

No. 831,007.

PATENTED SEPT. 11, 1906.

J. G. KIRKSEY.
CONCENTRATING TABLE.
APPLICATION FILED MAR. 6, 1905.

3 SHEETS—SHEET 1.

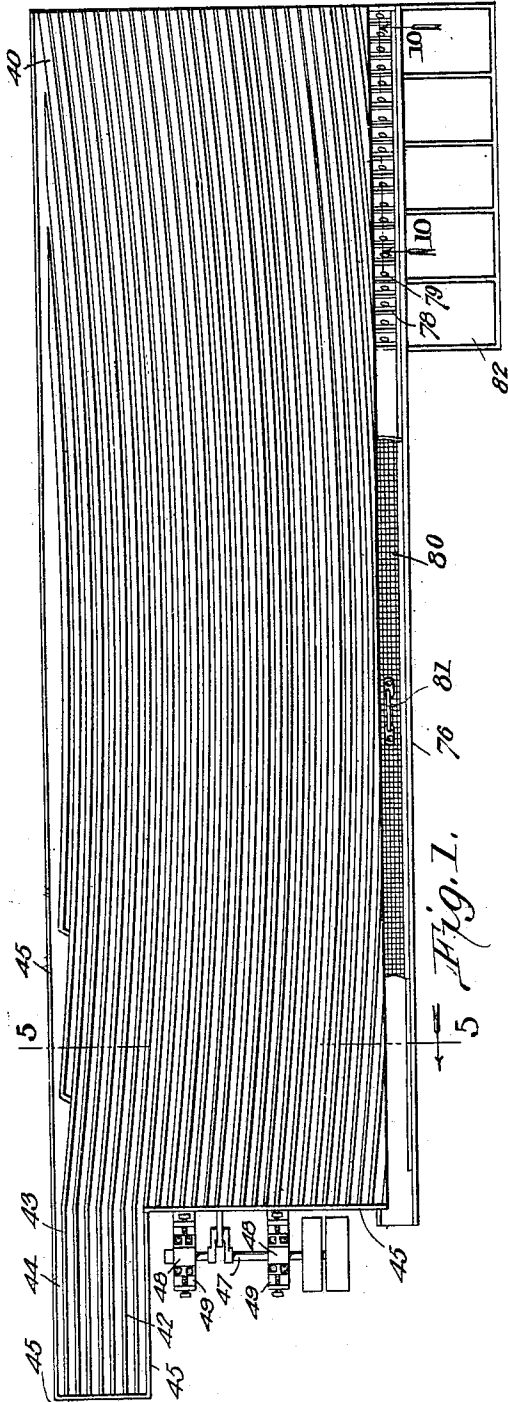


Fig. 1.

