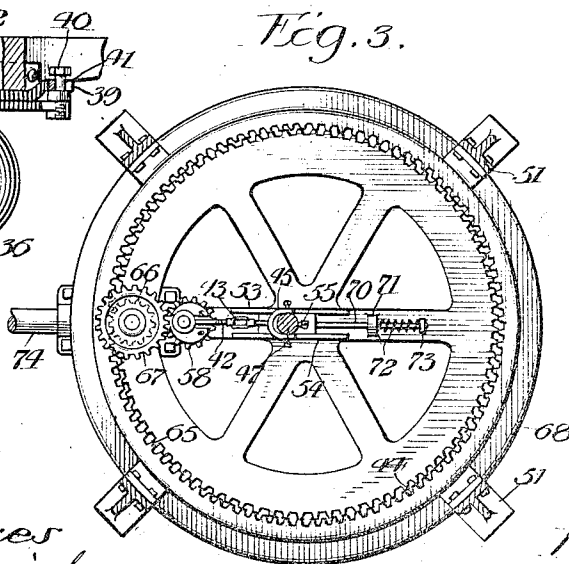
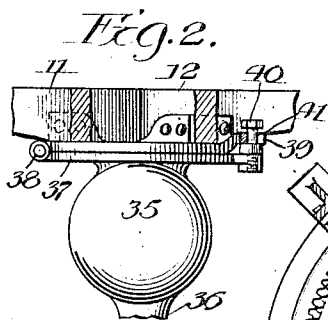
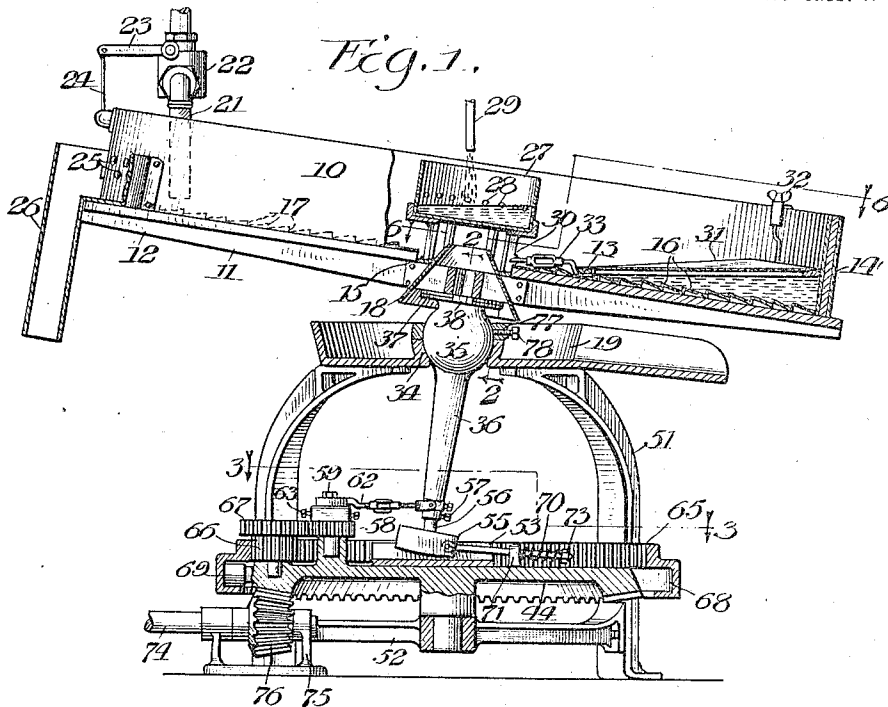


C. H. MUHLEMAN.
PAN MOTION CONCENTRATOR.
APPLICATION FILED JUNE 4, 1914.

1,141,972.

Patented June 8, 1915.

