(No Model.) 3 Sheets—Sheet 1.

C. E. SEYMOUR.

ORE CONCENTRATOR.

No. 560,435. Patented May 19, 1896.

Fig. 1.

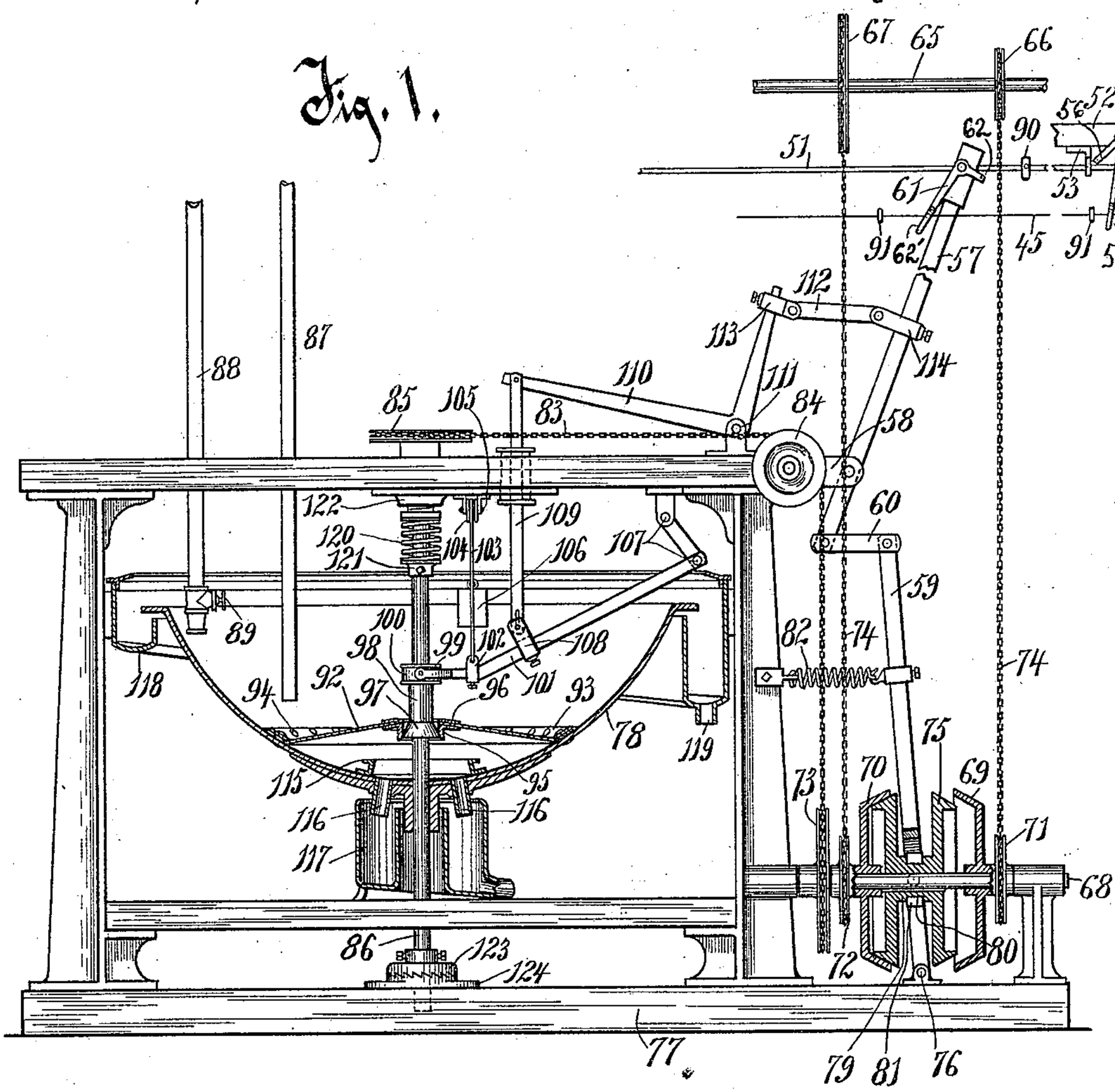


Fig. 2.

