Jan. 19, 1960 J. KRETA 2,921,680

ORE CONCENTRATING APPARATUS

Filed Oct. 31, 1955 4 Sheets-Sheet 1

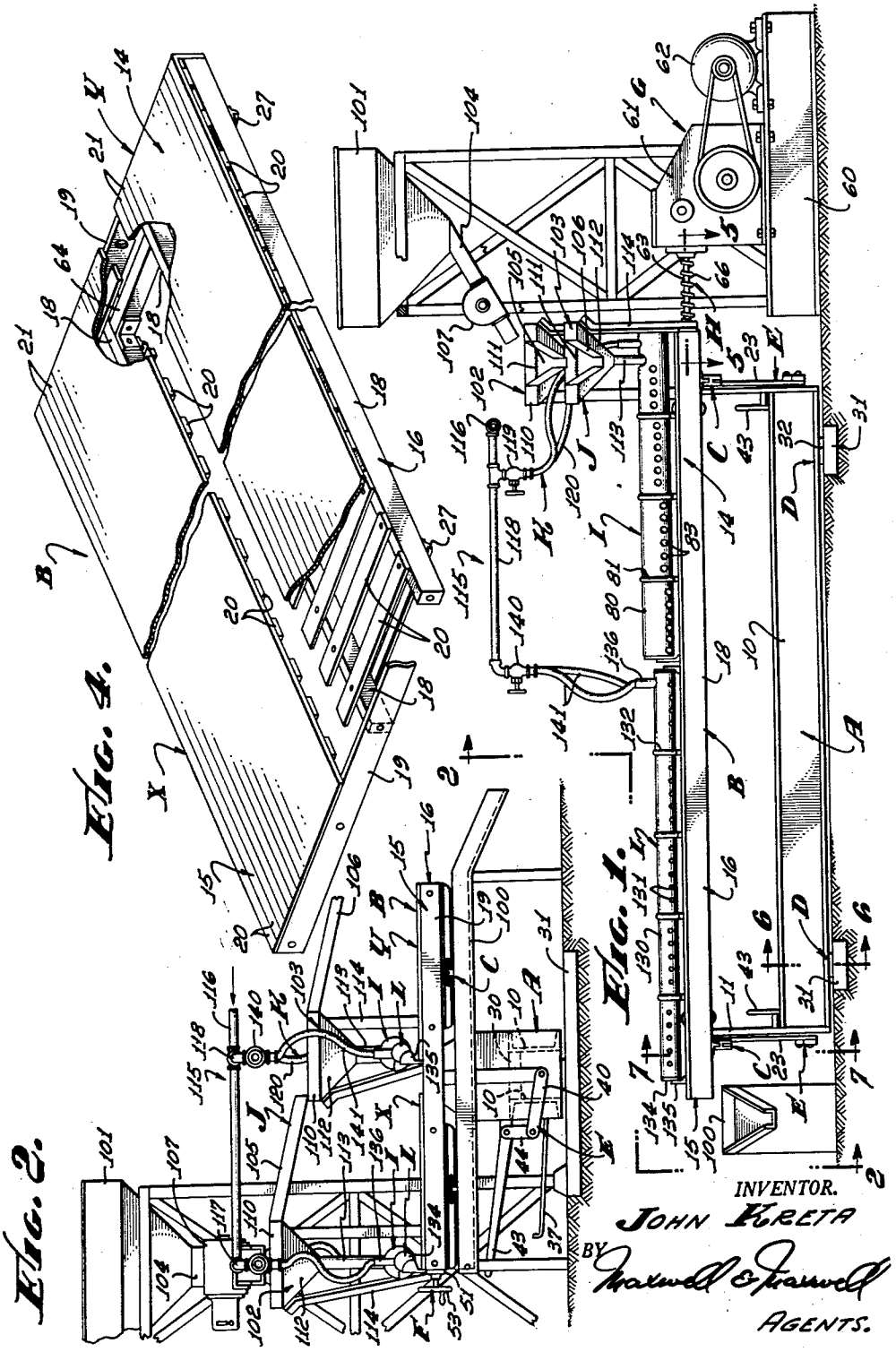


Fig. 4.

Fig. 1.

Fig. 2.

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ORE CONCENTRATING APPARATUS

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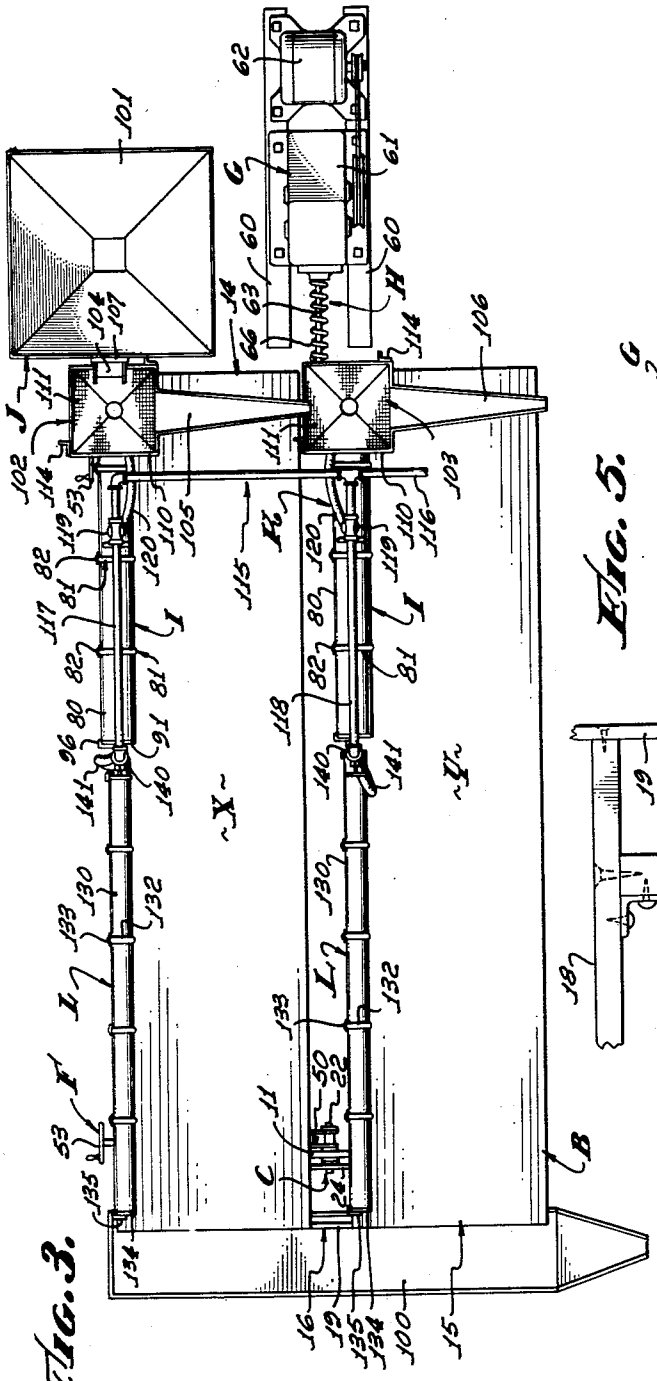


Fig. 3.

