H. D. McLEOD.

CONCENTRATING TABLE.

APPLICATION FILED AUG. 21, 1907.

930,218. Patented Aug. 3, 1909.

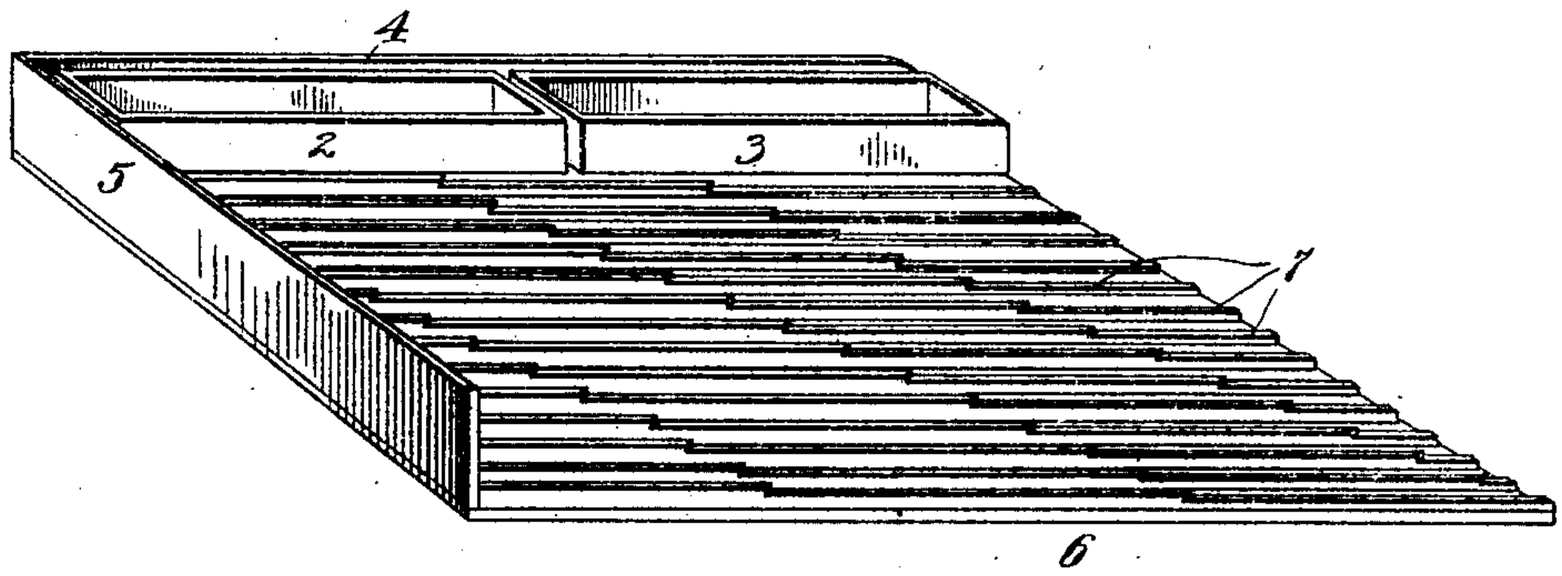


FIG. 1

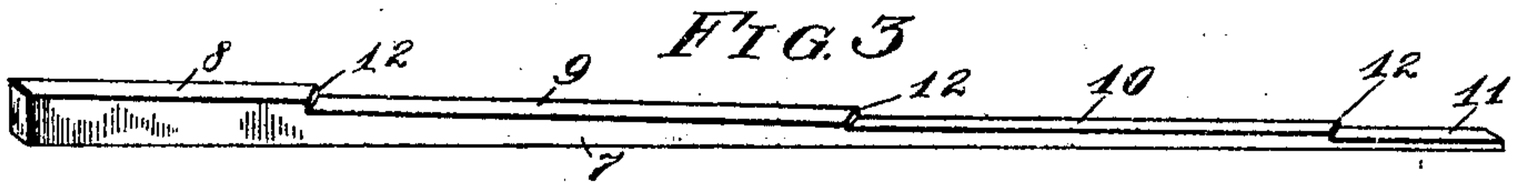


FIG. 3

FIG. 2

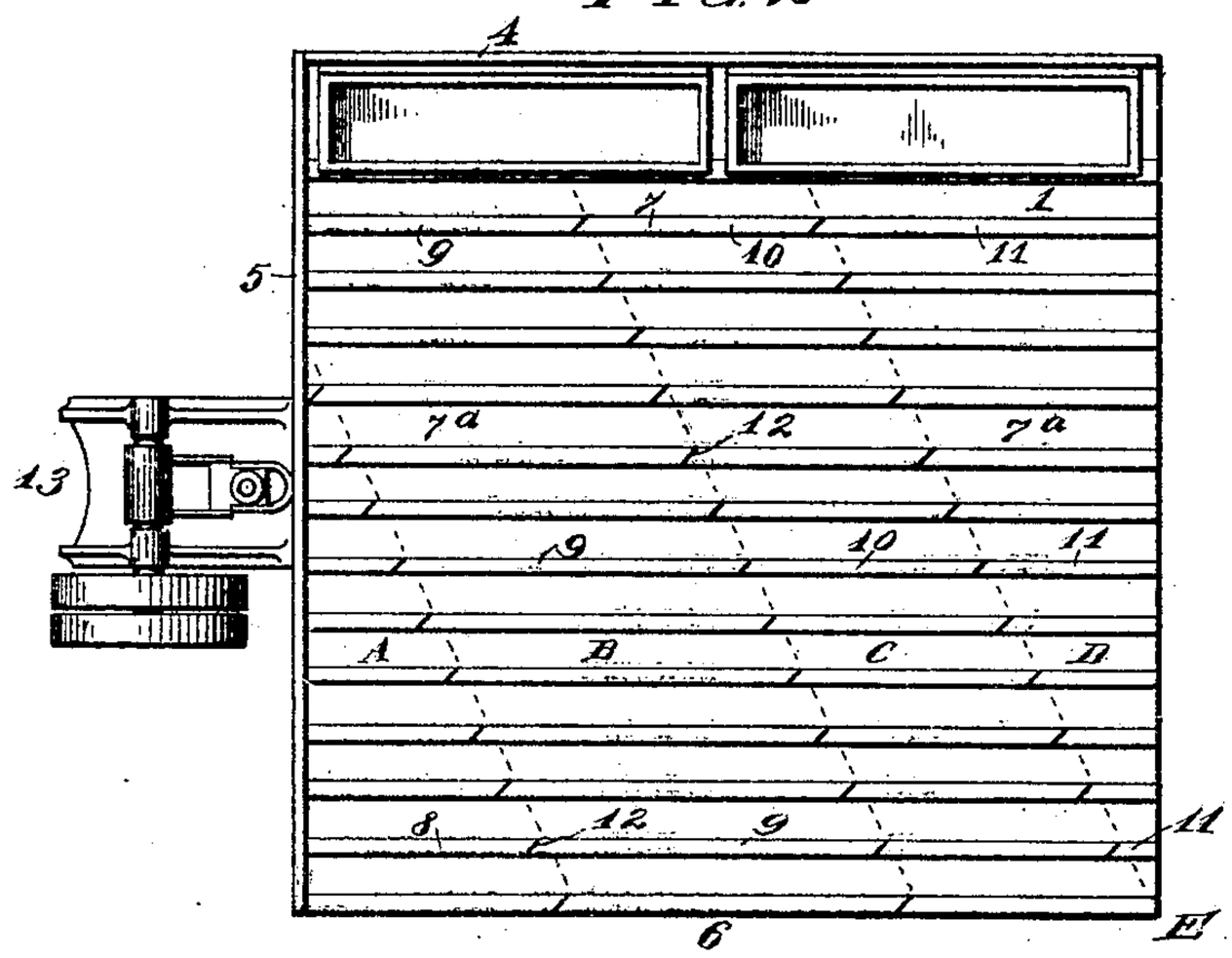


FIG. 4

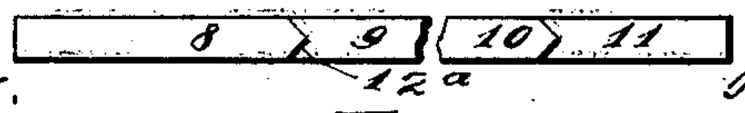
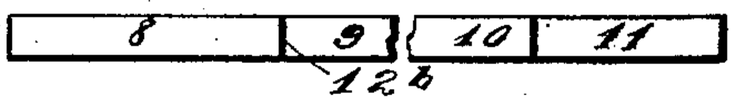


FIG. 5



WITNESSES:

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CONCENTRATING-TABLE.

No. 930,218. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed August 21, 1907. Serial No. 389,485.

To all whom it may concern:

Be it known that I, HOWARD D. McLEOD, residing at Cleveland Heights, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Concentrating-Tables, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to concentrating tables for separating the metalliferous minerals of ores from the gangue, and has for its object to provide a table of this character which shall preserve constancy of separation between the different grades or values of the ore constituents notwithstanding more or less fluctuation in the feed of the ore and the feed of the water as well as in the contents of the concentrate; also to provide for discharging the concentrate of highest value exclusively and uniformly from the tail or foot of the table; also to provide a table of this kind with several definite zones or definite areas wherein corresponding definite values of the mineral may be included and from which they may be removed with less fluctuation in the values than is possible with any other type of table with which I am familiar.