2 SHEETS—SHEET 1.



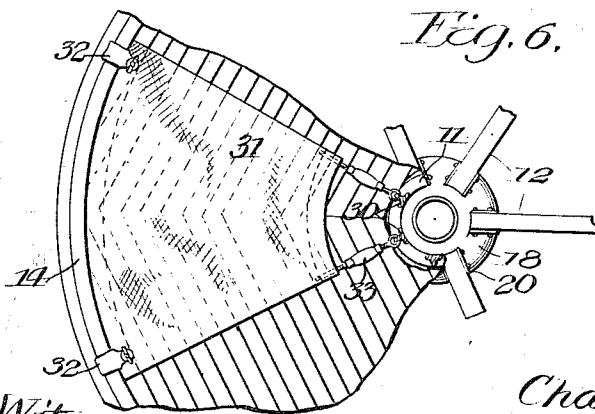
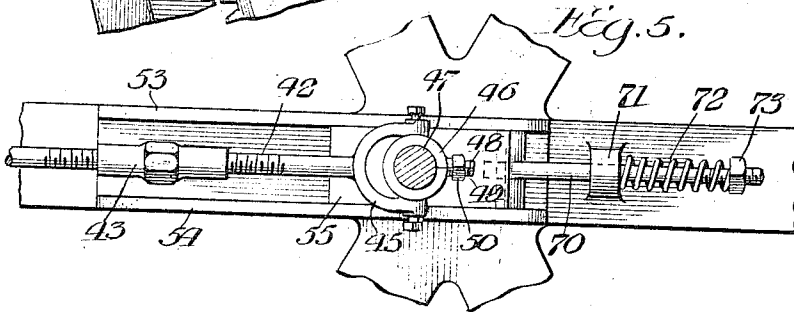
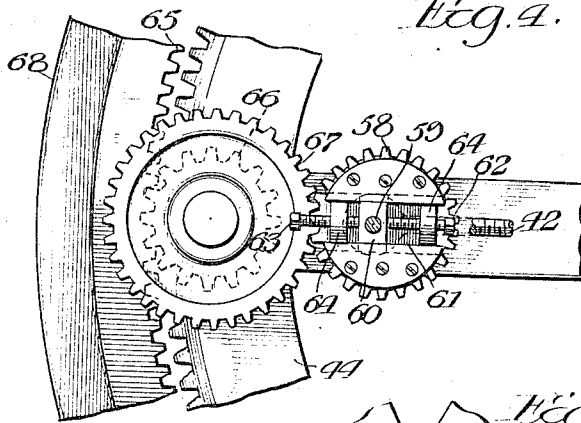
Witnesses
O. M. Hermann
E. M. Klatchen

Inventor
Charles H. Muhleman
by *Gillman & Gillman*
Attorneys

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Witnesses
Orr. Vermick
E. M. Klatcher

Inventor
Charles H. Muhleman
by Gullson & Gullson
Attys.

UNITED STATES PATENT OFFICE.

CHARLES H. MUHLEMAN, OF WESTERN SPRINGS, ILLINOIS, ASSIGNOR OF FIFTY-FIVE ONE-HUNDREDTHS TO FRANK LOW, OF ST. LOUIS, MISSOURI.

PAN-MOTION CONCENTRATOR.

1,141,972.

Specification of Letters Patent.

Patented June 8, 1915.

Application filed June 4, 1914. Serial No. 842,862.

To all whom it may concern:

Be it known that I, CHARLES H. MUHLEMAN, a citizen of the United States, and resident of Western Springs, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Pan-Motion Concentrators, of which the following is a specification and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to ore concentrators and contemplates a machine in which the heavier particles are separated from the gangue by the use of a pan or table having a movement which simulates that of the hand manipulated pan concentrator.

The object of the invention is to provide an ore concentrating machine which shall be of improved construction, effective in saving substantially all of the metallic values contained in the ore and capable of being operated with a minimum consumption of power.

More specifically, the object of the invention is to improve the construction of the ore concentrator shown in my Patent No. 764,197, dated July 5th, 1905.

In the accompanying drawings, Figure 1 is a central vertical sectional view of an ore concentrating machine embodying the features of improvement provided by the invention; Fig. 2 is a detail sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a plan sectional view taken on the line 3—3 of Fig. 1; Figs. 4 and 5 show details of Fig. 3 drawn to a larger scale, some of the parts being removed in Fig. 4, and others being shown in section, and Fig. 6 is a detail plan view partly in section, the plane of the section being indicated by the broken line 6—6 on Fig. 1.

The pan for receiving the ore is generally indicated by the numeral 10. When the machine is to be used for concentrating wet ore or pulp, this pan will preferably be held against rotation but will be rocked and vibrated in a suitable manner for obtaining the desired movement of the pulp and metallic particles within the pan. Provision for rotating the pan 10 is also provided for use when required, as in event the machine is to be employed for concentrating dry ore. The body of the pan 10 is conveniently supported by and built about a central head or spider 11. A plurality of timbers 12 extend

radially outward from the head or spider 11 and the floor 13 of the pan is laid upon these timbers. Preferably the pan also has a circumferential wall or rim 14. As shown this rim rises from the floor 13 adjacent its periphery. A central opening 15 in the floor 13 provides for the discharge of the concentrates and the surface of the floor 13 is desirably roughened to present ribs or "rifles" 16, each of which preferably has an abrupt or substantially vertical inner face 17. A shield 18 serves for guiding the discharged concentrates into a suitable receptacle 19 located below the pan. This shield is conveniently made of sheet metal and in the form of a truncated cone, the wall of the cone being slotted upwardly from its lower edge, as indicated at 20, Fig. 6, to receive each of the timbers 12. A feed pipe 21 for the supply of wet ore or pulp to be treated, preferably leads into the pan 10 adjacent one side of the same. If desired, this pipe may be provided with a valve 22. When such a valve is used, the handle 23 of the valve may be connected with the adjacent side walls 14 of the pan 10, as by a link 24. This arrangement provides for an intermittent feeding of the material into the pan, the valve 22 being opened and closed by the rising and falling of the adjacent part of the pan. The gangue is discharged from the pan through openings, as 25, in its side wall or rim. These openings are preferably located adjacent the feed pipe 21, and preferably at a level somewhat above the level of the floor or bottom of the pan. If desired a hood 26 may be secured against the outside of the rim 14 to cover the openings 25. Such a hood serves for delivering the gangue to a suitable receiver (not shown).