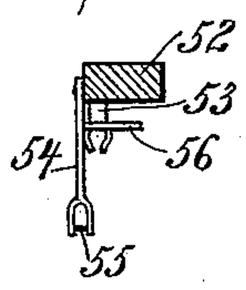
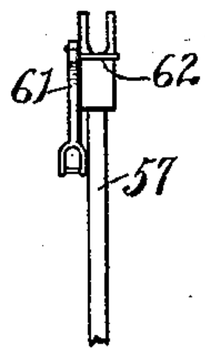


Fig. 5.



Witnesses.

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(No Model.) 3 Sheets—Sheet 2.

C. E. SEYMOUR.

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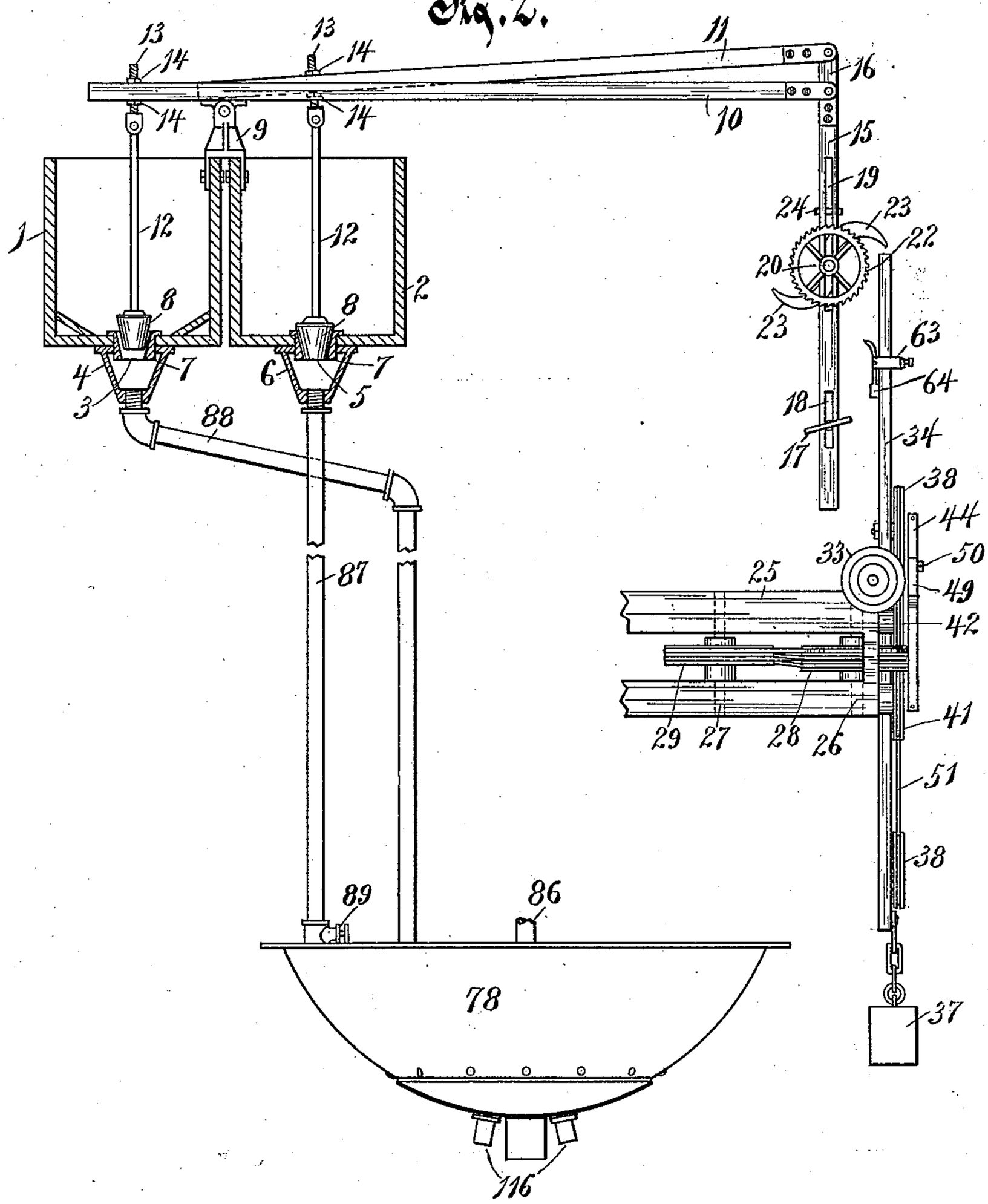
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