The invention may be defined as consisting generally of the features hereinafter described and claimed and embodied in the drawings forming part thereof, wherein—

Figure 1 represents a perspective view of a table constructed in accordance with my invention; Fig. 2 represents a plan view of the table shown in Fig. 1, the same being shown as provided with a conventional form of head motion by means of which the table is reciprocated; Fig. 3 represents a perspective detail of one of the riffles employed with the table shown in the preceding figures; and Figs. 4 and 5 represent details showing modified forms of the riffle illustrated in Figs. 1 to 3 inclusive.

Describing the parts by reference characters, the table comprises a deck 1, at the upper or feed side of which there is provided a feed box 2 for the ore and a water box 3 from which wash-water may be supplied to the deck. The deck is provided at the upper edge and the head thereof with retaining strips 4 and 5 respectively, the other edges of the deck being unobstructed. Between the boxes and the opposite edge 6, the deck is provided with a suitable number of riffles 7 extending the full length thereof, the riffled portion of the deck comprising substantially the entire surface between the boxes and the edge opposite the same. These riffles may be formed in any convenient manner, as by plowing out the upper surface of the deck to provide elevated strips between the recesses 7^a thus formed, or by making them of separate strips secured to the deck, the object in either case being to secure a suitable number of raised strips of proper height, width, and