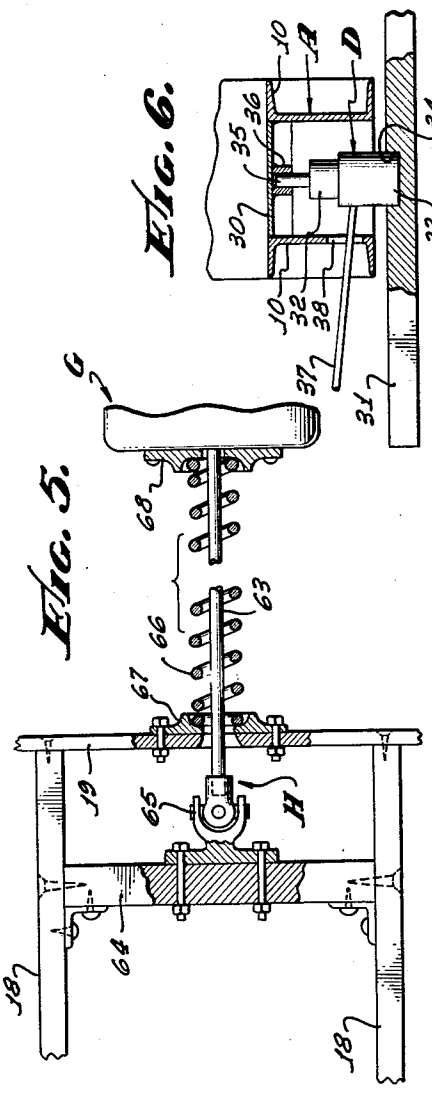


Fig. 5.

Fig. 6.

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FIG. 7.

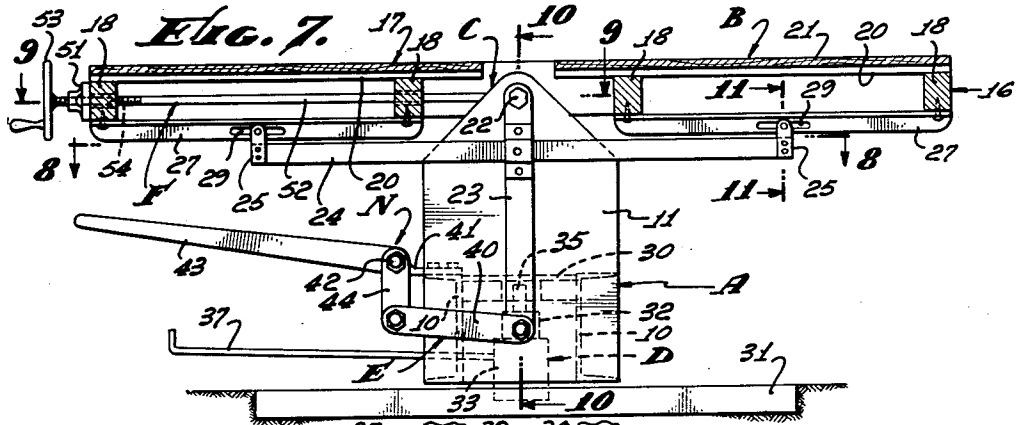


FIG. 8.

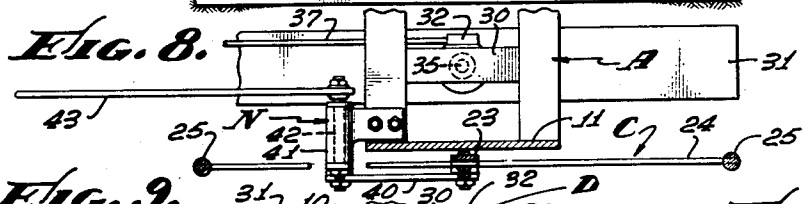


FIG. 9.

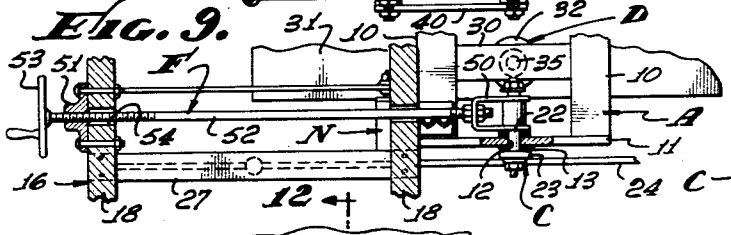


FIG. 10.

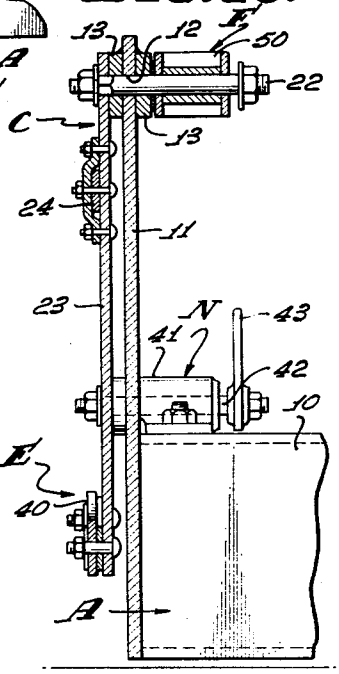


FIG. 11.

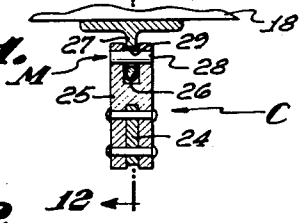
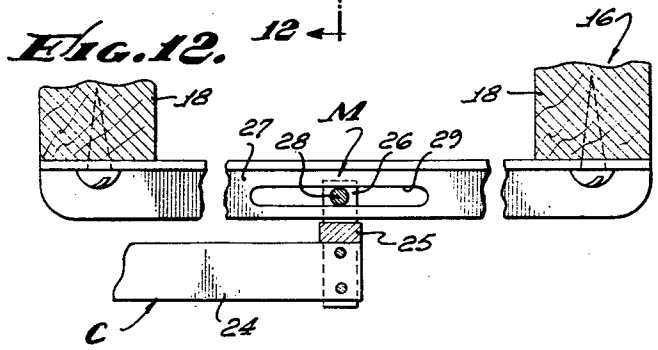


FIG. 12.