C. E. SEYMOUR.

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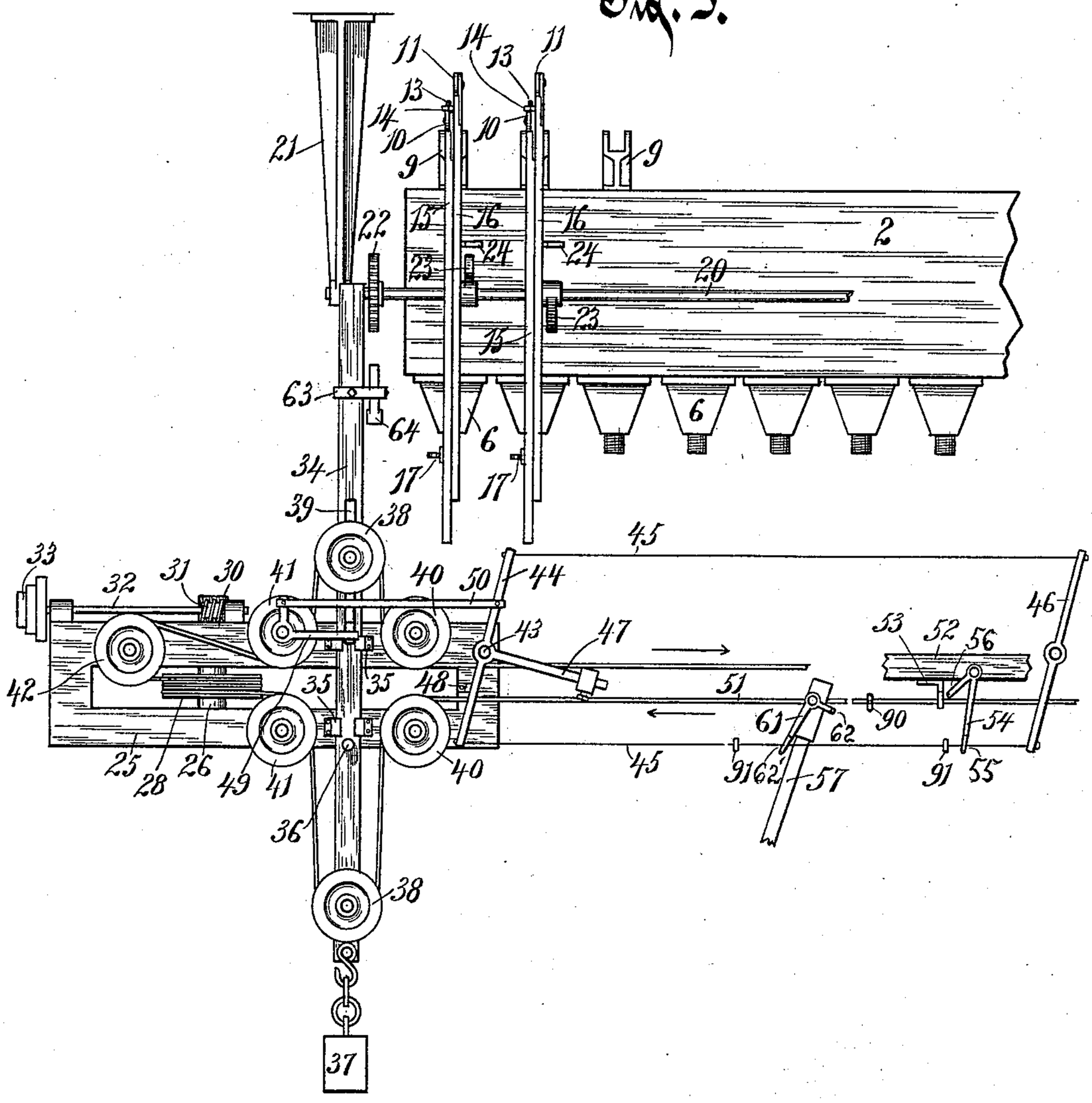
Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES E. SEYMOUR, OF LAKE GENEVA, WISCONSIN.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 560,435, dated May 19, 1896.