construction. The upper surface of each of these riffles is composed of a plurality of upper surfaces with abrupt, substantially vertical steps connecting said surfaces. The number of such surfaces and steps may vary, but each riffle toward the lower edge of the deck (that is to say the edge opposite the boxes 2 and 3) with the exception of the lowermost riffle, is shown as provided with four such surfaces, 8, 9, 10, and 11, and three connecting steps, 12, while the riffles adjacent to the upper edge of the table are provided with three such surfaces 9, 10, and 11, connected by two steps. The upper surfaces of the riffles vary in height above the deck from the head of the table to the tail or discharge end of the same, being highest adjacent to the head and diminishing in height toward the tail. If desired, one or more of the upper surfaces of each riffle may be inclined, as is the case with the surfaces 8 and 9, Fig. 3.

A particularly efficient form of step between the different surfaces of the riffles is shown in Figs. 1, 2, and 3. In these views the step is shown as formed by first cutting substantially at right angles to the length of the riffle and then cutting diagonally or obliquely from the corner of the step thus formed which is adjacent to the upper edge of the table toward the head of the table, the plane at which the second cut is made forming an obtuse angle with the portion of the riffle which extends toward the head of the table and the cut being substantially perpendicular to the deck. The advantages of forming the steps in this manner will be set forth hereinafter.

