nearly as possible to the mode of operation which I have described.

The diversified surfaces of the table which I have described may be made by first cutting and forming them in the wooden body or top of the table and then covering it with the linoleum or other covering tacked down to fit accurately the various surfaces; or they may be formed by making the top of the table with a plane surface and putting on it pieces of wood or other material of such size and form as to give the desired diversity of surface; or by these methods in combination. Of these I prefer the third, and I have shown it in Fig. 3, which is a plan view of the table, the covering being removed therefrom, which is to be taken in connection with the cross section views in Figs. 4, 5, 6 and 7, the linoleum covering being added to these views for the sake of clearness.

What I believe to be the best mode of construction is as follows: A strong frame is made in the form outlined in Fig. 3 with cross pieces serving as joists to support the table top extending from the side 1—4 to sides 2—2′—3, the upper edges of which cross pieces are in the same plane from the side 1—2 to the line *h m*, Figs. 2 and 3. From that line to the foot of the table at 3—4 and the line *h l* the cross pieces are cut down progressively so that their upper edges occupy a plane descending slightly from the line *h m*. On these cross pieces the top or deck of the table (as I shall denominate it) is securely fastened with screws, using preferably planed boards about three quarters of an inch thick and about three inches wide placed about a quarter of an inch apart. Where these boards cross the line *h m* they can be bent downward so as to form a plane surface bounded by the lines *h m p l h*. Then the surfaces of the boards which form sections F and G are planed down to form the proper slopes for those sections, as hereinafter described. The further diversities of slope are then obtained by nailing wedge-shaped wooden pieces or boards where necessary on the surface thus prepared. These wedge-shaped additions I will designate for brevity as "wedges". Taking up the table surface section by section I can now state how it is finally made ready for the linoleum covering.

Section A of Figs. 2 and 3 is formed by nailing a wedge 20 (Figs. 3 and 5) on the upper surface of the deck 21, the thickest part of the wedge being at the corner *a* and its body tapering to a feather edge along the line *b c*. This wedge, therefore, covers section A entirely.

Section B contains no wedge or other addition to the surface of the deck as already described. Strips of wood 22 (Fig. 3) are nailed to the deck within this section B and extend from the vicinity of corner 2 of the table in the direction of the concentrates discharge at 11, as shown. These strips 22 form (when the covering is placed on the table) the flat, rounded, wave-shaped riffles *r r r* of Fig. 2.

Section C is formed by nailing on the deck 21 a wedge 23 (Figs. 3, 4, 5 and 6) which is thickest at the corner *h* and tapers to a feather edge along the line *e f*, and also to a

point at *f*. Alongside this broad, flat wedge is nailed a narrow wedge extending from *h i* to *f*, which is shown in cross section in Fig. 4 as *h f i*. The top line *h f* of this wedge coincides in elevation with the top line *h f* of wedge 23, and it tapers to a feather edge along the line *i f*. The taper of this wedge from its top line *h f* to its feather edge *i f* is quite abrupt, its function being to enable the linoleum covering to pass from the surface of wedge 23 to the lower elevation of section D without too sharp flexure. The two wedges 23 and *h f i* constitute in effect, as will be seen, a single wedge with a crest along the line *h f*. The slope of that part of it lying in section C toward the head of the table and toward the concentrates discharge is of such inclination that when the table is tilted to its operating position section C is nearly level, but slopes downward very slightly from the feather edge *e f* of the wedge 23 and also from the point *f* toward the corner *h*.

Section D has the unaltered surface of the deck, as described, without the addition of any wedge.

Section E is formed by nailing a wedge 25 on the deck 21 (Figs. 3, 4) covering the entire section. This wedge is thickest at the point *l* and tapers to a feather edge on the line *j k*. The taper of this wedge is such that its surface is practically level in the operating position of the table.

Sections F and G are prepared by planing down the boards of the deck in a slight slope from the line *c g o* to the edge of the concentrates discharge *n m p*. This gives section F the same slope from *c n* to *g m* as the surface of section B, and a practically level surface from *c g* to *n m* in the direction of oscillation in the operating position of the table; and it gives to section G the same slope from *g m* to *o p* as that of section D toward the tailings side and a practically level surface in the direction of oscillation in the operating position of the table.