Application filed December 14, 1892. Serial No. 455,160. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SEYMOUR, of Lake Geneva, in the county of Walworth and State of Wisconsin, have invented a new and useful Improvement in Ore-Concentrators, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in ore-concentrators, having particular relation to means for discharging the concentrates where the receptacle or bowl must be emptied of its accumulation.

In the systems and apparatuses now in use it has been found impossible to provide for a continuous separation of the contents of the bowl or pan and the discharge of the products of separation.

It is one of the objects of the present invention, therefore, to provide mechanism capable of effecting the result above referred to—that is to say, mechanism for producing the continous separation of the contents of the bowl and the continuous discharge of the products of separation, the light and heavy particles, respectively, being discharged alternately.

That portion of my invention for obtaining the above results consists, broadly, in the provision of means for rotating the pan or bowl at a fast rate of speed and during said fast period of speed feeding pulp to the pan or receptacle, the lighter particles when separated being discharged centrifugally over the top of the pan during such fast speed, and means for changing the fast speed into a slow speed without stopping the rotation of the pan, and during said slow rate of speed stopping the flow of pulp and providing for the discharge of the heavy particles centripetally, a stream of water being used as an auxiliary means for assisting in the centripetal discharge.

Furthermore, in the form of concentrator herein shown and described the pan or bowl is run at a proper concentrating speed to retain the heavier particles or those of greater specific gravity in the pan and discharge the lighter particles or particles of less specific gravity over the top of the pan. The success of this operation, however, depends largely on the vertical movement of the pan and the amount of jar it receives to cause a vibrating action of said pan. To this end, therefore, I employ a thin sheet-metal pan in connection with means for giving the pan a vibrating action by a quick jar or bump for the purpose of transmitting a trembling movement to the material within the pan to prevent packing and assist in separation.

In connection with my present improvement I employ the system for conducting the pulp and water to the bowl, which is fully set forth and claimed in my application for improvements in systems for concentration of ores, the papers in which case were executed by me on the 17th day of November, 1892, and also the cable system, likewise fully described in said application, but claimed specifically in a previous application filed by me. For the sake of clearness, however, and to show the adaptation of the above-referred-to mechanism to the present invention I have fully described and shown the same in this application.

In the accompanying drawings, Figure 1 is a side elevation of the concentrator-bowl and its frame in connection with a portion of the tripping mechanism to effect variations in the speed of the pan or bowl, certain parts in said figure being shown in section. Fig. 2 is a side elevation of the feeding apparatus with parts in section, also illustrating the vertical sliding rod and a fragment of the mechanism for operating the same. Fig. 3 is a front elevation showing fully the means for operating the sliding rod and showing the manner in which the feeding system can be used in connection with a plurality of machines adapted for treating ore for separation, only two sets of the depending arms and two of the cams, however, being shown. Fig. 4 is a face view of the stop and one of the tripping devices, and Fig. 5 is a similar view of a fragment of the lever carrying the other tripping device.

Like numerals of reference designate like parts throughout the several views.

Referring to the drawings, the numeral 1 indicates the pulp-tank, and 2 the water-tank, the former provided with a series of outlet-openings 3, beneath each of which is a registering hopper 4, and the latter with similar openings 5, having beneath the same registering hoppers 6. The outlet-openings in both tanks have fitted therein gaskets or washers

7 to form a water-tight seat for valves 8. These valves are provided for each outlet-opening in both tanks. The inner sides of the tanks, as will be seen, lie in close proximity, and have secured thereto and projecting upward therefrom a series of standards 9, each forming fulcra for a pair of levers 10 and 11.