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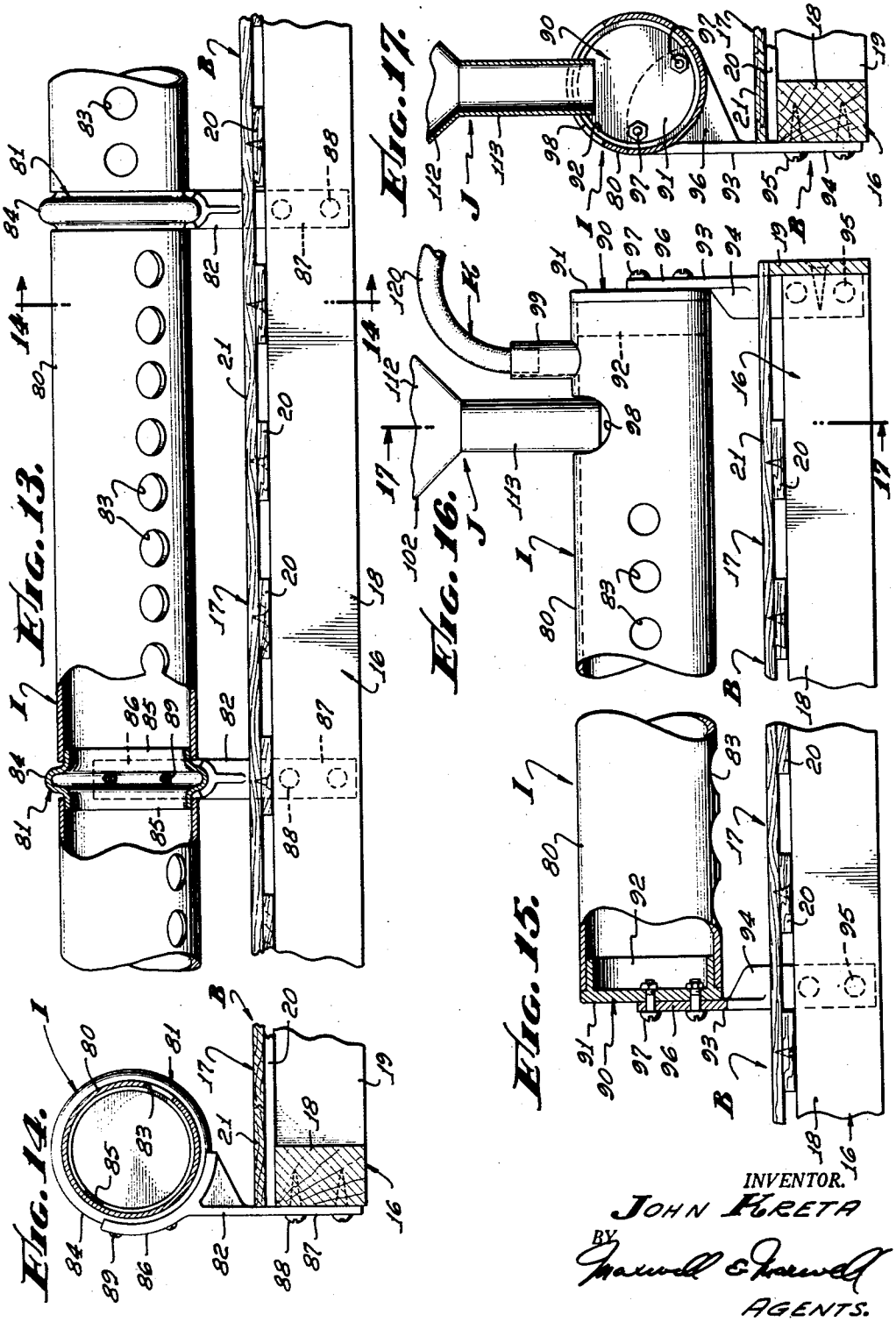


Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

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2,921,680

ORE CONCENTRATING APPARATUS

John Kreta, Randsburg, Calif.

Application October 31, 1955, Serial No. 543,706

12 Claims. (Cl. 209—437)

This invention has to do with a new and improved ore concentrating apparatus adapted to upgrade ore and/or separate ore, or mineral concentrates from their gangue.

It is well known that ordinary or conventional concentrating tables employed to upgrade and/or separate ores from their gangue, are extremely inefficient and seldom recover more than fifty percent of the mineral values that are passed over them. The inefficiency of the ordinary or conventional concentrating table is due to the fact that the greatest portion of the mineral values that are ordinarily handled are so fine that they are floated and/or washed away by the water that is employed to wash the gangue from the heavier or larger mineral particles that can be more readily collected and saved. These very fine concentrates are commonly referred to as flour or milk concentrates and can frequently be seen leaving the surfaces of conventional concentrating table with the gangue and water, or slime.

There have been many attempts in the past to increase the efficiency of concentrating tables so as to catch or save the flour or milk concentrates, but with little or no success. Such attempts have generally been directed to new and novel arrangements and application of riffles and the like to the deck or top surfaces of the tables and with the view of catching or trapping the extremely fine concentrates, and to the motions imparted to the tables by and through specific shaker mechanisms and unique table supporting means.

It is a general object of the present invention to provide a concentrating table construction adapted to separate the flour and/or milk concentrates from their gangue and to direct said flour or milk concentrates across the surface of the table in a predetermined manner and so that they can be advantageously collected.

Another object of the present invention is to provide a concentrating table that can upgrade ore with or without the use of water.

Another object of my invention is to provide a concentrating table having a flexible table with a smooth top or deck and adapted to be flexed to control the flow of material thereacross.

A further object of my invention is to provide an elongate concentrating table construction with means at each end to selectively raise and/or lower each end of the table as circumstances require.

A further object of the invention is to provide an elongate concentrating table construction with means at one or both of the ends thereof to selectively tilt or tip one or the other, or both of the ends of the table laterally, in either direction.

It is a further object of my invention to provide an elongate concentrating table of the general character referred to having means at one or both of the ends thereof adapted to selectively shift one or the other, or both of the ends of the table laterally, in either direction.

Another object of the present invention is to provide a concentrating table construction having a deck that is twisted or warped in a manner to control the flow of material thereacross and advantageously separate ore concentrates from their gangue.

It is an object of the present invention to provide a suitable support means at each end of the table and a shaker mechanism at one end of the table, which means and mechanism cooperates to allow for longitudinal reciprocation of the table, free of vertical and/or lateral movement or bumping which would otherwise cause the fine milk or flour concentrates to be cast about or agitated in a manner that would prevent controlling the flow thereof across or along the top surface, or deck, of the table.

Still another object of the present invention is to provide an ore concentrating apparatus having means for distributing material on the top or deck of a concentrating table, which means preconcentrates and/or classifies the material and deposits it along one side of the deck of the table in a predetermined manner.

It is an object of the present invention to provide an apparatus having a water supply and distributing means for a concentrating table construction, which means permits for controlling the application of water onto the table at various points or stations therealong.