A very important part of my invention resides in the relative arrangement of the steps on the various riffles. As will appear clearly from Figs. 1 and 2, the steps are so arranged that lines connecting like points of corresponding steps will be diagonal with respect to the length of the riffles, the lines forming an acute angle with the portions of

the riffles which are shown as extending toward the left or head of the table, and extending downwardly and forwardly from the feed side of the table to the lower side thereof. By this arrangement, several different zones of different height are formed, depending upon the number of steps in the riffles. These zones extend diagonally of the table and are comprehended respectively between the head of the table and the first line of steps; between the first and second lines of steps; between the second and third lines of steps; and between the last line of steps and the discharge end or tail of the table.

In Figs. 4 and 5 are shown modifications of the forms of steps shown in Figs. 1 to 3 inclusive. In Fig. 4 each step, 12^a, is substantially V-shaped in plan view, the apex of the V being directed toward the discharge end of the table and being preferably substantially coincident with the longitudinal axis of the riffle. In Fig. 5 the steps 12^b are shown as formed by cutting the riffle at right angles to the length thereof.

In operation, the feed from box 2 is spread out upon the deck, water is discharged from the box 3 and, as the side at which the boxes are located is higher than the opposite side 6, the water will flow transversely of the deck toward the side 6. The table in the meanwhile is reciprocated by means of a head motion 13, and separation of the heavy or good mineral from the gangue occurs in accordance with a principle well understood by those familiar with the art. As concentration is effected, and the riffle channels discharge the material over the sides of the riffles toward 6, the different zones, corresponding to the different elevations of the riffle surfaces, become filled with different values of material, and a distinct line of separation between such values is set up at each diagonal line of vertical steps. Thus fine slimes might be discharged from zone A, which is nearest the head of the table and is the highest zone; another distinct grade of mineral will be discharged from zone B; another will be discharged from zone C. The values in these zones are discharged over the edge 6, while the last and heaviest discharge of concentrate is discharged over the foot or tail of the table through zone D. If water is used, it washes successively over the riffles in each zone, taking the top or lightest layer of matter off toward the edge 6 of the table. Zone C will frequently contain a distinct and definite middling, which may be definitely guided and delivered over the edge 6 at the discharge end of zone C to be re-treated if desired. The concentrate of greatest gravity will be in the last zone toward the discharge end of the table, where it is held in place and guided toward the discharge end of the table by the riffles which prevent it from being washed over the edge 6.

The beveling or tapering of the steps is of importance during the operation of separating the ore, as it prevents the stirring up of the material by the impact of the steps thereagainst, and thus makes the separation more effective. It will be obvious that anything which will tend to throw the material upwardly will interfere with the successful separation thereof, and this action is avoided by making the steps abrupt and then tapering or beveling the steps in the manner described. The form of steps shown in Fig. 4 will accomplish the same result of making an effective separation between the zones of material and avoiding the stirring up of the material by the reciprocation of the table. While the tapered form of steps is preferable, for the reasons stated, the ordinary form of square step, which is shown in Fig. 5, may be employed with marked advantage over existing types of tables with which I am acquainted.

By my invention, different values and broad bands of mineral may be removed within different areas with less fluctuation in the values of the different bands of material than is possible with any other device of this character with which I am familiar. That is to say, true middlings carried in zone C have less chance of getting over into zone D, because the particles come up against a line of distinct vertically extending steps, which their gravity prevents them from climbing, and with far greater certainty than would be the case with a merely tapering form of riffle having no abrupt step.