The valves 8 are provided with valve-rods 12, which are jointed at their upper ends to threaded rods 13. The rods 13 connected to the valve-rods in the pulp-tank pass through the levers 10 and receive thereon above and below the levers nuts 14 14, while the threaded rods connected to the valve-rods in the water-tank pass through the levers 11 and receive thereon above and below said levers nuts designated by the same reference-numeral. This provides for the adjustment of the valves toward and from their seats. Jointed to the forward end of each lever composing a set are depending arms 15 and 16, normally held together by means of set-screws 17 passing through an elongated slot 18 in arm 15 and entering arm 16. In this manner the relative positions of the two arms can be readily adjusted. Each depending arm is provided near its upper end with an elongated slot 19, said slots registering and receiving through the same a shaft 20, having its journals in suitable brackets similar to 21. Mounted upon this shaft is a ratchet-wheel 22, and also a series of cams 23, arranged at different points of the length of the shaft and radiating therefrom at different angles, as clearly shown in Fig. 2, one of these cams being provided for each set of operating-levers 10 and 11, and adapted to operate upon tappets 24, carried by the depending arm 16 of said levers, in the manner hereinafter more fully explained.

The tripping mechanism which I employ for the purpose of operating the parts previously described is shown fully in Figs. 2 and 3. In these figures the numeral 25 indicates a frame suitable for supporting the driving mechanism. In this frame are journaled, upon vertical shafts 26 and 27, multiple sheaves 28 and 29, respectively. Shaft 26 is provided at its upper end with a pinion 30, which meshes with a worm 31, upon a horizontal shaft 32, carrying upon its outer end a cone-pulley 33, a corresponding pulley being provided upon a line shaft. (Not shown.)

The numeral 34 indicates a vertical rod which is free to slide in guideways formed by angle-brackets 35 35 upon the frame, said rod being provided medially with a projecting pin 36. Upon the lower end of this rod is suspended a weight 37, while at different points thereon are located sheaves 38 38, the axis of the upper one being adjustable in an elongated slot 39. Upon the right-hand side of rod 34 are two sheaves 40 40, arranged in a vertical line, and upon the left-hand side are also two sheaves 41 41, similarly arranged, while another sheave 42 is located to the left of multiple sheave 28, all of said several sheaves being quartered with reference to the multiple sheaves.

Turning in the frame 25 is a horizontal rock-shaft 43, having a bar or rod 44 secured to its end at right angles thereto. This bar or rod is apertured at opposite ends to permit wires 45 45 to be passed through the same, said wires being held in place by knotting the ends thereof. The opposite ends of the wires are extended and attached to the extremities of a medially-pivoted lever 46. The rocking shaft 43 has also extending therefrom an arm 47, provided with an adjustable weight, which holds rod or arms 44 normally in contact with a stop 48. The axis of the upper of the sheaves 41 has secured thereto a bell-crank lever 49, the short arm thereof connected with the bar or rod 44 by means of a link 50. The numeral 51 indicates a fragment of an endless rope or cable, the arrangement of which is shown fully in Fig. 3. This cable first passes over lower sheave 40, down and around sheave 38 at the lower end of rod 34, up and over lower sheave 41, thence extended back and forth over multiple sheaves 28 and 29, leaving the former and passing around sheave 42, and finally under upper sheave 41, over sheave 38 at the upper end of rod 34, and under upper sheave 40.

The numeral 52 indicates a fragment of a rigid frame from which depends a stop 53. In advance of this stop is pivoted a tripping device 54 of bell-crank form, the long and short arms thereof respectively being provided with an eye 55 and laterally-extending finger 56.