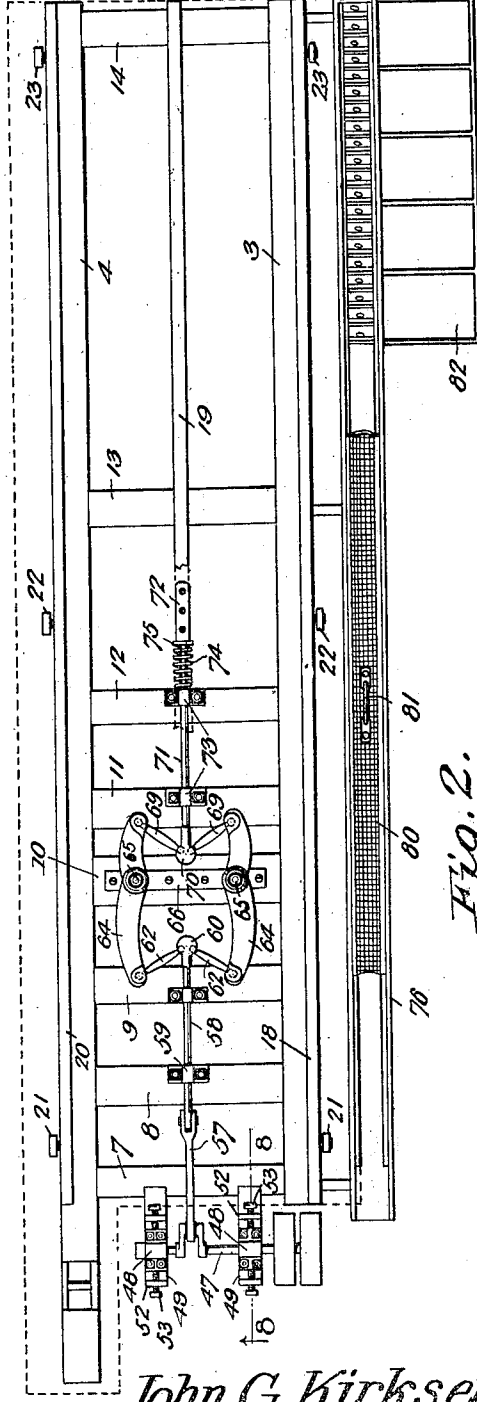


Fig. 2.

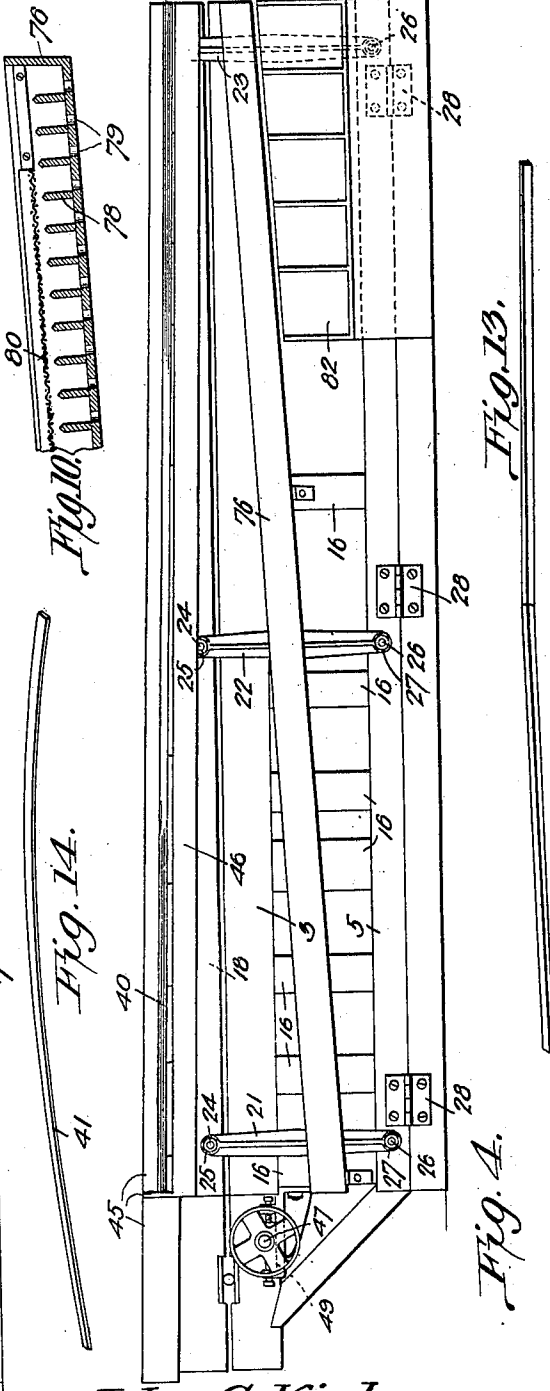
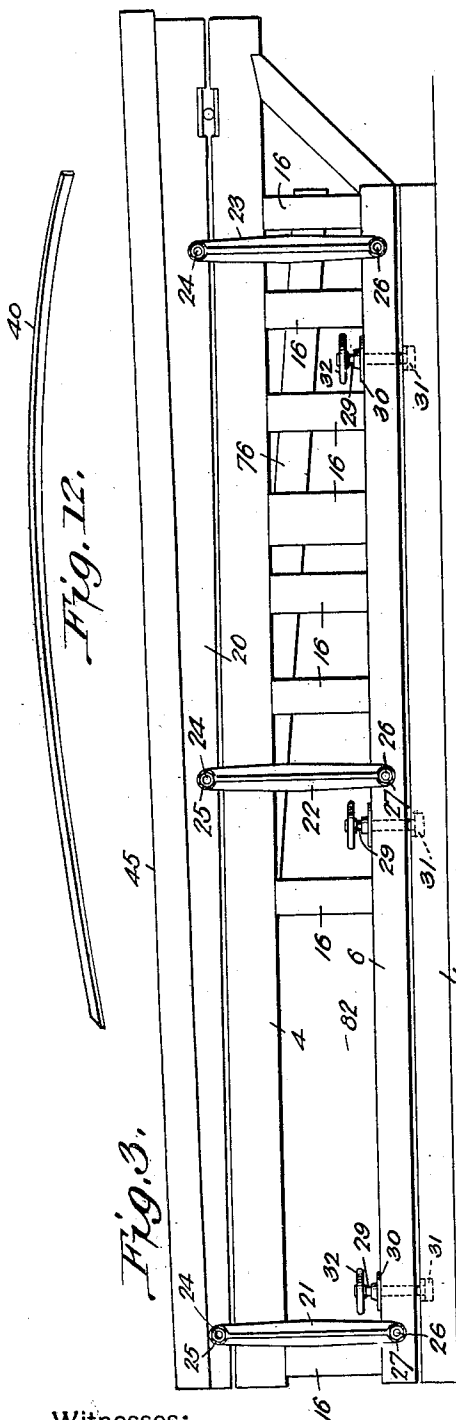
Witnesses:

E. J. Stewart
R. M. Elliott

John G. Kirksey,
Inventor,

by *C. A. Snow & Co.,*
Attorneys.

J. G. KIRKSEY.
CONCENTRATING TABLE.
APPLICATION FILED MAR. 6, 1905.



Witnesses:
E. V. Stuart
R. M. Elliott

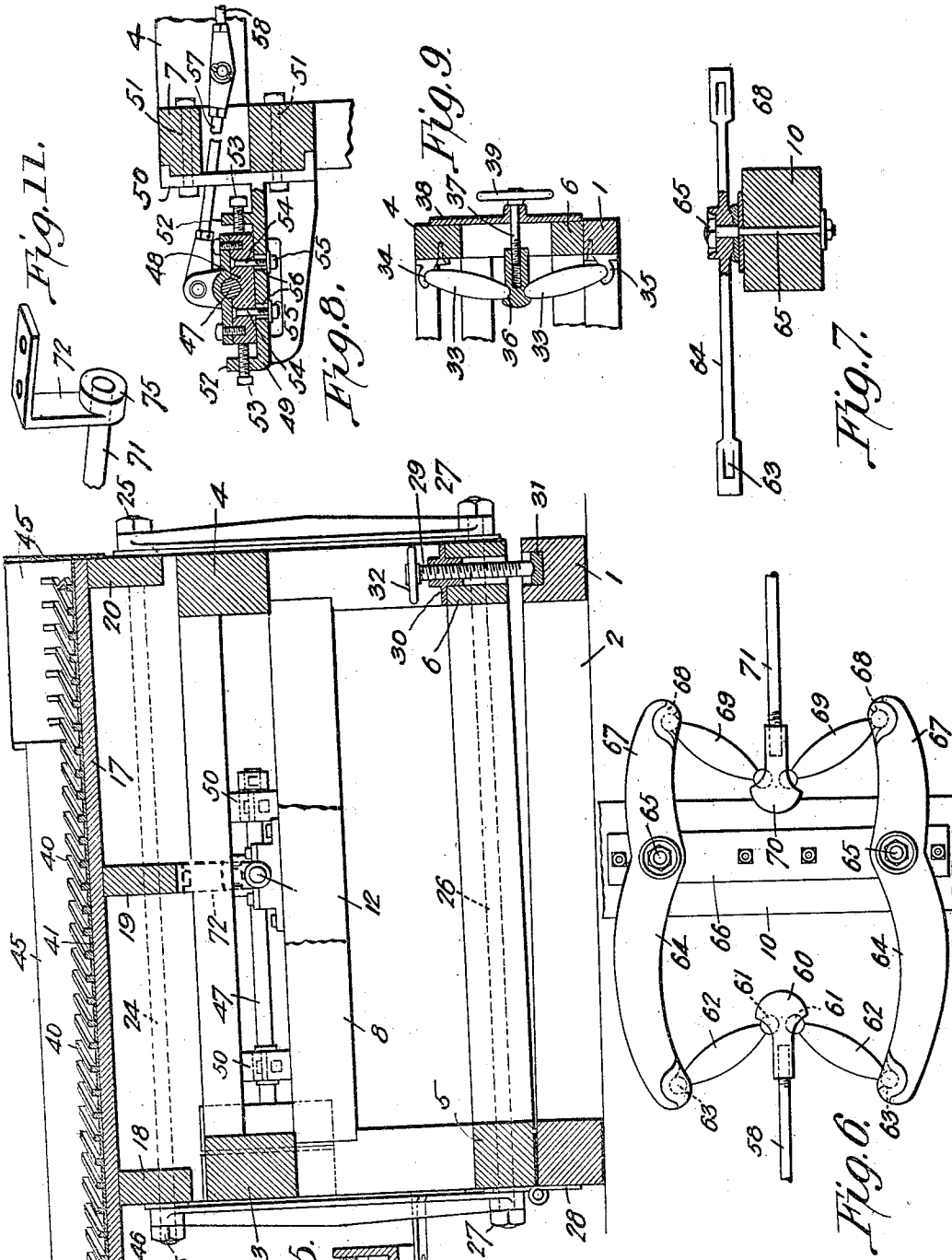
John G. Kirksey, Inventor,
 by *C. A. Snow & Co.*
 Attorneys.

