W. L. & F. S. CARD.

ACTUATING MECHANISM FOR CONCENTRATORS.

APPLICATION FILED MAY 26, 1905.

907,736.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

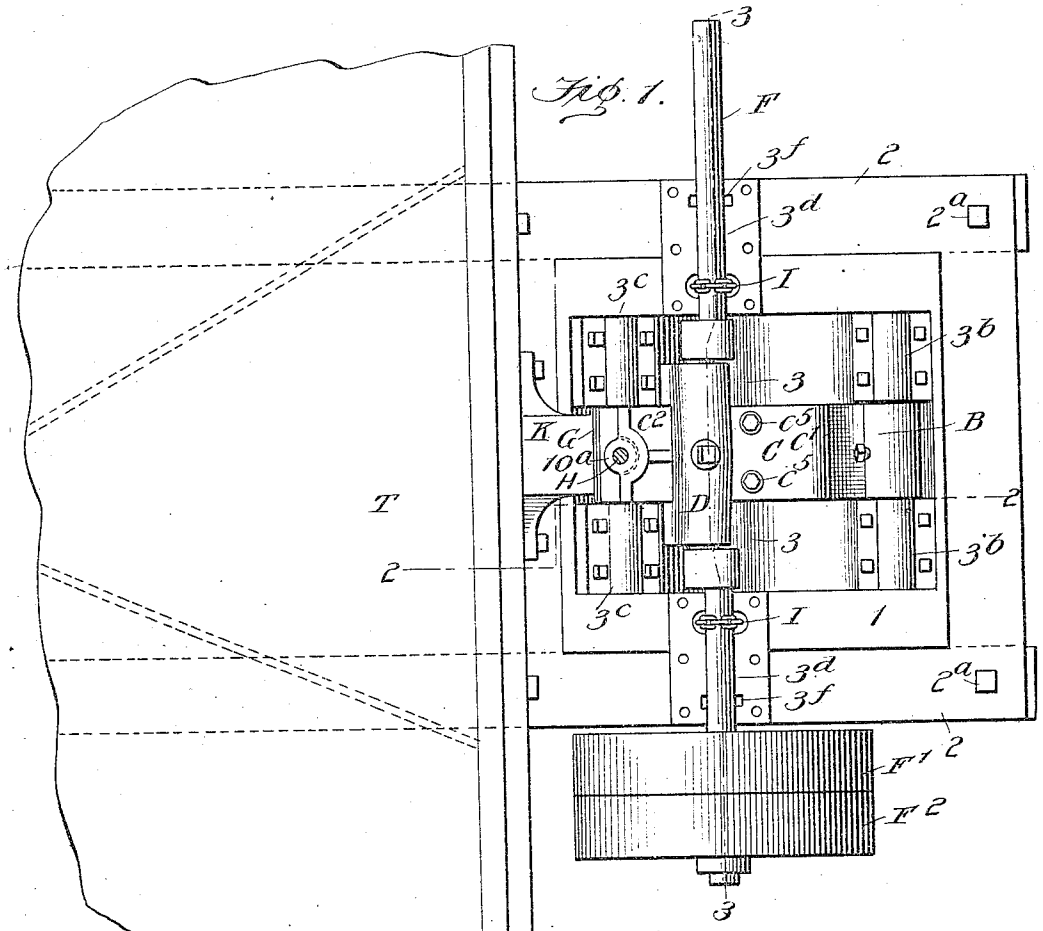
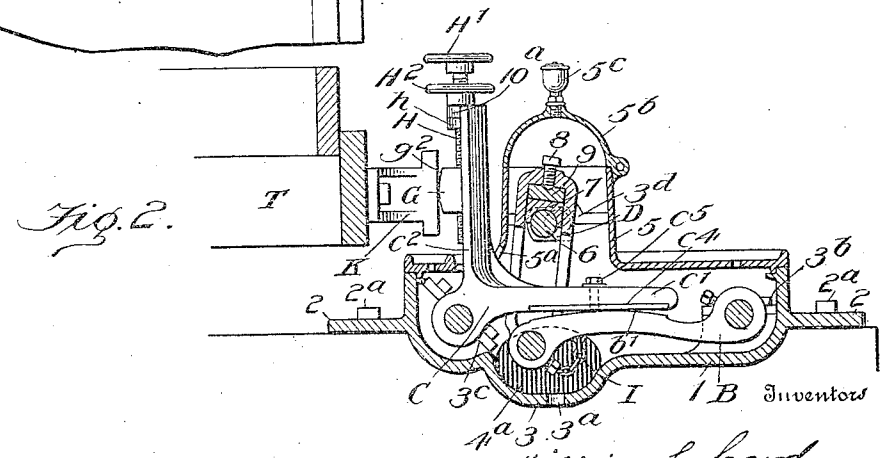