Located intermediate of the tripping device 54 and the sheave-carrying frame is a lever 57, pivoted to an arm 58, extending laterally from the frame of the machine, as shown in Fig. 1. The upper end of this lever is bifurcated or forked to receive the cable, and its lower end is connected with the upper end of a pivoted lever 59 (shown in Fig. 1) by a link 60. The upper end of lever 57 has pivoted thereto a tripping device 61, also of bell-crank form, and provided with a laterally-extending finger 62 at its upper end and an eye 62′ at its lower end. The long arm of this trip is acted upon so as to force the short arm thereof upwardly and release the cable, instead of downwardly, as in the case of tripping device 54.

Adjustably secured near the upper end of vertical rod 34 is a collar 63, said collar carrying a pawl 64. This pawl is arranged in line with the teeth of the ratchet 22, so that when the vertical rod is moved upwardly said pawl will engage the teeth and move the ratchet a desired distance.

The numeral 65 indicates a fragment of a main driving-shaft driven from any suitable source of power and having mounted thereon small and large wheels 66 and 67, respectively, preferably sprocket-wheels. Some distance

below the driving-shaft is a counter-shaft 68, having loosely mounted thereon two wheels 69 and 70, said wheels having their peripheries beveled. The hubs of these wheels have formed integrally therewith sprocket-wheels 71 and 72. The counter-shaft has mounted thereon near its inner end rigid therewith a sprocket-wheel 73. The sprockets 71 and 72 are connected, respectively, to the wheels 66 and 67 by sprocket-chains 74 74. Feathered or splined on the counter-shaft, intermediate the two pulleys, is a double friction-clutch wheel 75, having two disks the peripheries of which are beveled to enter the wheels 69 and 70 and register with the corresponding bevels thereof.

A rod or pin 76, secured in the frame 77 of the concentrator-pan 78, forms a pivot for the forked or bifurcated lower end of the shifting-lever 59, said forked portion straddling a central connecting-collar 79 of the double friction-clutch. This central connecting-collar is provided with an annular recess 80, which receives an annulus or ring 81. The furcate arms of the shifting-lever are connected to this ring by means of screws or equivalent devices, (not shown,) so that when movement is imparted to the lever the clutch will be caused to move longitudinally upon its counter-shaft. After the clutch has been moved to the right of Fig. 1 to engage with wheel 69 it is subsequently brought back into engagement with wheel 70 by a recoil-spring 82. A sprocket-chain 83 runs around sprocket-wheel 73 and thence upward and over two quartered sprockets 84, (one of which only being shown,) mounted in the frame, and thence around a sprocket-wheel 85 at the upper end of a bowl-shaft 86, whereby, when motion is imparted to the counter-shaft, rotation is communicated to shaft 86 and its bowl.

The pulp is conveyed from the pulp-tank by means of pipes 88, each of which is coupled at its upper end to one of the hoppers 4, and has its lower end entering the pan or bowl and having its discharge end near the inner wall, preferably pointing downward. The water is conveyed from the water-tank by means of pipes 87, which are coupled to the hoppers 6 beneath the bottom of said tank, and also extend into the pan or bowl, terminating at a point near the inner wall and near the top of the receptacle. Each of the water-pipes is provided with a stop-cock 89 for regulating the flow of water. It will be understood that a set of these pipes is provided for each machine in the series.