As the ore travels down the table toward edge 6, zone C contains all the highest grade of material with a sprinkling of poorer grade riding thereon. As this material reaches the steps separating the zones C and D, the poorer particles disappear, being confined within zone C, and zone D is left filled with the highest grade almost exclusively, which cannot fall down toward the edge 6, but are retained in zone D by the lowest or thinnest portions of the riffles and are directed over the discharge end or tail of the table. Where zone D is plain, smooth, or unriffled, slight variations in the feed, the grade of ore, or the water cause the line of separation to vary and the efficiency of the table is lessened, as such sensitiveness requires constant watchfulness and adjustment of the slope of the table to keep the line of separation of the heaviest values at the point E of the table. Absence of the riffles in zone D also results in a crowding of the concentrates toward the point E, leaving the upper portion of zone D devoid of concentrates, and the discharge of good material over the edge 6 is occasioned thereby. It has been found difficult, if not impossible, with such sudden fluctuations in feed as occur in all mills, to preserve a definite line between the zones of

materials on concentrating tables. With the abrupt or substantially vertical steps which are employed in the table disclosed herein, a fluctuation in the feed supply equal in depth to the height of such steps can occur without any transferal of values from one zone to the other, such transferal being resisted by the abrupt vertical steps opposed thereto.

One of the most marked advantages secured by using a table provided with a step-riffle system of the character described is the stability or non-fluctuating quality of the work, which is due to defining the line where each grade of material will be discharged over the edge 6. This result, so far as I am aware, has never before been secured on a riffled deck, whereas, with my device, the work from hour to hour is constant, enabling one attendant to care for a greater number of machines, with a corresponding reduction in the cost of production.

Having described my invention, I claim:

1. A concentrating table comprising a deck provided with riffles extending longitudinally thereof and each having different sections of its upper surface at different distances from the deck, the section adjacent to the head being at the greatest distance from the deck and the section adjacent to the foot or discharge end of the table being at the least distance from the deck, and one or more substantially vertical steps connecting such sections, the steps bounding the ends of sections of the same height being arranged in a line oblique to the length of the table and extending downwardly and forwardly from the feed side of the table to the lower side thereof, substantially as specified.

2. A concentrating table comprising a deck provided with riffles extending longitudinally thereof and each having different sections of its upper surface at different distances from the deck, and one or more abrupt steps connecting such sections of the upper surface of each riffle, said steps being beveled longitudinally of the riffles, substantially as specified.

3. A concentrating table comprising a deck provided with riffles extending longitudinally thereof and each having different sections of its upper surface at different distances from the deck, each of said steps having a substantially vertical cutting edge and a tapered surface extending from such edge toward the head of the table.

4. A concentrating table comprising a deck provided with riffles extending longitudinally thereof and each having different sections of its upper surface at different distances from the deck, each of said steps having a substantially vertical cutting edge and a tapered surface extending from such edge toward the head of the table, the steps bounding the ends of sections of the same height being arranged in a line oblique to the length of the table, substantially as specified.

5. A concentrating table comprising a deck provided with riffles extending longitudinally thereof and each having different sections of its upper surface at different distances from the deck, and steps connecting such sections of the upper surface, each of said steps having a vertical cutting edge and a beveled surface extending from such cutting edge toward the head of the table, the steps which connect corresponding surfaces on different riffles being in a line extending diagonally of the length of said table, whereby different zones of riffled surfaces are formed, one of said diagonal lines extending from the junction of the lower edge and tail of the table toward the upper edge and head thereof, substantially as specified.

6. A concentrating table comprising a deck provided with riffles extending longitudinally from the head to the discharge end thereof and each having different sections of its upper surface at different distances from the deck, the highest section of each riffle being adjacent to the head of the table, and substantially vertical steps connecting such sections of the upper surface of each riffle, the steps which connect the corresponding surfaces on different riffles being in an oblique line extending downwardly and forwardly from the feed side of the table to the lower side thereof, whereby different oblique zones of riffled surfaces are formed, and the oblique line which connects the steps bounding the lowest sections of the riffles extending to the junction of the lower edge and discharge end of the table, substantially as specified.

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

HOWARD D. McLEOD.

Witnesses:
J. B. Hull,
E. I. Hutchinson.