A number of strips of wood 27 (Fig. 3) are nailed across the planed down portion of the deck 21 which forms section G, the strips extending preferably from the concentrates discharge edge over into that part of the deck 21 which forms section D, and being placed at an angle with respect to the concentrates discharge edge and increasing in length toward the wedge *h f i*. When the linoleum is placed on the deck over these strips 27 they produce wave like elevations in sections G and D, on which the riffles r^3 r^3 r^3 are placed, as before described.

All the wedges which I have described present plane surfaces without curvature or irregularity on their upper sides which come into contact with the linoleum covering. Upon the deck thus prepared the linoleum covering is nailed and thus are formed the diversified surfaces and slopes of the sections as stated in the preceding description of Fig. 2.

I am aware that it is not usual to state actual dimensions of parts in a patent specification and I think it likely that the description which I have already given of the concentrating table which is the subject of my invention is sufficient to enable one skilled in the art to make and use it. But it is necessary in the treatment of fine slimes that the slopes and adjustments of the different sections or subdivisions of the table shall be adapted with nicety to the work to be done in order to secure the best results, and it will undoubtedly facilitate the work of even a skilled constructor to state the dimensions of some of the more important parts of the table as I have made and used it with success.

The following are the outside dimensions of the finished table; side 1—2 six feet and 4¾ inches; side 2—2′ six feet and ¾ of an inch; side 2′—3 five feet; side 3—4 four feet and 11 inches; side 4—1 nine feet and 7 inches. The angle 1 2 2′ is a right angle, and the angle 2 1 4 is approximately one hundred and four degrees. The slope of the deck between the line *h m* and the foot of the table as compared with the surface of the deck between that line and the head of the table is one and one quarter inches.

Wedge 20, Fig. 3, is five sixteenths of an inch thick at *a* and three sixteenths of an inch thick at *d*. From *d* to *c* the end of the wedge has a short bevel just sufficient to permit the linoleum to pass smoothly from the wedge to section F. The distance from *a* to *d* (Fig. 3) is six feet, two inches; the distance from *a* to *b* is four feet and from *d* to *c* is ten and ⅜ inches. The line *d c* is parallel with *a b*. Wedge 23, Fig. 3, is one and ⅜ inches thick at *h*. This side *h f* is five feet, six inches in length and parallel with the side 1—2; the side *h s* is eighteen and ¼ inches in length, and the side *s e* three feet. Wedge 25, Fig. 3, is one inch thick at *l*. The side *j l* is eighteen inches long and the side *l k* four feet and five inches long. The wedge *h f i*, Figs. 3 and 4, is one and ⅜ inches thick at *h* and the end of it *h i* is five and ¼ inches wide. These wedges are preferably formed of wooden strips about three inches wide tapered to a feather edge at one end and of suitable thickness at the other and nailed upon the deck about a quarter of an inch apart. It is to be understood that these dimensions and the details of construction of frame and deck above given are not essential to the embodiment or use of my invention, but may be varied according to the judgment of the constructor.

I have spoken in several places of the "operating position" of the table. This is a position in which the body of the table is

tilted upward slightly at the side 1—4 so as to correspondingly depress the sides 2—2′—3. This tilt should be sufficient to bring the tops of the high riffles *h f* and *l k* to a level in the direction of their lengths. The elevation of the corner 1 should be such as to cause the pulp to flow across section A in a direction substantially perpendicular to the line *b c*. The high riffle which is nailed on the crest of wedge 23 to flood section C is $\frac{5}{8}$ of an inch thick at *h* and tapers to $\frac{1}{16}$ of an inch at *f*, and continues from that point to *m* as a thin riffle. The high riffle which is nailed to the crest of wedge 25 is $\frac{1}{2}$ inch thick at *l* and tapers to $\frac{1}{16}$ of an inch at *p*. These are shop construction thicknesses. The skilled operator may have occasion to vary either or both of them slightly by planing down the top of the riffle a little, or tacking a thin strip on it in order to get the exact height of the dam for the most perfect working under the conditions present.