In the operation of feeding from the pulp-tank 1, while the machines are receiving pulp, one of the valves 8 of said pulp-tank is raised or held open by the gravity or weight of the levers 10 and 11 until the time arrives for discharging the pan. This discharge is accomplished by the tripping mechanism, the operation of which will now be described. It will be observed that the weighted arm 47 holds rock-shaft 43 and bar or rod 44 normally in the position shown in Fig. 3, said rod bearing against the stop 48. The endless cable is moved by the sheave 28 in the direction indicated by the arrows, and as the button 90, carried by the cable, reaches the stop 53 its travel is of course arrested. As this takes place the strain or pull of the cable directed against the lower sheave 38 of rod 34 causes the raising of said rod. When the rod has been raised a certain distance, the pawl 64 engages with the ratchet-wheel 22 and turns it until the same passes beyond the line of the pawl, whereby the latter is disengaged. As the ratchet is thus turned shaft 20 is likewise rotated a sufficient distance to bring the first of the series of cams into engagement with the tappet 24 upon the first set of depending arms 15 and 16, whereby said arms are raised, and consequently the levers 10 and 11 turned upon their fulcra, thereby closing the pulp-valve and opening the water-valve leading to the first machine of the series. As the vertical rod 34 continues to move upward the pin 36 projecting therefrom comes in contact with and raises the bell-crank lever 49, which, through the connecting-link 50, draws back the upper end and carries forward the lower end of bar or rod 44. The lower wire 45, it will be noticed, carries two buttons 91 91. The moment, therefore, the lower end of rod 44 moves forward the lower wire is moved in the same direction and the button 91 nearest the outer end thereof will strike the depending arm of tripping device 54 and throw the short arm thereof downwardly, forcing the rope or cable which previously had been held taut by the button being in contact with the stop free from said stop. The cable being now free the weight upon the end of sliding rod 34 will return the same to its original position and the cable will resume its motion with considerable impetus, and engaging the top of lever 57 will bring said lever rearwardly with a jerk to an approximately vertical position. As lever 57 is thus operated shifting-lever 59 is also turned upon its pivot, thereby throwing the double friction-clutch from the position shown in Fig. 1—that is, in engagement with the wheel giving fast or concentrating speed—to the wheel imparting slow speed to the concentrator-pan and its shaft. When the movements just described take place, the button of the cable is in engagement with the lever 57, and of course the progress of said cable is again arrested, with the result that the sliding rod 34 is once more raised, and, as before, the pawl 64 engages the ratchet 22 and carries said ratchet, shaft, and cam farther around, so that said cam passes away from the tappet 24 and allows the levers 10 and 11 to drop, thereby closing the clear-water valve and opening the pulp-valve. This change is accomplished by the gravity of the levers and depending arms, and almost at the same time this occurs the speed changes back to a fast speed—that is to say, by the release of the button carried by

the endless cable 51 from the lever 57 by reason of the pin 36 again contacting with bell-crank lever 49. It is obvious that the moment this contact occurs lever 57 is released and the recoil-spring 82, acting upon the shifting-lever 59, returns the double friction-clutch to its normal position in engagement with the pulley giving fast speed. After this the button on the cable passes to the next machine and exactly the same operation takes place, and so on throughout the series.

The foregoing describes fully the feeding mechanism, the cable system, and the means for effecting variable speeds of the pan or bowl. I will now proceed to describe the mechanism for which I claim novelty in the present application, and at the same time show its interrelation with the above-described mechanism, and for illustration of the same reference is made to Fig. 1 of the drawings. In this figure the numeral 92 indicates a flexible disk, preferably of sheet-rubber, fixed in the pan and held water-tight at its outer end by a ring 93, preferably of copper, said ring being secured by means of rivets or bolts 94.

The bowl-shaft 86 passes loosely through a ring or tube 95, said tube provided at its upper end with an angular flange which fits beneath the edge of the disk bordering its circular opening. Upon the top of the disk at a corresponding point is arranged a flat ring or band 96. Bolts (not shown) pass through this ring or band, through the disk, and through the angular flange of tube 95. The tube 95 forms a valve-opening, which is normally closed by a tapering valve 97, said valve provided with a tubular valve-stem 98, which surrounds the bowl-shaft, so as to be free to move vertically when actuated in the manner hereinafter explained. The upper end of the valve-stem is provided with an enlargement formed with an annular groove 99. This groove receives a split ring 100, said ring being arranged in the forked end of a lever 101. The forked lever has secured thereon a clip 102, to which is attached a rope or cable 103, said rope or cable being extended upward over a pulley 104, suitably journaled in a hanger 105 and provided upon its free end with a weight 106. This weight has the effect of keeping the valve normally in the position illustrated in Fig. 1.