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

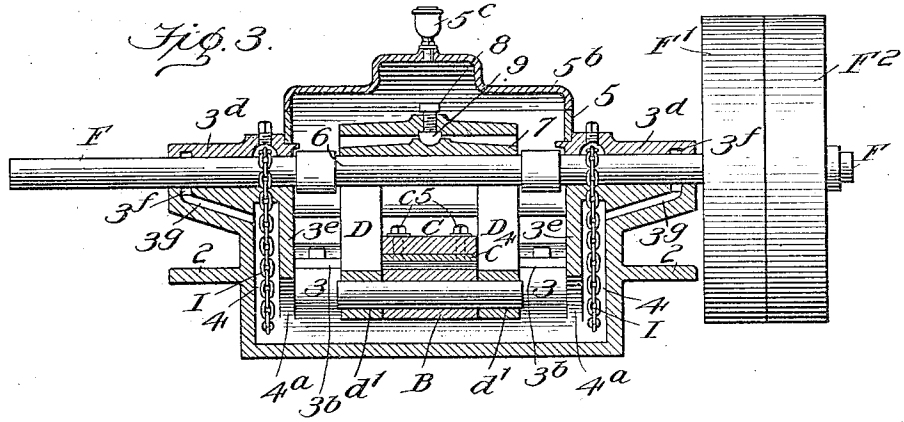


Fig. 4.

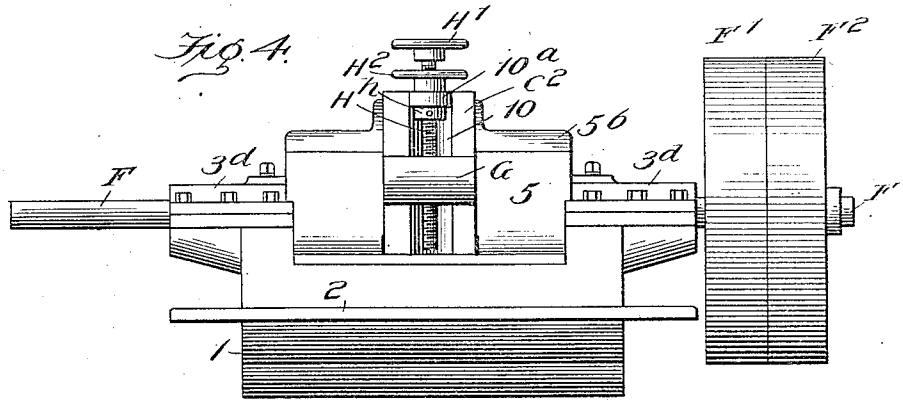


Fig. 5.

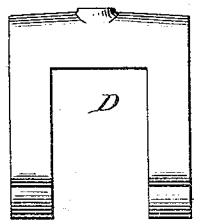


Fig. 6.

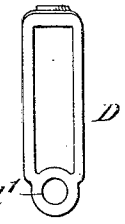


Fig. 7.

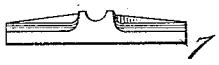


Fig. 8.

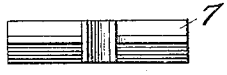


Fig. 9.

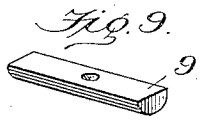
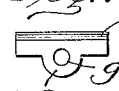


Fig. 10.



Fig. 11.



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UNITED STATES PATENT OFFICE.

WILLIAM L. CARD AND FRANK S. CARD, OF DENVER, COLORADO, ASSIGNORS TO THE CARD MANUFACTURING COMPANY, OF DENVER, COLORADO, A CORPORATION OF COLORADO

ACTUATING MECHANISM FOR CONCENTRATORS.

No. 907,736. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed May 26, 1905. Serial No. 262,418.