Another object of the present invention is to provide a concentrating table construction having a split deck, each portion of which is adapted to handle a separate supply of material or ore.

Another object of the present invention is to provide a concentrating table construction of the general character referred to that is easy and economical of manufacture and which is both dependable and effective in operation.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevational view of the concentrating table and the ore and water supply and distributing means therefor. Fig. 2 is an end elevational view of the construction shown in Fig. 1 and taken substantially as indicated by line 2—2 on Fig. 1. Fig. 3 is an elevational plan view of the structure shown in Fig. 1. Fig. 4 is a perspective view of the table and/or deck of the table construction, apart from the supporting means and water and ore supply means, and having portions thereof broken away to show details of construction. Fig. 5 is an enlarged detailed sectional view of a portion of the structure that I provide and taken substantially as indicated by line 5—5 on Fig. 1. Fig. 6 is an enlarged detailed sectional view of a portion of the structure that I provide and taken substantially as indicated by line 6—6 on Fig. 1. Fig. 7 is an enlarged detailed transverse sectional view of my concentrating table construction and taken substantially as indicated by line 7—7 on Fig. 1. Fig. 8 is a plan view of a portion of the structure illustrated in Fig. 7 and taken as indicated by line 8—8 on Fig. 7. Fig. 9 is a detailed sectional view of a portion of the structure shown in Fig. 7 and taken as indicated by line 9—9 on Fig. 7. Fig. 10 is an enlarged detailed sectional view of the structure shown in Fig. 7 and taken as indicated by line 10—10 on Fig. 7. Fig. 11 is an enlarged detailed sectional view of a portion of the structure shown in Fig. 7 and taken as indicated by line 11—11 on Fig. 7. Fig. 12 is a detailed sectional view taken as indicated by line 12—12 on Fig. 11. Fig. 13 is an enlarged elevational view of a portion of the ore distributing means and showing por-

tions thereof broken away to illustrate details of construction. Fig. 14 is a transverse sectional view of the structure shown in Fig. 13 and taken substantially as indicated by line 14—14 on Fig. 13. Fig. 15 is an elevational view of one end portion of the ore distributing means and having portions thereof broken away to show details of construction. Fig. 16 is a side elevational view of the other end of the ore distributing means provided by the present invention, and Fig. 17 is a transverse sectional view of the construction shown in Fig. 16 and taken substantially as indicated by line 17—17 on Fig. 16.

The concentrating table construction provided by the present invention and illustrated throughout the accompanying drawings includes generally, an elongate base A, an elongate substantially horizontally disposed flexible table B, support means C to support the table above the base, vertically adjusting means D adapted to vary the longitudinal inclination of the table, longitudinally spaced tilting means E adapted to rock or tilt the table laterally, and lateral adjusting means F adapted to shift the ends of the table laterally relative to the longitudinal axis of the base.

The structure provided by the present invention further includes a suitable shaker mechanism G and a coupling means H connecting the shaker mechanism with the table and adapted to vibrate or shake the table longitudinally of the base.

The structure that I provide further includes ore distributing means I adapted to deposit ore into the table in a predetermined manner at one end portion thereof, water distributing means L adapted to deposit water at the other end portion of the table, and water supply means K adapted to supply water to the means I and L, respectively.

The base A provided by the present invention is shown as an elongate horizontally disposed member having a pair of laterally spaced longitudinal side beams **10** and an elongate vertically disposed standard **11** at each end of the base to project upwardly therefrom. In the particular case illustrated, the beams **10** are shown as elongate channel beams and the standards **11** are shown as simple, flat vertically disposed plate-like members fixed to the ends of the beams as by welding or the like. The standards **11** project a substantial distance above the ends of the beams at each end thereof and each is provided with a suitable bearing opening **12** extending longitudinally therethrough. In the case illustrated, suitable annular boss-like parts **13** are fixed to each side of each standard **11** to be in register with and adapted to supplement the bearing openings **12** extending therethrough.

The table B provided by the present invention is shown as an elongate substantially horizontally disposed structure having, which I will term, an upper or head end portion **14** and a lower foot or discharge end portion **15**. The table B is somewhat flexible and is shown as including a frame **16** and a top or deck **17**.

The frame **16** is shown as including a plurality of laterally spaced elongate parallel stringers **18** extending longitudinally of the table, elongate headers **19** at each end of the table and fixed to and extending between the ends of the stringers **17**, and a plurality of longitudinally spaced transverse battens **20** fixed to and extending across the beams.

The table top or deck **17** is a flat smooth surface and is shown as being established by a plurality of elongate parallel boards **21** fixed to the battens **20** in side by side relationship and extending longitudinally of the frame.

The table B is preferably formed entirely of wood and is secured together by means of suitable screw fasteners and the like.

In practice, the length and width of the table B can vary widely as circumstances require. In the particular case illustrated, the table is shown as being of considerable lateral extent and as having the central longitudinal portion of the deck **17** and the central portions of the transverse battens **20** of the frame **16** removed to divide or split the deck into two like elongate sections X and Y, each of which is adapted to handle a supply of material in a manner that will be hereinafter described.

The particular frame construction for the table B is shown as having four longitudinal stringers **18**, and the stringers are arranged so that each deck section X and Y of the table has an outer stringer **18** along its outer edge and an inner stringer **18** along or below its inner edge portion.

The support means C adapted to support the table B above the base A is shown as including a support shaft **22** at each end of the base and rotatably engaged in the bearing openings **12** in the standards **11** to project from the opposite sides thereof, an elongate substantially vertically disposed arm **23** is secured to one end of each support shaft to depend therefrom, and an elongate substantially horizontally disposed leaf spring **24** is secured to the arm **23**, below the support shaft **22** and so that its ends project laterally from the arm **23** to occur below the deck sections X and Y of the table B. The support means C further includes a vertically disposed head **25** and a vertical slot **26** entering it from its upper end having fixed to and projecting upwardly from each end of each spring **24** an elongate rail **27** fixed to and extending between the inner and outer stringers **18** at each end of the deck sections X and Y to occur above the ends of the springs **24** and to slidably engage in the slots **26** in the heads **25**. The rails **27** depend from the under side of the table frame and are shown as being established by simple T sections.

A suitable coupling means M is provided to prevent the heads **25** and their related rails **26** from becoming disengaged. The coupling means M is shown as including a retainer pin **28** carried by each head **25** to bridge the slot **26** therein and to pass through a suitable opening **29** provided in the rail **27** related thereto. In the particular case illustrated the openings **29** in the rails **27** are elongated to allow for lateral shifting or adjustment of the table relative to the base as will be hereinafter described in considering the lateral adjusting means F. It will be apparent that with the support means C that I provide, the table B moves straight forward and backward relative to the longitudinal axis of the base as it is reciprocated by the means G, in a manner that will be hereinafter described, and is free of any vertical or lateral movement relative to the base.