No. 831,007.

PATENTED SEPT. 11, 1906.

J. G. KIRKSEY.
CONCENTRATING TABLE.
APPLICATION FILED MAR. 8, 1906.

3 SHEETS—SHEET 3.



Witnesses:
E. J. Stewart
R. M. Elliott

John G. Kirksey, Inventor,
by *C. A. Snow & Co.*,
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN GIDEON KIRKSEY, OF CARTHAGE, MISSOURI.

CONCENTRATING-TABLE.

No. 831,007.

Specification of Letters Patent.

Patented Sept. 11, 1906.

Application filed March 6, 1905. Serial No. 248,713.

To all whom it may concern:

Be it known that I, JOHN GIDEON KIRKSEY, a citizen of the United States, residing at Carthage, in the county of Jasper and State of Missouri, have invented a new and useful Concentrating-Table, of which the following is a specification.

This invention relates to concentrating-tables.

10 The objects of the invention are to improve the construction of such apparatus so as to require less floor-space and fewer wearing parts; to increase the capacity of the apparatus and render it more efficient in operation; to provide an apparatus that will more effectively separate ores of low specific gravity each from the other—such as zinc sulfids and carbonates, iron pyrites, lead sulfids, calc spar, flint, and limestone gangues; to provide a form of concentrating-table that will effectively save the slimes or very finely powdered concentrates in a thoroughly cleaned condition; to provide an apparatus that will handle successively coarsely-classified ores as well as slimes or finely-powdered materials and handle large quantities of the same, and generally to improve and simplify apparatus of the character described.

20 With the above and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts of an ore-concentrator, as will be hereinafter fully described and claimed.

30 In the accompanying drawings, forming a part of this specification, and in which like characters of reference indicate corresponding parts, there is illustrated one form of embodiment of the invention capable of carrying the same into practical operation.

40 In the drawings, Figure 1 is a view in plan of the table and certain adjunctive mechanism. Fig. 2 is a similar view of the frame of the apparatus with the table removed, showing the table-actuating mechanism. Fig. 3 is a view in side elevation. Fig. 4 is a view similar to Fig. 3 viewed from the opposite side of the machine. Fig. 5 is a view in transverse section taken on the line 5 5, Fig. 1. Fig. 6 is a detail view, on an enlarged scale, of a portion of the table-actuating mechanism. Fig. 7 is an edge view of one of the table-actuating elements shown in Fig. 6. Fig. 8 is a view in vertical longitudinal section on the line 8 8, Fig. 2. Fig. 9 is a sectional detail view in elevation of a modified form of

frame-elevating mechanism. Fig. 10 is a vertical sectional view taken on the line 10 10, Fig. 1. Fig. 11 is a perspective detail view of a portion of the table-vibrating mechanism. Fig. 12 is a perspective detail view of one of the riffles. Fig. 13 is a similar view of a modified form of riffle. Fig. 14 is a perspective detail view of one of the spacing elements that are interposed between the riffles.