To all whom it may concern:

Be it known that we, WILLIAM L. CARD and FRANK S. CARD, citizens of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Actuating Mechanism for Concentrators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to the construction and application to ore concentrators of mechanism for imparting thereto a reciprocating movement whereby the metallic particles contained in the comminuted ore are caused to traverse the length of the table and to be discharged therefrom, and is especially directed to that class of mechanism whereby an accelerated forward movement, and a retarded return movement is effected, said movement being of such character that the stratification of the metallic particles on the table will not be destroyed or disturbed. Devices of this class where usually employed, as for instance, adjacent to dry crushing mills, are surrounded by an atmosphere charged with dust and grit which materially and injuriously affects the bearings, causing rapid wear of the same and demanding constant lubrication and frequent replacement of parts. In addition thereto, such devices are commonly committed to the care of unskilled labor, and, if of a complicated character as to construction or adjustment, occasion loss of time and values, as well as much annoyance in adjustment.

The object, therefore, of our present invention is to simplify the construction, facilitate adjustment and lubrication of bearings, and enhance the durability of this class of devices.

To this end one feature of our invention, generally stated, resides in a mechanism for actuating concentrator tables, wherein the co-acting elements are comprised of vibrating members having rolling contact, the point of contact receding from one center of motion and simultaneously approaching the other center of motion, so that a gradual acceleration and gradual retardation of the concentrator table is alternately effected and the power applied with greatest advantage.

A further feature of our invention resides in the provision of an oil well and protective cover for the operative mechanism and means for automatically lubricating the pivots and bearings thereof, whereby labor is saved and the life of the mechanism prolonged.

There are other features of the invention, residing both in special combinations and elemental construction, all as will hereinafter more fully appear.

In the drawings accompanying this specification, and forming part of the same, Figure 1 is a plan view of a mechanism embodying our invention, the cover thereof removed, and so much of a concentrator table as is required to illustrate the relation and operation of the devices being shown in connection therewith. Fig. 2 is a longitudinal vertical section of the same on the line 2—2, Fig. 1. Fig. 3 is a transverse vertical section on the line 3—3, Fig. 1. Fig. 4 is a front elevation of the mechanism, the concentrator table omitted. Fig. 5 is a front elevation of the forked link or pitman whereby the power is transmitted from the crank shaft to the vibrating members of the mechanism. Fig. 6 is a side elevation of the forked link or pitman. Fig. 7 is a side elevation of the saddle-brass interposed between the crank and the forked link or pitman. Fig. 8 is a top view of the saddle-brass shown in Fig. 7. Fig. 9 is a perspective view of the equalizing block or key interposed between the pitman and the saddle-brass. Fig. 10 is a view of the inner face of the adjustable contact-plate of the vibrator. Fig. 11 is a plan view of the adjustable contact-plate of the vibrator.

Like symbols refer to like parts wherever they occur.

We will now proceed to describe our invention more fully so that others skilled in the art to which it appertains may apply the same either in the form chosen for illustration or in such modified form thereof as circumstances may require.

In the drawings, 1 indicates a suitable bed plate for the support of the operative members of the mechanism, said bed-plate being provided with a flange 2 whereby it may be bolted or otherwise attached to a proper sub-frame or foundation by bolts 2^a. The central portion of the bed plate is depressed to form a sink or tank for a lubricant, as at 3, said sink or tank being provided with an out let 3^a through which the tank may be emp-

tied, and by means of which hot water or other suitable fluid may be introduced and the tank flushed for the purpose of cleaning the same. Within the tank 3, at opposite points, and preferably in the same horizontal plane, are babbitted seats or bearings 3^b 3^c for the reception of the pivots or journals of the vibrating members B, C, of the mechanism. The power and crank shaft F is journaled in suitable bearings 3^d located on opposite sides of the tank 3 at the top thereof and intermediate the bearings 3^b 3^c.

The bed-plate 1 is strengthened by longitudinal partitions 3^e forming side chambers or wells 4, 4 for chain elevators I which convey the lubricant to the bearings of the crank shaft, said partitions being perforated or slotted below as at 4^a to communicate with the main body of tank 3. The bearings 3^d are provided with grooves, as at 3^f, which communicate with the tank through passages 3^g, whereby all oil finding its way towards the ends of shaft F will be returned to the tank, and none of the lubricant will be wasted.

5 indicates the cover for the tank 3 and contained mechanism, said cover having a suitable opening 5^a for the passage of the vibrator by means of which movement is imparted to the table T. If desired, the cover 5 may be provided with a hinged section 5^b whereby the lubricant may be introduced into tank 3 and the operative parts inspected, and an oil cup such as 5^c may also be provided, though, if preferred, other provision may be made for the introduction of the oil and the inspection of the mechanism. The main cover 5 may be bolted or otherwise secured to the combined tank and bed plate.