In Fig. 8 I illustrate the adjustable supports for the table on which the latter rests. They consist of a pair of movable posts 30 having the upper end of each member provided with a socket which is adapted to engage a suitable ball-shaped casting attached to the bottom of the table, one pair of posts being arranged on each side of the table. The lower ends of these posts are movably supported in suitable guides 31, which are mounted on a base 32. These guides are provided with suitable openings through which are adapted to pass wedges 33, the inclined faces of one pair of wedges lying in one direction, those of the opposite pair lying in the opposite direction, as shown in the drawing. Each post is adapted to be raised and lowered as the wedge moves to and fro beneath it. Each wedge of a pair is connected to an arm 34 which is fixed on a shaft 35, which shaft is revolubly mounted on bases 32. An arm 36 is fixed on shaft 35 and is adapted to engage a rod 37, which rod extends outwardly to the side of the table and carries on its outer end a hand wheel 38 by which the rod may be rotated. This rod is suitably mounted and connected to arm 36 so that when it is rotated arm 36, shaft 35 and arm 34 will be rocked to move the wedges 33 in the direction desired. Since the inclined surfaces of one pair of wedges lie in one direction and those of the other pair lie in the opposite direction, it is evident that the rocking of arm 34 in one direction will cause one pair of wedges to elevate its abutting pair of posts 30 and the other pair to lower its abutting pair of posts. In consequence of this arrangement of wedges and operating connections any desired adjustment of inclination of the table which rests on the posts will be accomplished thereby. I also illustrate in Fig. 8 the mechanism by which the oscillating movements are produced in the table. This motion mechanism forms no part of this invention and consequently I do not describe it further than to state that rod 40 is connected at one end to the table, the other end thereof being connected to a suitable mechanism O by which the rod and table are reciprocated in the desired manner. This mechanism is also illustrated in Fig. 1, which figure also illustrates the complete table embodying my invention, the table surface here shown being identical with that illustrated in Fig. 2.

A wash water launder 9, shown in Figs. 1 and 2, is preferably placed adjacent to the feed box extension at 7. This launder does not extend to the edge of the concentrates discharge, but terminates a little short of that edge, and is designed to effectively wash the sands away from the mineral before the latter reaches the edge of the concentrates discharge. In the bottom of this launder adjacent to openings 9^a therein, are arranged a plurality of pivotally mounted gates 9^b which are adapted to be turned independently of each other so as to permit more or less wash water to pass through opening 9^a at any given point therein. By this feature of adjustment the operator is enabled to procure an even distribution of wash water on the surface below, or to increase or diminish the flow at any point.

The principle of my invention, so far as it can be expressed in general terms, may be stated substantially as follows: first, to construct upon the table a series of spaces or sections extending from its head to its foot, each section differing in the inclination of its surface from the section or sections contiguous to it, over which sections the material being treated will tend to flow in the operation of the table under the influence of gravity from the feed box to the tailings discharge; second, to provide adjacent to the concentrates discharge a space or spaces upon which the final cleaning up of the separated mineral is to take place; third, to so construct and arrange the first mentioned sections that the separation of mineral particles from the other constituents of the pulp shall be effected in greater or less degree in each of them as the material passes over it. These sections I denominate for distinction the concentrating sections, and they are the sections A, B, C, D, and E in Fig. 2 of this application. By the influence of the oscillating movements of the table the mineral particles thus separated are caused to move over the surface of the table toward and to and into the space aforesaid which is adjacent to the concentrates discharge, which, for distinction, I denominate the cleaning up space. In the table as described in this specification this space consists of two contiguous sections F

and G and the upper or forward portion of section D, which I believe to be the better construction. These could be united in one continuous space and I shall speak of this portion of the table in some of the claims as a space, intending thereby to include the entire cleaning up area, whether it be a single space or divided into two or more. Each of these concentrating sections is, therefore, in effect, a concentrating table by itself, and is to be designed and constructed in respect to its conformation, pitch and other features with particular reference to treatment of the material in the state in which it will be received on that section. Thus the mineral, with such residue of sand as may remain with it, will be gathered together on the cleaning up space where it is subjected to a final washing. Little or nothing reaches this space with the mineral except sand, the lighter parts of the gangue going across the concentrating sections to the tailings discharge.

The treatment of fine slimes is an operation of the utmost delicacy. The movements of the material on the table and the separation of the mineral from the gangue are affected by exceeding slight variations of surface, slope, or oscillation.