The vertical adjusting means D is adapted to vary the longitudinal inclination of the table B. In the form of the invention illustrated, the means D is shown as including a spreader **30** at each end portion of the base A to extend between the side beams **10** thereof, a foundation block **31** at each end portion of the table to occur beneath the spreaders **30**, and a suitable jack mechanism **32** supported by each foundation block **31** and engaging the spreader **30** related thereto. In the particular case illustrated, I have indicated the jack mechanisms **32** as being simple hydraulic jacks having base portions **33** engaged and held in suitable recesses **34** provided in the foundation block **31** and as having vertically shiftable rams **35** projecting upwardly therefrom and engaged in suitable socket members **36** fixed to the underside of the spreaders **30**, as clearly illustrated in Fig. 6 of the drawings.

With the means D set forth above, it will be apparent that the ends of the base A of my concentrating table construction can be shifted vertically to vary the longitudinal inclination of the table and that the construction is suitably stabilized by the engagement of the jacks **32** with the foundation blocks **31** and with the socket members **36** on the spreaders **30**.

In the particular construction illustrated, a suitable

operating lever 37 is provided for each of the jacks 32. The operating levers 37 are shown as simple elongate rod-like parts projecting laterally from the base of the jacks to a point at one side of the table where they are easily accessible. In the case illustrated, the jacks occur between the beams 10 of the base A and suitable openings 38 are shown provided in the side beams of the base to pass the operating levers 37, with working clearance.

It will be apparent that in practice, variations of the longitudinal inclination of the table, can, if desired, be obtained by providing a single jack mechanism and other suitable and/or equivalent means, at one end of the table construction only.

The longitudinally spaced tilting means E adapted to tilt or rock the table B laterally is shown as including, a manually operable bell crank mechanism N carried by the base A at each end thereof, and a link 40 pivotally connected to and extending between the bell crank mechanism and the arm 23 of the support means C.

Each bell crank mechanism N is shown as including, a mounting bracket 41 fixed to one of the beams 10 of the base A, a shaft 42 rotatably carried by the bracket to project from opposite sides thereof and extending parallel with the longitudinal axis of the base, an elongate substantially horizontally disposed operating lever 43 fixed to one end of the shaft to project laterally therefrom and towards one side of the table construction where it can be advantageously engaged by the operator of the construction, and a substantially vertically disposed work arm 44 of limited longitudinal extent fixed to and depending from the other end of the shaft.

The link 40 of the tilting means E is a simple straight elongate member with one end pivotally connected to the lower end of the work arm 44 of the bell crank mechanism and its other end pivotally connected to the lower terminal end of the arm 23 of the support means C, as clearly illustrated throughout the drawings.

With the construction set forth above, it will be apparent that by raising or lowering the operating levers 43 of the tilting means E, at each of the ends of the construction, the arms 23 and the horizontally disposed supporting springs 24 of the support means C can be advantageously tilted and with the result that the ends of the table B connected to the ends of the springs 24 through or by heads 25 and rails 27, are tilted. It will be apparent that by tilting one end of the table in one direction and the other end of the table in the other direction, or by tilting both ends of the table in the same direction, but to different degrees, the table and deck sections X and Y thereof can be warped, twisted or flexed to any desired degree throughout their longitudinal extent.

It will be further apparent that by adjusting the longitudinal inclination of the table by operation of the vertical adjusting means D and by adjusting the flexure, warp, or twist in the table, in the manner set forth above, the direction and/or course of flow of material across the deck sections X and Y of the table D, as well as the rate of flow of material thereacross, can be easily and accurately controlled.

The lateral adjusting means F that I provide for my concentrating table construction is adapted to shift the ends of the table laterally relative to the longitudinal axis of the base A. The means F involves a mechanism at each end of the table, which mechanism is shown as including, a yoke 50 rotatably connected to the other end of the support shaft 22, a threaded bracket 51 fixed to one side of the table, laterally of the yoke, and elongate shaft 52 with an inner end rotatably connected to the yoke 50 and an outer end threadedly engaged through the bracket 51, and projecting laterally from the said side of the table, and an operating wheel 53 fixed to the outer terminal end of the shaft, as clearly illustrated in Figs. 6, 8 and 9 of the drawings.

In the particular case illustrated, the threaded bracket 51 is shown fixed to the outer side of the outer stringer 18 supporting the deck section X of the table B.

Suitable openings 54 are shown provided in the table stringers 18 to freely pass the shaft 52 of the means F as they extend from the side of the table to the supporting shafts 22 of the means C, which are located substantially centrally of the table.

With the means F described above, it will be apparent that by rotating the shafts 52 by means of the operating wheels 53 at the side of the table B, each end of the table B can be advantageously shifted and set laterally in one direction or the other, relative to the longitudinal axis of the base. It will also be apparent that the elongated openings 29 in the rails 27 of the support means C will permit for such lateral shifting of the table.

As a result of the above, it will be apparent that when the table B is vibrated or reciprocated longitudinally of the base A and in a manner that will be described hereinafter, the direction in which the deck sections X and Y of the table B reciprocate can be varied considerably and as circumstances require.

In addition to the foregoing, it will be seen that lateral shifting of the ends of the table also cooperates with the tilting means F and permits for more accurate and more infinite control in flexing the deck sections X and Y of the table and controlling the flow of material thereacross.

The shaker mechanism G and the coupling means H provided by the present invention and adapted to shake or reciprocate the table longitudinally of the base A, can vary widely in form and construction. In the case illustrated, the shaker mechanism is diagrammatically illustrated as a typical or conventional shaker mechanism such as is commonly employed in connection with vibrating concentrating tables, and is shown as including a supporting frame 60, a housing 61 on the frame and in which a suitable crank or cam mechanism is housed, an electric motor 62 for driving the mechanism and a drive rod 63 related to the crank or cam mechanism within the housing to be reciprocated thereby and projecting forwardly from the housing to connect with the upper or head end of the table.

The coupling means H is adapted to connect the forward end of the drive rod 63 of the shaker G to the table B, and is shown as including, a cross member or anchor beam 64 fixed to and extending between the inner stringers 18 of the table frame 16, forward of the header 19 at the head end of the table, and a universal joint 65 connecting the end of the rod 63 to the beam, as clearly illustrated in Fig. 5 of the drawings.

It will be apparent from the above that the universal joint 65 of the coupling means H allows or permits the table B to be shifted vertically by the means D and/or laterally by the means F without affecting the satisfactory operation of the shaker mechanism.