F indicates the crank shaft which may be provided with suitable means for applying power thereto to cause a rotation thereof, as, for example, the fast and loose pulleys F^1, F^2. The shaft F, which is journaled in the bearings 3^d 3^d of the combined tank and bed-plate, is provided at its center with the crank section 6 on which is seated a saddle-brass 7 that in turn carries the upper end of a forked-link or pitman D by means of which the vibrating members of the mechanism are actuated. The pitman D, which is preferably bifurcated or forked for pivotal connection by its lower end with one of the vibrating members of the mechanism, may also be slotted laterally and otherwise so shaped above and internally as to receive and accommodate a saddle-brass 7 which is interposed between the crank 6 and the upper end of the pitman; and the lower ends of the pitman may be bored as at d^1 to receive the pivot pin or journal by which the pitman is connected with the free end of one of the vibrating members of the mechanism.

In order to provide for the vertical adjustment of the pitman D, not only to take up wear and lost motion, but also, and especially, to regulate the operative length of the pitman whereby the character of the reciprocation of the table is controlled, a set screw 8 is passed through the upper end of pitman D, and, in order to insure the proper automatic adjustment of the saddle-brass 7 with relation to the crank 6 and the pitman D, said set-screw 8 is stepped in a semicylindrical block or key 9 provided with a concave seat in the top of the saddle-brass so that the saddle-brass may at all times accommodate itself to the crank and pitman.

B indicates one of the vibratory or oscillating members of the mechanism, and C the other, the former being pivoted at one end on the bed-plate 3, as at 3^b, and being pivoted at its opposite end to the pendent end of the pitman D from which it receives motion. The other vibratory or oscillating member C which communicates the motion to the concentrator table is also pivoted on the bed-plate, as at 3^c, and engages the member B from which it receives motion, either directly or mediately through intervening elements if so desired. The first of these vibratory members B is curved upon its upper or contacting surface, as at b^1, and in order to insure durability in service said portion of the member B may be chilled in casting, or otherwise hardened or protected. It will be noted that the slight curvature b' of the member B extends from the floating end towards the pivot for one half, more or less, of the length of said member, or in other words constitutes the arc of a curve of long radius which effects a rolling contact between said member B and the member C, and results in an accelerated forward motion and a retarded rearward motion as the rolling contact between the members automatically and alternately shifts from and toward the respective pivots of the members. The second of these vibratory or oscillating members C is preferably given the form of an elbow lever pivoted on the bed-plate at its angle, as at 3^c, with one of its arms c^1 arranged to overlap and contact directly with, or to otherwise receive motion from, the member B, and in case of direct contact it is preferred to insert in said arm c^1 or secure thereto a renewable steel plate c^4 secured by screws c^5 or in other suitable manner.

For purposes of this specification, the vertical arm c^2 of the vibratory or oscillating member C, which communicates movement to the table, we have herein termed the vibrator arm, the same being provided on its front with a channel 10 for the reception of a sliding contact-plate G, said channel being closed above by the perforated end wall or plate 10^a through which passes a screw rod by means of which the sliding contact-plate is adjusted.

G indicates the sliding contact-plate car-

ried by the vibrator arm, said plate having on its rear face the tongue or projection g (preferably semi-circular) whereby it may be connected to and guided on the vibrator, said tongue or projection being provided with a threaded opening or nut g^1 through which passes the threaded bolt by which the adjustment of said contact-plate is effected. The outer face of the contact plate is convex or curved as indicated at g^2 so that the movement of the vibrator is augmented, without change of character, in being communicated from the vibrator arm c^2 to the concentrator table T. It will be noted, that as the member C receives its motion from the harmonically vibrating members B through the medium of the rolling contact b', so it also transmits said motion augmented to the table T through the medium of the rolling contact at g^2.

H indicates the threaded rod whereby the contact-plate is adjusted on the vibrator, said rod having on its upper end a hand-wheel H^4, and below the latter a hand-wheel and jam-nut H^2. Within the channel or groove 10 of the vibrator arm, and below the perforated end wall 10^a, a collar h is secured to the threaded rod by a pin or otherwise, so that the threaded rod may revolve freely in the end wall 10^a through which it passes and thus raise or lower the contact-plate G on the vibrator according to the direction of rotation of said rod H. In order to permit the rotation of rod H, the jam-nut H^2 is first eased off, and after the proper adjustment of the sliding contact-plate G has been effected the said jam-nut H^2 will be set home to lock the parts in fixed position.

I, I indicates endless chain belts which encircle the power or crank shaft F and are pendent in the wells 4, 4, from which they supply the lubricant to said shaft.