I have described with minuteness the form of my invention which I have found best in practice. But these details are not all essential to the realization of the invention and may be varied in many particulars. For example, all the riffles could be omitted and the table would still operate fairly well and embody my invention in a substantial sense. In particular, it may be said that the riffles *r r r* in section B have their principal utility in the treatment of slimes which are at once fine and rich in mineral. In the treatment of pulp containing a relatively small proportion of mineral they may be omitted with little or no diminution in the effectiveness of the machine. Other variations of detail may be made while still preserving the fundamental elements of my invention.

What I claim is:

1. In combination a differentially reciprocating ore concentrating table having upon its working surface a series of coterminous concentrating sections with floors differing from one another in relative inclination and extending from its head to its foot over which material being treated will tend to flow successively by gravity from the portion receiving the pulp to the tailings discharge, and having also a cleaning space adjacent to the concentrates discharge coterminous with the series of concentrating sections aforesaid and coincident therewith in elevation upon their coterminal lines and receiving material for cleaning up from each of said concentrating sections.

2. In combination in a differentially reciprocable ore concentrator a table deck made as a single solid structure without capacity for flexure at any point, comprising a series of coterminous sections with floors or diverse relative inclinations having first in order at its highest point a section upon which the pulp to be treated is delivered which section is of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the reciprocating movements; and next in order a section of such less slope toward the tailings discharge than the first that the influence of the reciprocating movements upon the mineral passing over it in operation will predominate over the influence of gravity; and next in order a third section having a dam along its lower border to create a pool above the dam.

3. In combination in a differentially reciprocable ore concentrator a table deck made as a single solid structure without joint or capacity for flexure at any point comprising a series of coterminous sections with floors of diverse relative inclinations having first in order at its highest point a section upon which the pulp to be treated is delivered which section is of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the reciprocating movements; and next in order a section of such less slope toward the tailings discharge than the first that the influence of the reciprocating movements upon the mineral in the pulp passing over it will predominate over the influence of gravity; and next in order a third section having a dam along its lower border to create a pool above the dam with riffles submerged in the pool thereby created.

4. In combination in a differentially reciprocable ore concentrator a table deck made as a single solid structure without joint or capability of flexure at any point comprising a series of coterminous sections with floors of diverse relative inclination having first in order at its highest point a section upon which pulp is delivered for treatment which section is of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the reciprocating movements; and next in order a section of such less slope than the first toward the tailings discharge that the influence of the reciprocating movements upon the mineral in the pulp passing over it will predominate over the influence of gravity; and next in order a third section having a dam along its lower border to create a pool above the dam with riffles submerged in the pool thereby created with a cleaning

space into which mineral is conveyed from all of said sections and a concentrates discharge to which the mineral passes from said cleaning space with means to supply wash water to said cleaning space.

5. In an ore concentrating table a source of power and mechanism to produce transverse reciprocating movements of the table in combination with a series of coterminous sections of diverse relative inclinations, having first in order a section of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the reciprocating movements; and next in order a section of such less slope than the first that the influence of the reciprocating movements upon the mineral passing over it in operation will predominate over the influence of gravity, troughs on the second section angularly disposed with respect to the line of reciprocation and extending toward the concentrates discharge, and a third section adjacent to the second section having a dam along its lower border to flood it with water in operation.

6. In a differentially reciprocable ore concentrating table the combination of a series of coterminous sections with floors of diverse relative inclinations, having first in order at the upper or head end of the table a section of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the reciprocating movements; and next below in order a section of such less slope than the first that the influence of the reciprocating movements upon the mineral passing over it in operation will predominate over the influence of gravity and cause the mineral to turn gradually in the direction of its travel toward the line of reciprocation, a cleaning space which is coterminous with both sections aforesaid, the slope of which space toward the foot of the table is greater than that of either of the aforesaid sections and which receives mineral for cleaning up from each of them; and a section below and adjacent to the second section having means along its lower border to flood it with water in operation.