In practice, and where circumstances require, a suitable buffer means can be provided between the head end 14 of the table and the shaker mechanism 61. In the case illustrated, I have shown a suitable buffer spring 66 engaged around the rod 63 to occur between the header 19 of the table frame 16 and the shaker housing 61, and suitable seats 67 and 68 for the ends of the spring and secured to the said header and housing. The buffer spring 66 is a compression spring and serves to slow up or retard the rearward movement of the table B and to quicken or make more abrupt the forward movement of the table as it is reciprocated by the means G. As a result of the above movement of the table, it will be apparent that material deposited on the deck sections X and Y is caused to move along or across the deck sections in the direction in which they are reciprocated and towards the foot end of the table.

In practice, it is desirable that the shaker mechanism G be such that the length of stroke and the rate of reciprocation of the drive rod 63 can be varied as circumstances

require and so that the vibrating or reciprocating action of the table can be controlled as circumstances require.

In practice, it is preferred that the table B be normally slightly inclined longitudinally so that the foot or discharge end **15** of the table is slightly lower than the upper head end portion **14** thereof and so that the material or ore deposited at or near the head portion of the deck sections X and Y of the table will tend to flow longitudinally forward towards the foot end of the table as it is reciprocated by the means G. It is further preferred that the table be normally tilted laterally in one direction so that the material deposited at or along the uppermost side edges of the deck sections X and Y thereof, tends to flow laterally thereacross. With the above relationship of parts, that is, with the table inclined longitudinally and tilted laterally in the manner set forth above, it will be apparent that material deposited at or near the uppermost corner of each deck section, at the head portion of the table, tends to flow laterally, diagonally and longitudinally across the deck sections.

In practice, when the table is inclined and tilted as set forth above and when the table is angularly related to the base A, as by operation of the means F, and is then shaken or reciprocated longitudinally of the base by the means G, the lightest material or gangue deposited on the deck sections X and Y of the table flows laterally across the inclined surfaces thereof and pours over the lower side edges thereof, adjacent the head end of the table, while the heavier mineral concentrates being handled can be caused to flow longitudinally along the deck sections X and Y towards the foot end of the table and to pour over the foot end thereof, where they can be advantageously collected in a suitable trough **100**, or the like. The particles of material of varying specific gravity or density, that is, particles of material whose specific gravity is somewhere between the lightest gangue and heaviest mineral concentrates being handled, fan out and flow across the table in a set pattern and according to their specific gravity. As a result of the above, it is possible in certain circumstances to set my table so that different grades of concentrates or different concentrates of varying specific gravity can be discharged and collected at different stations across the foot end of the deck sections X and Y of the table B.

In practice, when the table is shifted laterally so that it is angularly related to the longitudinal axis of the base and so that it is reciprocated diagonally and in a direction towards the upper corner at the foot end of the table, the foot end of the table can be tilted so that the uppermost corner portions of the deck sections X and Y thereof are inclined upwardly. When the table is flexed in the manner set forth above, and is reciprocated, the heavy flour concentrates will actually flow up the inclined corners at the foot end of the deck sections X and Y as they move longitudinally therealong.

The ore distributing means I is adapted to deposit ore along the upper side edge of each of the deck sections X and Y and is shown as including two like units or assemblies, one related to each deck section X and Y and each including an elongate tubular structure having a plurality of axially aligned tube sections **80**, coupling rings **81** engaged between the opposed ends of the tube sections and connecting the tube sections for relative rotation, and mounting brackets **82** for the coupling rings and secured to the table B.

Each tube section **80** is provided with a row of longitudinally spaced openings or apertures **83** along one side thereof and adapted to allow ore deposited into the assemblies to pour or spill onto the deck sections X and Y therebelow.

The coupling rings **81** are shown as simple annular rings, each having an enlarged central portion **84** and longitudinally projecting annular end portions **85**. The end portions **85** of the rings **81** enter the ends of the tubes **80** adjacent thereto, to support the tubes and establish sliding frictional engagement therewith. The enlarged central portion **84** of each coupling ring **81** projects radially outwardly between the opposed ends of the tube sections related thereto and serves to maintain the tubes in proper spaced relationship and against longitudinal shifting.

The mounting brackets **82** are shown as simple cast brackets having head portions **86** establishing arcuate seats to receive the central portions **84** of the coupling rings **81**, and stem portions **87** depending from the head portions to occur adjacent the upper side edges of the deck sections X and Y of the table B. In Figs. 14 and 15 of the drawings, the mounting brackets **82** are shown secured to the outer stringers **18** of the table frame **16** and to their related mounting rings **81** by means of suitable screw fasteners **88** and **89**, respectively.

In circumstances where there is no stringer to mount the bracket **81** to the table B, suitable mounting blocks can be secured to the under side of the deck, as would have to be provided on the deck section Y of the construction illustrated in the instant case.

Suitable closures **90** and support brackets **93** are provided at each end of the tube assemblies of the means I to close and support the terminal ends thereof. In the case illustrated, each closure **90** is shown as having a disc-shaped body **91** to occur adjacent the terminal end of the tube **80** related thereto and an axially projecting annular flange **92** thereon and slidably entering the ends of the tube. The support brackets **93** are shown as simple cast brackets having base portions **94** fixed to the table B as by suitable screw fasteners **95**, and head portions **96** projecting up from the base portion and secured to the bodies **91** of the closure by suitable screw fasteners **97**.

Each tube assembly of the means I has one tube section **80** with an inlet opening **98** to receive ore from the supply means J and a stand pipe **99** to connect with and receive water from the water supply means K. In the case illustrated, the inlet openings **98** and the stand pipes **99** are shown provided in and on the tubes **80** of the tube assemblies which occur adjacent the head end **14** of the table B. The inlet openings **98** open substantially upwardly and are shown as being elongated circumferentially of the tubes in which they are formed so that the said tubes can be rotated in a manner that will be hereinafter described. The stand pipes **99** are simple straight tubular members fixed to the same tubes **80** in which the inlet openings **98** occur, to occur adjacent the said inlet openings and so that they normally project upwardly from the said tubes. It is to be understood that simple water receiving openings could be employed in place of the stand pipes **99** and that the particular construction shown and described is for the purpose of illustration only.

In practice, it is preferred that the tubes **80** of the means I be supported above the table a short distance, as for example, about one-half inch.

With the structure set forth above, it will be apparent that the tube assemblies of the ore distributing means I are fixed to the table B and reciprocate or vibrate therewith, when the construction is in operation. It will also be apparent that the tube sections **80** of the means I can be rotated relative to each other and so that the rows of openings or apertures **83** therein can be set at varying heights above the deck sections X and Y of the table.

The ore supply means J, adapted to supply ore to the means I, is shown as including an elevated supply bin **101** adjacent the head end of the table B, a screening funnel **102** secured to the table B at the head end thereof to occur above the uppermost end of the tube assembly of the means I for the deck section X, a screening funnel **103** secured to the table B at the head end thereof to occur above the uppermost end of the tube assembly of the means I for the deck section Y, a feed tube **104** from the bin **101** to the funnel **102**, an overflow trough

105 from the funnel 102 to the funnel 103 and an overflow trough 106 from the funnel 103 to a point laterally offset from the structure. The means J further includes a suitable feed control mechanism 107 in the tube 104 and controlling the rate at which the ore is deposited into the screening funnel 102.