60 The base of the apparatus comprises a pair of longitudinal parallel beams 1, which are connected by a pair of cross-beams 2 to render this part of the apparatus rigid, there being as many of these base-beams employed as may be necessary.

70 Hinged to one side of the base is the superstructure carrying a table and its actuating mechanism. This superstructure consists of four longitudinal beams 3, 4, 5, and 6 and pairs of transverse beams 7, 8, 9, 10, 11, 12, 13, and 14, the latter serving to connect the beams 3 and 4 and render them rigid. This form of superstructure has been found thoroughly efficient in use and is one that will generally be preferred; but it is to be understood that the arrangement shown may be varied, if found necessary or desirable, and still be within the scope of the invention. The beams 3 and 4 are supported on the beams 5 and 6 by pairs of uprights 16, (shown in Figs. 3 and 4,) which will generally correspond in number with the cross-beams, although a fewer number may be employed, if preferred.

80 Arranged above the superstructure is a table 17, which forms one of the essential elements of the present invention, the principal feature of which resides in the novel arrangement of riffles and spacers employed. The table may be constructed of any material, preferably of wood, and is supported upon longitudinal beams or sill-pieces 18, 19, and 20, these latter being mounted for reciprocatory movement upon pairs of arms 21, 22, and 23, the upper ends of which are connected with the longitudinal beams 18 20 by means of cross-rods 24, that pass through the series of beams 18 and 20 and carry on their outer ends nuts 25 to hold the arms against accidental separation from the bars. The lower ends of the arms work upon bars 26, which extend through the longitudinal beams 5 and 6 and carry on their outer ends nuts 27, that operate to hold the bars in position.

As is necessary with machines of this char-

acter, the table must be tilted transversely at varying angles according to the material being operated upon, and to effect this result the superstructure is hinged to one of the longitudinal beams 1 at 28, and the beam 6 carries a series of adjusting-screws 29, which work in flanged nuts 30, carried by the beam 6, and engage at their lower ends with seats 31, seated in sockets in one of the beams 1, the upper ends of the screws being provided with hand-wheels 32 to facilitate turning. It will be seen that by moving the adjusting-screws 29 the proper tilt of the table may be effected to secure the results designed.

Instead of employing screws for adjusting the table, as shown in Figs. 3, 4, and 5, a double toggle may be employed, as shown in Fig. 9, consisting of two toggle-links 33, the upper ends of which engage sockets 34 and 35, carried, respectively, by the inner sides of the beams 1 and 4 and the lower ends of which engage sockets formed in a head or nut 36, which is provided with a threaded orifice that is engaged by the inner end of a screw 37, working in a plate 38, secured to the beams 4 and 6, the outer end of the screw having combined with it a hand-wheel 39 to effect its turning. Of course there will be two or more of these adjusting elements combined with the apparatus. It will be seen that by turning the hand-wheel in one direction the head or nut will be moved toward the outer side of the superstructure, thereby straightening the links and causing the sections of the superstructure to be separated, and upon a reverse movement of the hand-wheel the links will assume an angular position relatively to each other, and thus allow the superstructure to lower. The beams 18 and 20, supporting the table, are somewhat wider at their upper than at their lower sides, preferably by about three-quarters of an inch, so that when the parts of the superstructure assume a horizontal position the table will still have a slight incline.

The novelty of the riffles 40 resides in the fact that they are curved, as shown in Fig. 12, and, as shown in Fig. 1 at the feed end of the table, the riffles are relatively high and narrow at the feed end of the table and relatively low and broad at the discharge end, this arrangement being adopted in order to cause the finer concentrates to be caught at their initial entry, and thus greatly reduce the resistance to discharge toward the opposite end of the table. This is also true of the modification shown in Fig. 13, in which the riffle is angular and the angle will be disposed approximately at the center of the table, so that when the machine is in operation the flow of the water and ore will be downhill substantially to the center of the table and uphill to its discharge end, thereby increasing the capacity of the machine in that more equal disposition is made of the bulk of

gangue. In other words, the initial downward inclination of the riffles causes the material under treatment to quickly spread out and prevent choking of the passages between the riffles, while the upward terminal inclination of the riffles tends to retard the movement of the material longitudinally of the table for the purpose of retaining the same as long as possible upon the table to effect a more thorough separation of the values therefrom. Interposed between the riffles are strips 41, of linoleum, rubber, or wood, that closely fit between and operate to space the riffles. These spacing-strips are of the same thickness throughout, but of course gradually decrease in width from the feed to the discharge end of the table and are thus in arrangement the opposite of the riffles, the object of this disposition being that at the feed end the riffles will present obstructions to the ore or material being fed to the table, these obstructions gradually decreasing according to the discharge, where the spacers and the riffles both occupy the same place, and thereby remove practically all obstructions to discharge.