When in service, the tank 3 may be filled with lubricant to about the level of the flange 2 of the bed-plate or sufficiently to submerge or partially submerge the several bearings 3^d 3^e d^1, the splash from the tank oil, together with the lubricant elevated by the endless chains I, I will serve to maintain the lubrication of the remaining bearings of the mechanism. The cover 5 being in place upon the tank of the bed-plate will effectively house and protect the mechanism and its bearings from any dust and grit carried in the air.

In operation power will be applied in any suitable manner and from any suitable source to rotate the shaft F and crank 6 from which movement is communicated through link or pitman D to the vibratory or oscillating member B.

The character of the movement of member B, and of the member C actuated thereby, will depend on the length of pitman D, and this can be adjusted by means of the set screw 8, while the length of the stroke can be augmented without changing its character by means of the screw rod H and its hand-wheel H^1 whereby the curved contact-plate may be moved any desired distance from the pivot of the vibrator arm c^2.

In the position of rest, in the preferred construction, or that illustrated in the drawings, that is to say with the crank 6 in its lower position, the contact between the vibratory members B and C will be on that side of the median line nearest the pivot 3^b of the member, or in a position to exert the greatest leverage when assuming the load on the forward stroke of the table, and as the crank 6 and pitman D gradually rise for the first half of the revolution of the crank, the rolling contact between the vibrating members B and C will progressively approach the pivot 3^c of the member C, thus reducing the leverage and steadily accelerating the forward movement of the vibrator arm c^2, such movement being imparted to the table through the medium of the curved contact-plate G, the initial contact of which with the table buffer K is at the lowest point of its curved face. As the forward movement of the vibrator arm c^2 progresses, the contact between the curved plate G and buffer is transferred to and beyond the most advanced point of said curved face g^2 of the contact-plate, thus augmenting the length of the stroke of the table without altering its character, and at the close of the stroke, or when the centers of the crank the pivot d^1 which connects the lower end of pitman D and the member B are in alinement, there is an imperceptible instant of rest before the backward movement of the table begins. This backward movement of the table may be due to the reaction of the usual spring, or may be accomplished in any other suitable manner, several modes being known to mechanics and those skilled in the art.

On the return or rearward movement of the table, which occurs during the descent of crank 6 and pitman D, the greatest leverage of the reactive devices of the table on the vibrator member C will be exerted when the contact between the curved contact-plate G and the table buffer K is farthest from the pivot 3^c of the member C, and this leverage will gradually decrease as the rolling contact between member B and the arm c^1 of member C progressively recedes from the pivot point 3^c of member C and approaches the pivot point 3^b of member B, thus producing a retarded return movement of the table from the same causes operating in reverse manner. At the rear end of the stroke there is a period of comparative rest of much longer duration than the quickly reversed movement at the forward end.

As a result of the construction hereinbefore set forth, it will be noted that extreme

simplicity of construction is obtained with accompanying facility of adjustment and repair, that an effective automatic lubrication of the bearings, which reduces the labor and attention required in operating the mechanism or movement and increases its durability is attained, and that such an arrangement of the leverage as conserves power and perfectly controls the acceleration and retardation of the stroke of the table is effected.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from the floating end of said member towards its pivot for at least half the length of said member, the members being arranged for a rolling contact which alternately recedes from and approaches the respective pivot points of said members, a pitman connected with one of said members, and means for actuating said pitman.

2. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from the floating end of said member towards its pivot for at least one half the length of said member, the members arranged to overlap and have a rolling contact which alternately recedes from and approaches the respective pivot points of said members, and a pitman connected with the floating end of the underlying one of said members for actuating said member.

3. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from its floating end towards its pivot for at least half the length of the member, the members arranged to have a rolling contact which alternately recedes from and approaches the respective pivots of the members, and adjustable means for actuating said members.

4. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from its floating end towards its pivot for at least half the length of said member, said members arranged to have a rolling contact which alternately recedes from and approaches the respective pivots of said members, an adjustable pitman connected with one of said members, and means for actuating said pitman.

5. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, said mechanism comprising a plurality of vibratory members one of which receives motion through the intermediacy of a rolling contact and also imparts motion to the table through the intermediacy of a rolling contact.

6. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, said mechanism comprising a plurality of pivoted vibratory members one of which receives motion through the intermediacy of a rolling contact and also imparts motion to the table through the intermediacy of a rolling contact.