The screening funnels 102 and 103 are substantially alike and each is shown as having a top portion 110 with a classifying screen 111 therein extending thereacross, an intermediate downwardly convergent central portion 112, and a lower downwardly projecting spout portion 113. The spout portions 113 of the funnels 102 and 103 are adapted to deliver or conduct screened or classified ore into the tube assemblies of the distributing means I and through the inlet receiving openings 98 in the upper end tubes thereof, as clearly illustrated in Figs. 16 and 17 of the drawings.

The funnels 102 and 103 are shown as being mounted or fixed to the table B by suitable support members 114 and so that they shake or are reciprocated with the table and so that the lower spout portion 113 thereof remains in proper engagement in the receiving openings 98 of the means I.

With the structure set forth above, it will be apparent that the material or ore deposited into the screening funnel 102, from the bin 101 and under control of the feed control mechanism 107, is first screened, that is, the smaller particles of ore pass through the screen 111 thereof and are delivered into the tube assembly of the means I related to the deck section X. The ore not passing through the screen 111 of the funnel 102 flows through the trough 105 thereof and is delivered into the screening funnel 103 where it is screened a second time by the screen 111 in the funnel 103, which screen is preferably of larger mesh than the screen in the funnel 102. The smaller particles passing through the screen 111 of the screening funnel 105 flows downwardly through the funnel and into the tube assembly of the means I related to the deck section Y. The ore not passed by the screen 111 of the funnel 103 flows through the trough 106 to a point or location laterally offset from the table, from which point it can be disposed of or handled in any desired manner.

With the above relationship of parts, it will be seen that the supply means J classifies the ore so that the deck section X of my table construction handles and treats fine ore while the deck section Y handles coarse ore.

A suitable water pipe system 115 is shown provided for the water supply means K and water distributing means L. The system 115 is shown as including a water main 116 spaced above and extending transverse the upper or head portion of the table B and a pair of laterally spaced parallel branch lines 117 and 118 overlying the upper side edges of the deck sections X and Y.

The water supply means K for the ore distributing means I is shown as including a valve 119 in each branch line 117 and 118 to occur above each of the tube assemblies of the ore distributing means I, for each of the deck sections X and Y, and a flexible rubber hose 120 connected to each valve 119 and depending therefrom to be slidably engaged in the water receiving stand pipes 99 of the tube assemblies.

With the structure set forth above, it will be seen that when the structure of the present invention is in operation and ore is introduced into the tube assemblies of the means I through or by the means J, water can be introduced into the tube assemblies by the means K and under control of the valve 119.

It will be further apparent that when ore and water is introduced into the tube assemblies of the means I and the said assemblies are reciprocated with the table B, as set forth above, the means I can be adjusted by rotating the tube sections 80 thereof relative to each other, to vary the vertical positioning of the rows of openings or apertures 83 therein, to preconcentrate the ore before it is distributed onto the deck sections X and Y. The above preconcentration of the ore being handled is, in effect, a panning operation and is accomplished by rotating the uppermost tube section 80 of each tube assembly so that the row openings 83 therealong is spaced a considerable distance above the deck section to which it is related and rotating each of the other sections so that the rows of openings 83 therein become consecutively lower, or closer to the deck section and until the row of openings or apertures 83 in the last or foremost tube section 80 of the assemblies is the lowest and is faced substantially downwardly. With the above relationship of parts and when the assembly is reciprocated, it will be apparent that the lighter particles of materials introduced into the tube assemblies remain on top or high therein and find their way out and onto the deck sections of the table through the uppermost row of openings, which row of openings occur at the head end of the table, while the heaviest particles of material being handled drop to lower levels in the tube assemblies and find their way out and onto the deck section of the table through the lower rows of openings along the tube assemblies. The heaviest particles drop or are worked downwardly to the bottom of the tube assemblies and eventually find their way out through the lowermost row of openings of the assemblies, which openings occur in the foremost tube sections.

The milk or flour concentrates being reciprocated with the gangue and water in the tube assemblies are suitably submerged and do not float on top of the slime as it is deposited onto the deck sections of the table.

By roughly preconcentrating the ore in the distributing means I, in the manner set forth above, it will be apparent that the ore is distributed along the upper side edges of the deck sections X and Y at varying stations along their longitudinal extent and according to the varying specific gravity of the individual particles.

In practice, the means I can vary widely in details of construction and in proportions. As for instance, the length and number of tube sections 80 employed to establish the means I, and the number, size and shape of openings 83 therein can be varied widely, without destroying the idea of means provided by this invention.

In the particular case illustrated, I have shown the tube assemblies of the means I extending slightly less than half way to the foot end of the table. In practice, the means I could be made to extend a greater or lesser distance towards the foot of the table if circumstances required.

The water distributing means L of the present invention is provided to apply water to the deck sections X and Y of the table B, forward of or downstream from the ore distributing means I, and is adapted to wash the gangue away at the forward portions of the deck sections X and Y and to maintain the flow of concentrates therealong.

The means L is shown as including an elongate assembly of axially aligned elongate tube sections 130, for each deck section X and Y, and continuing forwardly towards the foot end of the deck sections of the table from that point where the tube assemblies of the means I terminate. The tube assemblies of the means L are shown as being substantially the same in construction as the tube assemblies of the means I and each includes a plurality of elongate axially aligned tube sections 130, each with a row of longitudinally spaced apertures or openings 131 therein, coupling sleeves 132 engaged between the opposed ends of the tube sections and connecting the sections together for relative rotation, mounting brackets 133 fixed to and extending between the table and the mounting rings to fix the assemblies to the table in vertical spaced relationship thereto, and closures 134 for the terminal ends of the end tubes of the assemblies, mounting brackets 135 fixed to and extending between the end closures and the table to support the ends of the assembly, and a water receiving opening stand

pipe 136 fixed to and projecting upwardly from the uppermost tube section and adapted to receive a flexible water hose.

In view of the fact that the details of construction of the means L is the same as the means I, it is believed that illustration of the means L in Figs. 1, 2 and 3 of the drawings will be sufficient disclosure and that enlarged detailed view of the said means need not be provided.

The only distinction between the construction of the water distributing means L and the ore distributing means I is the relative size of the two assemblies and omission of the ore receiving openings in the means L, which openings must be provided in the means I.

In the case illustrated, I have shown the various elements of the tube assemblies of the means L as being considerably smaller in diameter than the corresponding element of the means I.