Combined with the feed end of the table is an extension 42, into which the feed of material and water first enter, this extension being provided with riffles 43, commensurate in height with the riffles 40, the object of this extension being to catch the fine concentrates before they pass to the table proper and are thus kept from mixing with the other concentrates farther down the table, as would otherwise be the case, and by this initial separation a more rapid conservation of the concentrates may be secured than otherwise. The riffles 43 have linoleum or wooden spacers 44 between them similar to those between the riffles 40. The extension 42, as also the feed end and back end of the table, has an upstanding flange 45, which will serve to prevent the materials from working off the table, and the discharge end of the table is provided with a downturned flange 46, as clearly shown in Fig. 5, the latter flange serving as a means for directing the materials to a trough presently to be described.

The means for imparting reciprocatory movement to the table comprises a crank-shaft 47, working in bearings 48, adjustably mounted in brackets 49, secured to the pair of cross-beams 7, the brackets being provided with a head-plate 50, through which project bolts 51 for securing it to the beam. There are two of these brackets provided, and each is a counterpart of the other, so that a description of one will serve for both. In order to vary the movement of the table to adapt the machine for handling ores of different characters, it is essential that the shaft 47 should be adjustable to and from the superstructure, and to effect this result the bracket has combined with it two upstand-

ing ears 52, provided with longitudinally-threaded orifices that are engaged by jam-bolts 53, which bear at their inner ends against a bearing 48. In addition to these jam-bolts there is combined with the bearing a pair of locking-bolts 54, that project through the bearing and carry at their outer ends nuts 55, the openings 56 in the bracket through which the bolts 54 pass being oblong to permit desired adjustment. It will be seen that by loosening one pair of the jam-bolts 53 and tightening the other the bearings 48 may be moved longitudinally of the brackets for the purpose stated. Combined with the crank-shaft is one end of a pitman-rod 57, to the other end of which is connected one end of a shaft 58, mounted in bearings 59, secured to the upper sides of the cross-beams 8 and 9, the other end of the shaft 58 having combined with it a head 60, provided on opposite sides with sockets 61, that are engaged by the inner ends of a pair of toggle-links 62, the outer ends of which engage sockets 63 in a pair of toggle-levers 64, journaled upon stud-bolts 65, extending through the cross-beam 10, a wear-plate 66 disposed beneath the toggle-levers operating to shield the beam from wear. The shorter members 67 of the toggle-levers are provided with sockets 68, that are engaged by the outer ends of a pair of toggle-links 69, the inner ends of which engage with sockets formed in a head 70, carried by one end of a shaft 71, the other end of which is secured in a casting 72, bolted to the under side of the beam 19. The shaft 71 works in journal-boxes 73, secured to the upper sides of the beams 11 and 12, and carries a coiled spring 74, one end of which bears against a head 75 on the casting 72 and in which it is rigidly secured and the other end against one of the bearings 73, as clearly shown in Fig. 2. It will be seen that when the crank-shaft 47 is turned in the appropriate direction the links 62 will be straightened out, thereby causing the links 69 to approach each other, with the result that inward movement is imparted to the shaft 71, moving the table in one direction by draft on the casting 72, and as soon as the crank passes its center and starts upon its return the links 64 will be caused to approach each other, whereupon the spring 74 will break the joints of the two sets of toggle-links and cause a sharp and quick return reciprocatory movement to the table. In other words, the movement of the table in one direction or toward the driving mechanism is slow, while the return movement is rapid, and by this jumping or shaking action a rapid and proper separation of the concentrates is secured and clogging of the screen is obviated.