To permit the supplying of additional water to the material in the pan 10, a hopper 27 may be supported centrally over the pan above the discharge opening 15. As shown, this hopper is provided with a circumferential row of discharge openings 28 in its wall. If supplied with water from a water supply pipe 29, this water will be distributed over the pan through the discharge openings 28. The hopper 27 is conveniently supported in position by means of a plurality of uprights, as 30, which rise from the head 11 and extend upwardly through the central opening 15 in the floor 13.

In some instances it may be desirable to support a section of fabric within the pan 10 for retaining those minute particles of metal which float upon the pulp in the froth or scum. In the drawings this fabric is shown as taking the form of a blanket 31 having the shape of a segment of the pan. This blanket is supported in position by being stretched between two series of clamps 32 and 33, the former of which are hooked over the rim 14 of the pan and the latter of which are engaged with certain of the up-rights 30.

The receptacle 19 into which the concentrates are discharged, is preferably made annular, its central portion or hub, 34, being formed into a socket for receiving a spherically enlarged portion 35 of a supporting pillar or column 36. The higher end of the column 36 is enlarged to provide a seat 37 for the central head of the pan. To provide for tilting the pan 10 in one direction the central head 11 is connected with the seat 37 at one side by means of a hinge 38, and an adjusting screw 40 serves for connecting the head and seat which is remote from the hinge. As shown, the adjusting screw 40 has threaded engagement with the seat 37 and is provided with an annular groove 41 for receiving the arms of a fork 39 which is formed upon the head 11. Turning the adjusting screw 40 accordingly serves to tilt the pan 10 about an axis which is parallel to the plane of the section illustrated in Fig. 1. The pan 10 is also tilted by adjustably swinging the column 36. For this purpose a sectional link 42, having its parts connected by a turn buckle 43 is provided.

One end of the link 42 is connected with a rotating support, as the beveled gear 44. The other end of the link is connected with the column. As shown, the inner end of the link 42 is formed into a fork, as 45 (Fig. 5) and the arms of the fork have swiveled connection with a ring or collar 46 which turns upon the column 36. Preferably the column is grooved, as at 47, to receive the collar 46, and the collar is split to permit of its being elastically passed over the end of the column and into the groove. When the ring is in place its ends may be connected in any convenient manner. As shown, the ends of the ring are outturned, as at 48 and 49, and are threaded to receive a nut 50.

The beveled gear 44 preferably turns in a horizontal plane below the pan 10. As shown, the parts are associated upon a frame which is generally designated 51. This frame has cross arms 52, which provide a journal bearing for the beveled gear 44. The receptacle 19 is seated upon the top of the frame. The beveled gear 44 serves for guiding the lower end of the column 36 when the pan is held against rotation and for turning the column when the pan is to

be rotated. To this end a pair of parallel ribs or flanges 53, 54, are formed upon the back of the beveled gear 44, to serve as ways for slidably receiving a shoe 55 between them. When the pan 10 is to be held against rotation, as for the treatment of wet ore or pulp, the shoe 55 has swiveled connection with the lower end of the column 36. As shown, a stud 56 rises from the shoe 55 and rotatably enters the lower end of the column. When the pan is to be rotated, as for the treatment of dry ore, the column 36 is connected with the shoe 55 to rotate therewith. For this purpose a set screw 57 may be entered in the column 36 adjacent its lower end and turned up to bind upon the stud 56. If the link 42 be so adjusted in length as to support the column 36 in an inclined position, rotation of the gear 44 will impart such a motion to the pan as to cause its contents to flow around the pan adjacent its rim. In certain of the appended claims this motion of the pan is referred to as a rotary tilting of the pan though it will be understood that it does not necessarily include rotation of the pan for as already explained it is preferred that the pan be held against rotation. It is also desirable to impart a vibrating or "jiggling" motion to the pan. For this purpose the connection of the link 42 with the gear 44 includes a pinion 58 which is rotatably mounted upon the gear and carries a wrist pin 59 for receiving the outer end of the link 42. Preferably the wrist pin 59 is adjustably mounted upon the pinion 58. This detail of the construction is most clearly illustrated in Fig. 4. As there shown, the wrist pin 59 enters a block 60. This block fits in a slide way 61 extending across the top of the pinion 58. Set screws 62 and 63 engage the block 60 upon opposite sides for holding the same in adjusted position. As shown, each of these set screws passes through and has threaded engagement with a lug 64 which rises from the floor of the slide way 61. A relatively rapid rotation is imparted to the pinion 58 during the turning of the beveled gear 44. For this purpose an internal gear 65 is stationarily mounted in the frame 51 and a pinion 66 is rotatably mounted upon the back of the beveled gear 44 and meshes with the internal gear. An intermediate pinion 67 is formed integral with the pinion 66 and meshes with the pinion 58.