The water supply means K for the water distributing means L is shown as including a manually operable valve 140 at the end of each branch pipe 117 and 118 of the pipe system 115, and a flexible hose 141 connected with each valve and depending therefrom to enter the stand pipe 136 of the tube assemblies related thereto.

With the water distributing and supply means L and K set forth above, it will be apparent that by establishing a desired flow of water into the tube assemblies of the means L through or by the means K, and by rotating the tube sections of the means L to vary the vertical positioning of the openings 131 therein, the distribution of water onto the lower or foot end portions of the deck sections X and Y can be easily and accurately controlled.

As pointed out above, my table construction can, under certain conditions, be advantageously and effectively operated dry, that is, without the use of water. When such conditions exist, the water supply means K for the means I and L can be turned off or put out of service.

In other conditions it has been found that the effectiveness of my construction is improved by operating the ore distributing means I dry, and applying water to the lower or foot end portion of the table only, or by operating the ore distributing means wet, that is, with water, and putting means L out of service.

In practice, when a permanent installation of my invention is to be made and where a large quantity of one particular grade of ore is to be handled, the various means that I provide for adjusting the dispositioning of the deck sections of my table construction and the means provided for flexing and controlling the configuration of the deck sections, could be eliminated and the deck sections could be twisted and/or warped and set in a fixed configuration which would advantageously handle the ore to be processed.

It is to be further understood that in practice, concentrating tables embodying the present invention and having but one deck section could be provided, and that the particular split deck construction illustrated and described above is only typical of one preferred form and application of my invention.

It is still further to be understood that the details of construction of the various elements and means of the form of the invention illustrated and described above, is only typical of one carrying out of the invention and that, in practice, various other constructions and equivalent means could be employed to obtain the same end results.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, and manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard.

2. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed tc each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and means to maintain the table in longitudinal alignment relative to the base including, a shaft pivotally connected with the standard at the end of the table remote from the head motion and projecting laterally therefrom and connected to one side of the table.

3. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and manually operable means at the end of the table to shift the longitudinal

axis of the base and including an elongate shaft rotatably and pivotally connected with the standard related thereto and projecting laterally therefrom, a bracket fixed to one side of the table and threadedly receiving the outer end portion of the shaft and a hand wheel fixed to the outer terminal end of the shaft.

4. An ore concentrating table having an elongate, substantially horizontally disposed rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and means to vary the longitudinal inclination of the table including a manually operable vertical jack at the end of the table remote from the head motion and below the base.

5. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the spring and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and means to vary the longitudinal inclination of the table including a manually operable vertical jack below each end of the base.

6. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, means to maintain the table in longitudinal alignment relative to the base including, a shaft pivotally connected with the standard at the end of the table remote from the head motion and projecting laterally therefrom and connected to one side of the table, and means to vary the longitudinal inclination of the table including a manually operable vertical jack below each end of the base.

7. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, manually operable means at the end of the table to shift the longitudinal axis of the base and including an elongate shaft rotatably and pivotally connected with the standard related thereto and projecting laterally therefrom, a bracket fixed to one side of the table and threadedly receiving the outer end portion of the shaft and a hand wheel fixed to the outer terminal end of the shaft, and means to vary the longitudinal inclination of the table, including a manually operable vertical jack at the end of the table remote from the head motion and below the base.

8. An ore concentration table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, means to maintain the table in longitudinal alignment rela-

tive to the base including, a shaft pivotally connected with the standard at the end of the table remote from the head motion and projecting laterally therefrom and connected to one side of the table, and means to vary the longitudinal inclination of the table including a manually operable vertical jack below each end of the base, said manually operable tilting means including, a bell crank having a vertically disposed work arm and a laterally outwardly projecting lever arm pivotally connected to the lower end of each standard on an axis parallel with the longitudinal axis of the table and a link pivotally connected with and extending between the free end of the work arm and the lower end of the arm of the support means related thereto.

9. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate track related to each end of the springs and fixed to the under side of the table to extend transversely thereof and an upwardly projecting head fixed to each end of the springs and slidably engaging the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, manually operable means at the end of the table to shift the longitudinal axis of the base and including an elongate shaft rotatably and pivotally connected with the standard related thereto and projecting laterally therefrom, a bracket fixed to one side of the table and threadedly receiving the outer end portion of the shaft and a hand wheel fixed to the outer terminal end of the shaft, and means to vary the longitudinal inclination of the table, including a manually operable vertical jack at the end of the table remote from the head motion and below the base, said manually operable tilting means including, a bell crank having a vertically disposed work arm and a laterally outwardly projecting lever arm pivotally connected to the lower end of each standard on an axis parallel with the longitudinal axis of the table and a link pivotally connected with and extending between the free end of the work arm and the lower end of the arm of the support means related thereto.

10. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate, flange-like track with an elongate opening therein related to each end of the springs and fixed to the under side of the table to depend therefrom and extend transversely thereof, an upwardly projecting, slotted head fixed to each end of the springs and slidably engaging the track related thereto and a pin carried by each head and extending through the opening in the track related thereto, and manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard.

11. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate, flange-like track with an elongate opening therein related to each end of the springs and fixed to the under side of the table to depend therefrom and extend transversely thereof, an upwardly projecting, slotted head fixed to each end of the springs and slidably engaging the track related thereto and a pin carried by each head and extending through the opening in the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and means to vary the longitudinal inclination of the table including a manually operable vertical jack at the end of the table remote from the head motion and below the base.

12. An ore concentrating table having an elongate, substantially horizontally disposed, rectangular table, support means to support the opposite ends of the table for lateral pivotal movement and longitudinal reciprocation, and a power driven head motion means connected with one end of the table to reciprocate the table longitudinally, said support means including an elongate, horizontally disposed base extending longitudinally of and below the table, a vertical standard at each end of the base to project upwardly therefrom and terminating below the table intermediate the sides thereof, an elongate, substantially vertically disposed arm pivotally connected to the upper end of each standard on an axis parallel to the longitudinal axis of the table and to depend therefrom, an elongate, horizontally disposed leaf spring fixed to each arm to project laterally from the opposite sides thereof and extend transversely of the longitudinal axis of the table, an elongate, flange-like track with an elongate opening therein related to each end of the springs and fixed to the under side of the table to depend therefrom and extent transversely thereof, an upwardly projecting, slotted head fixed to each end of the springs and slidably engaging the track related thereto and a pin carried by each head and extending through the opening in the track related thereto, manually operable tilting means connected with the lower end of each arm to pivot each arm relative to the standard, and means to vary the longitudinal inclination of the table including a manually operable vertical jack below each end of the base, said manually operable tilting means including, a bell crank having a vertically disposed work arm and a laterally outwardly projecting lever arm pivotally connected to the lower end of each standard on an axis parallel with the longitudinal axis of the table and a link pivotally con-

nected with and extending between the free end of the work arm and the lower end of the arm of the support means related thereto.

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