In handling a large quantity of ore, especially when the same is rich in concentrates, there is a tendency for the clean concentrates to come off or be separated at a

point from four to six feet from the end of the table, and it is a desideratum to catch these rich concentrates in order to avoid re-handling, which generally occurs where the concentrates are a second time submitted to the table for treatment. To secure this result, there is combined with the lower side of the table a trough 76, divided into a plurality of pockets by partitions 78, the bottom of each pocket having a discharge-opening 79. Combined with this trough is a longitudinally-adjustable screen 80, provided with a handle 81, by which it may be adjusted relatively to the trough 76, and upon this screen the concentrates will fall from the lower side of the table, the water being allowed to pass from the different compartments and escape through the openings therein. Disposed beneath the trough at its upper end and where the compartments are arranged in the trough is an ore-box 82, into which falls the ore that is carried over with the concentrates, the trough being divided into a plurality of compartments, although, if preferred, it may be a single chamber, and the ore that passes to this box may be removed and re-treated or discharged, as may be preferred. By adjusting the screen 80 relatively to the trough 76 a most effective saving of the concentrates may be secured. As shown in Fig. 4, the trough 76 is inclined, so that the water that escapes from the concentrates may be discharged toward the lower end of the apparatus.

The extension 42 is advantageous, because it first receives the material fed to the machine. The riffles or strips thereon form grooves therebetween which are comparatively wide and deep, and therefore before the material reaches the table proper from the extension the ore and heavy particles as a result of the movement of the table find their way under the gangue or like particles and are held in these grooves on the extension and in the grooves communicating therewith on the upper portion of the transversely-inclined table. They are therefore kept from spreading too much at the feed end when first discharged thereon, thus greatly increasing the capacity and efficiency of the apparatus. The extension 42 serves the same purpose as would the elongation of the entire table, but is advantageous in that it requires no greater floor-space, because it merely projects back of the pulley and the mechanism adjacent thereto. Moreover, this extension possesses advantages, because should the ore be discharged over a wide surface when fed to the table and before it could find its way under the gangue in the grooves, as hereinbefore explained, the cleaned ore would not be discharged over as wide a surface at the discharge end as otherwise and the capacity of the machine will thus be greatly reduced.

By providing riffles which have a descending slope from the feed end and an ascending slope to the discharge end the travel of the material over the table is hastened and the disposition of the gangue is rendered more rapid, leaving principally the ore proper in the grooves of the reduced area where they can be more effectually acted upon by the smoothly transversely flowing water.

It will be seen from the foregoing description that although the apparatus of this invention is exceedingly simple in construction, that it combines in a novel and practical manner all of the elements necessary for the provision of a thoroughly and efficient device, and, moreover, that by the manner in which the parts are constructed and assembled that liability of derangement in use is reduced to a minimum.

Having thus described the invention, what is claimed is—

1. An ore-separator comprising a concentrating-table which is transversely inclined to the vertical and has an extension at its feed end, a series of straight parallel riffles disposed longitudinally upon the extension, a series of longitudinal riffles upon the table and inclined downwardly from the feed end of the table and inclined upwardly toward the discharge end of the table, certain of said riffles constituting continuations of the straight riffles on the extension, and means for shaking the table.

2. An ore-separator comprising a concentrating-table which is transversely inclined to the vertical and has an extension at its feed end, a series of straight parallel riffles

disposed upon the extension, a series of longitudinal riffles upon the table and inclined downwardly from the feed end of the table and inclined upwardly toward the discharge end of the table, certain of said riffles constituting continuations of the straight riffles on the extension, a trough at the lower edge of the table and having compartments adjacent the discharge end of the table, said compartments being provided with outlets, a longitudinally-adjustable screen within the trough, and means for shaking the table.

3. In an ore-separator the combination with a base, a superstructure thereon, and means for adjusting the superstructure to a desired angle in relation to the base; of an elongated table mounted upon the superstructure and disposed at an incline to the horizontal, an extension at the feed end of the table, riffles disposed longitudinally of the extension, riffles upon the table and inclined downwardly from the feed end thereof and upwardly toward the discharge end thereof, certain of said riffles constituting continuations of the riffles upon the extension, said downwardly and upwardly extending riffles diminishing in height and increasing in width toward the discharge end of the table, and means for shaking the table.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN GIDEON KIRKSEY.

Witnesses:

JNO. H. SPENCER,
EDW. C. PFENNING.