Owing to the vibration of the parts provision is preferably made for guidedly supporting the beveled gear 44 at its rim. As shown, an annular groove 68 is formed in the frame 51 adjacent the internal gear 65. A plurality of rollers 69 (only one of which is shown) are mounted upon the rim of the beveled gear 44 and run in the groove 68. Provision is also desirably made for cushioning the vibrating movement of the col-

umn 36. For this purpose a rod 70 may be pivotally connected with the shoe 55 and slides through a stud 71 which is formed upon the back of the beveled gear 44. A spring 72 is then coiled about the rod 70 and reacts between the stud 71 and a nut 73 which is threaded upon the rod.

Any convenient means may be provided for rotating the beveled gear 44. As shown a drive shaft 74 is mounted in a journal bracket 75 below the gear and carries a beveled pinion 76 which meshes with the gear. A ring 77 is preferably applied to the hub portion 34 of the receptacle 19 to hold the spherically enlarged portion 35 of the column 36 to its seat. A set screw 78 set into the ring and entering a groove or socket (not shown) in the adjacent part of the column 36 may be employed as a means for holding the pan 10 against rotation. When the set screw 57 is tightened to cause the column 36 to rotate with the shoe 55 the set screw 78 will be turned back out of engagement with the column.

The invention provides an apparatus which is of simple and inexpensive construction and which may be made of sufficient size to treat large quantities of pulp or dry ore. Furthermore the operation of the same is efficient and substantially continuous.

I claim as my invention,—

1. In a concentrator, in combination, a pan and a supporting column therefor, means for tilting the column, means for tilting the pan independently of the column and means for revolving the column about a vertical axis without rotation of the column.

2. In a concentrator, in combination, a pan and a supporting column therefor, means for tilting the column, means for tilting the pan independently of the column, means for revolving the column about a vertical axis without rotation of the column, and a vibrator acting on the column.

3. In a concentrator, in combination, a tilting column, a pan mounted thereon, a rotatable member guidedly receiving the lower end of the column, a crank journaled on the said rotatable member, connection between the crank and column and means for turning the crank in its said journal during the rotation of the said rotatable member.

4. In a concentrator, in combination, a tilting column, a pan mounted thereon; a rotatable member guidedly receiving the lower end of the column, a crank journaled

on the said rotatable member, a link connecting the crank and column, means for turning the crank in its said journal during the rotation of the said rotatable member, and means for adjusting the throw of the crank.

5. In a concentrator, in combination, a tilting column, a pan mounted thereon, a rotatable member guidedly receiving the lower end of the column, a crank journaled on the said rotatable member, a link connecting the crank and column, means for turning the crank in its said journal during the rotation of the said rotatable member, and means for adjusting the length of the said link.

6. In a concentrator, in combination, a tilting column, a pan mounted thereon, a rotatable member guidedly receiving the lower end of the column, a crank journaled on the said rotatable member, a link connecting the crank and column, means for turning the crank in its said journal during the rotation of the said rotatable member, means for adjusting the length of the said link and means for adjusting the throw of the crank.

7. In a concentrator, in combination, a tilting column, a pan mounted thereon, a rotatable member guidedly receiving the lower end of the column, a stationary gear, a pinion journaled on the said rotatable member and meshing with the gear, and vibrating means actuated by the pinion and acting on the column.

8. In a concentrator, in combination, a pan, a series of parallel riffles on the floor of the pan, each riffle having an abrupt side which faces the center of the pan and extending in connected straight lines forming a polygon which incloses the center of the pan, and means for imparting a rotary tilting motion to the pan.

9. In a concentrator, in combination, a pan, a series of parallel riffles on the floor of the pan, each riffle having an abrupt side which faces the center of the pan and extending in connected straight lines forming a polygon which incloses the center of the pan, means for imparting a rotary tilting motion to the pan, and means for vibrating the pan while being tilted.

CHARLES H. MUHLEMAN.

Witnesses:

CHARLES B. GILLSON,
E. M. KLATCHER.