7. In a differentially reciprocable ore concentrating table the combination of a series of coterminous sections with floors of diverse relative inclinations, having first in order at the head of the table a section of such slope that the influence of gravity upon the mineral passing over it with the pulp in operation will predominate over the influence of the oscillating movements; and next below in order a section of such less slope than the first that the influence of the oscillating movements upon the mineral passing over it in operation will predominate over the influence of gravity and cause the mineral to turn gradually in the direction of its travel toward the line of oscillation; a cleaning space which is coterminous with both sections aforesaid and receives mineral from them both, and a section adjacent to the second section having riffles on its surface and a dam along its lower border to flood it and the riffles with water in operation.

8. In a differentially reciprocable ore concentrating table the combination of a series of coterminous sections with floors of diverse relative inclinations, having first in order at the head of the table a section of such slope that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the oscillating movements; and next below in order a section of such less slope than the first that the influence of the oscillating movements upon the mineral passing over it in operation will predominate over the influence of gravity and cause the mineral to turn gradually in the direction of its travel toward coincidence with the line of oscillation; a cleaning space which is coterminous with both sections aforesaid the slope of which toward the foot of the table is greater than that of either of said sections, which cleaning space receives mineral for cleaning from both of said sections, the said second section also having troughs formed in its surface at an angle to the line of oscillation and extending toward the said cleaning space; and a third section adjacent to the said second section having a dam along its lower border to flood it with water in operation.

9. In a differentially reciprocable ore concentrating table the combination with means for discharging pulp upon the uppermost corner of the table of a series of coterminous sections having floors of diverse relative inclinations of which the first in order at the head of the table is a section of such slope toward the second section that the influence of gravity upon the mineral in the pulp passing over it in operation will predominate over the influence of the oscillating movements to such extent as to cause the mineral to move across the section in lines perpendicular, or substantially so, to the lower border of the section; and next in order a section of such less slope than the first that the influence of the oscillating movements upon the mineral passing over it in operation will predominate over the influence of gravity to such extent as to cause the mineral to turn gradually in the direction of its travel toward coincidence with the line of oscillation; a cleaning space adjacent to the concentrates discharge which receives mineral for cleaning from both of said sections, the surface of which second section is provided with troughs leading toward the concentrates discharge; and

a third section adjacent to the second section having means along its lower border to flood it with water in operation.

10. In an ore concentrating table a source of power and mechanism operated thereby to produce transverse oscillating movements in the table in combination with a series of coterminous sections on the working surface of the table of diverse inclinations, the first of said sections having such slope from the upper corner of the table toward the second section that the force of gravity will cause the mineral constituent of the pulp passing over it to move in lines approximately perpendicular to the lower edge of the section notwithstanding the oscillating movements of the table, and the second of said sections having such less slope than the first section that the force of the oscillating movements will predominate over the force of gravity upon the mineral to such extent as to cause it to turn gradually in the direction of its motion toward coincidence with the line of oscillation, said second section having also troughs formed in its surface leading toward the concentrates discharge; and a third section adjacent to the second having a dam along its lower side and riffles adjacent to the dam and flooded by it in operation, the direction of said riffles being coincident with the line of oscillation; and a fourth section receiving the overflow from said dam, and a fifth section adjacent to said fourth section and extending to the tailings discharge with a dam along its lower edge to flood it in operation, and a cleaning up space adjacent to the concentrates discharge toward and into and across which concentrated mineral is caused to move out of and from each of the aforesaid sections by the oscillating movements of the table.

11. In combination a differentially reciprocable ore concentrating table, a series of coterminous concentrating sections upon the table with floors differing from one another in their relative inclinations and extending from its head to its foot over which material being treated will tend to flow by gravity from the point of its deposit on the table to the tailings discharge, a plurality of said sections having on their lower borders dams to flood them with water, and having riffles submerged in the pools fromed by said dams.

12. In combination a differentially reciprocable ore concentrating table, a series of coterminous concentrating sections upon the table with floors differing from one another in their relative inclinations and extending from its head to its foot over which material being treated will tend to flow by gravity from the point of its deposit on the table to the tailings discharge, and having a cleaning space coterminous with said series of concentrating sections extending along a portion of the side of the table and coincident in elevation with said sections at their coterminous lines to which cleaning space concentrates are delivered from all said concentrating sections and from which the finished concentrates are discharged from the table.

In witness whereof I hereunto subscribe my name this 20th day of September, 1909.

EMIL DEISTER.

Witnesses:
HARRY F. KENNETH,
ELWIN W. HULSE.