7. In combination with a concentrator table, mechanism for imparting thereto an accelerated forward motion and a retarded rearward motion, said mechanism comprising a plurality of vibratory members, one of which is a harmonically vibrating member, and one of which receives motion through the intermediacy of a rolling contact and also transmits motion to the table through the intermediacy of a rolling contact.

8. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members, one of which has a curved face which extends from its floating end toward the pivot for at least half the length of the member, said members arranged to overlap and having a contact which alternately recedes from and approaches the respective pivots of said members, one of said members being an elbow lever, adjustable means for actuating said members, and an adjustable slide having a curved face located on the vibrator arm of the elbow lever member.

9. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from the floating end towards the pivot for at least half the length of said member, the members arranged to have a rolling contact which alternately recedes from and approaches the pivots of said members, one of said members being an elbow lever, an adjustable slide having a curved face located on one arm of said elbow lever member, and an adjustable pitman for actuating said members.

10. In combination with a concentrator table, a mechanism for alternately imparting

thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a curved face which extends from the floating end towards the pivot for at least half the length of said member, said members overlapping and one of said members being an elbow lever, an adjustable slide on one arm of said elbow lever member, a pitman connected with the other of said members, means for adjusting said pitman, and means for actuating said pitman.

11. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of overlapping pivoted members one of which has a slightly curved face which extends from the floating end towards the pivot for at least one half of the length of said member, a pitman connected with one of said members, a crank for actuating the pitman, a saddle-brass interposed between the crank and pitman, and an equalizing block interposed between the pitman and the saddle brass.

12. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a pivoted member having a slightly curved face which extends from its floating end towards its pivot, an elbow lever member pivoted at its angle and having one of its arms in rolling contact with the curved face of the first named member and its other arm adapted to engage the buffer of the concentrator.

13. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from its floating end towards its pivot for at least half the length of said member, said members having a rolling contact between them, means for actuating one of said members, and means adapted to coöperate with the other of said members to impart motion to the concentrator table.

14. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from the floating end toward the pivot for at least half the length of said member, each of said members having rolling contact with an adjacent member, and means for actuating said pivoted members.

15. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from its floating end toward the pivot for at least half the length of the member, and a pivoted member arranged to have contact with the concentrator table and also rolling contact with the first named pivoted member.

16. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of overlapping pivoted levers one of which has a slightly curved face, said members arranged to have a rolling contact, a crank, a bifurcated pitman actuated by the crank and pivotally connected with the underlying member intermediate of the pivots of said members.

17. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members one of which has a slightly curved face which extends from the floating end towards the pivot for at least half the length of said member, said members having a rolling contact which alternately recedes from and approaches the respective pivots of the members, a pitman for actuating said members, and means for controlling the operative length of said pitman and the character of the stroke.

18. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted contacting members one of which has a slightly curved face which extends from its floating end towards the pivot for at least half the length of said member, the members relatively arranged to cause the leverage to vary as the contact point of said members automatically shifts with respect to each other alternately from and towards the respective pivots of said members, a pitman for actuating said members, and a set screw for controlling the operative length of said pitman.

19. In combination with a concentrator movement having contacting movable members which lie in substantially horizontal planes, a bed-plate having a sink or tank for the reception of said movable members.

20. In combination with a concentrator movement having contacting movable members which lie in substantially horizontal planes and a pitman for actuating said members, a bed-plate having a sink or tank for the reception of the horizontally disposed movable members.

21. In combination with a concentrator movement having movable members which lie in substantially horizontal planes, a pitman for actuating said members and a crank for actuating the pitman, a bed-plate having

a sink or tank for the reception of the horizontally disposed movable members, and a cover for the tank adapted to inclose said members.

22. In combination with a concentrator movement having movable members which lie in substantially horizontal planes and a pitman for actuating said members, a bed-plate having a sink or tank for the reception of said movable members, said movable members arranged with relation to the tank of the bed-plate so that the greatest displacements thereof occur at the center of the tank.

23. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of pivoted members having rolling contact between them independent of the means for varying the length of stroke of the said concentrator table, and means for varying the length of stroke of said table.

24. In combination with a concentrator table, mechanism for alternately imparting thereto an accelerated forward motion and a retarded rearward motion, comprising a plurality of members having fixed pivots and rolling contact between them, and means for actuating said members.

In testimony whereof we affix our signatures, in presence of two subscribing witnesses.

WILLIAM L. CARD.
FRANK S. CARD.

Witnesses:
EDWIN A. SPERRY,
PHILO. P. BUSH.