The lever 101 is provided with a double hinge-joint 107 at its outer end. A block 108 is carried by the lever, and to this block is pivotally secured a link 109. This link is preferably slotted at its point of connection in order to prevent the transmission of any vertical motion which the shaft 86 when moving up and down might possibly transmit, if the slot were not provided, to said link. The upper end of the link is pivotally connected to a bell-crank lever 110, said lever having its fulcrum at 111, and is connected to trip-lever 57 by a connecting strap or link 112, preferably having its opposite ends pivotally secured to blocks 113 and 114, arranged, respectively, upon the bell-crank lever and trip-lever.

A ring 115 is fixed in the center of the pan or bowl, so as to confine the discharge to a central point through tubular ports or openings 116, which lead to a trough 117, from which the product of concentration is conducted in any convenient manner to a tank. (Not shown.)

From the above description it will be readily seen that when the trip-lever 57 is thrown forward it also throws the shorter arm of the bell-crank lever 110 in the same direction and the long arm thereof downward, thereby imparting a like movement to lever 101 through the connecting-link 109. This of course causes the valve-stem to be depressed, and the valve carried at the lower end thereof will simultaneously move downward. The flexible disk being no longer supported in a raised position by the valve will, by reason of the weight of the concentrates and water, descend until arrested by contact with the upper edge of ring 115. The valve, however, continues its downward movement, and consequently passes away from the valve-opening formed by the ring 95, through which the product of concentration will pass, finally lodging in the trough 117, as previously described.

It will be noticed that the flexible disk in its normal raised position slopes from the center toward the wall of the pan, and as the disk is held in its raised position during the concentrating period the force of course will be centrifugally away from the center of the disk toward the wall of the pan. This would also be the case under a slow motion of the pan if the disk remained in the same position. Inasmuch, however, as during the slow motion the disk is depressed in the center it changes the fall from the wall of the pan to the center, so that under a slow rotation the force of gravity is stronger to carry the contents toward the center than centrifugal force is to carry the contents away from the center, as would be the case were the disk to remain in its cencentrating position, or sloping toward the pan. In other words, the centrifugal force is overcome by changing the position of the disk to such a degree that centripetal force, or the force of gravity to carry the contents to the center, is stronger than the centrifugal force to carry the contents away from the center, thus materially assisting in the centripetal discharge of the contents during the slow motion.

At the time lever 57 is tripped so as to cause the descent of the flexible disk and the opening of the valve said lever 57 also causes the shifting of the friction-clutch, so as to change the speed of the pan momentarily from a concentrating speed to a slower rate of speed. Furthermore, simultaneously with this tripping of the lever the feeding mechanism is also operated by the same movement, causing the

closing of the pulp-feed and the opening of the water-feed, thereby allowing the contents to be washed through and into the trough 117. From the above it will be seen that I create a contrary force by changing the position of the disk 92, thereby making a fall or slope to the center and decreasing the centrifugal force to a state at which it is not sufficient to hold the material against the wall of the pan, but allow it to fall by the assistance of the water shooting down against it as it is revolving slowly. When the button is released from lever 57, the speed is again changed to a concentrating or faster speed by the shifting of the friction-clutch, the pulp-feed is again opened and the water-feed closed, while the flexible disk is raised to its normal position by the elevation of the valve through the weight 106.

The concentrator pan or bowl 78 is surrounded by a trough 118, provided with a discharge-opening 119. When, therefore, the pan or bowl is rotating at a proper concentrating speed, the heavier particles, or the particles of greater specific gravity, are retained in the pan and the lighter particles discharged over the top thereof into this trough.

A spring 120 surrounds the bowl-shaft and is confined between an adjustable collar 121 and a head 122, secured to the under side of one of the cross-beams of the frame. At its lower end the bowl-shaft also carries adjustably a cam-head 123, which is adapted, as the shaft is rotated, to contact with a similar cam-surface 124, secured to the lower cross-beam of the concentrator-frame, whereby a vertical or jumping movement is given to the bowl-shaft. In connection with this bumping movement imparted to the bowl or shaft I desire to employ a thin sheet-metal pan which, as the shaft receives the jars caused by the contact of the cam-surfaces, will have imparted thereto a vibratory or tremulous motion, whereby similar motion is given to the material within the pan to prevent its packing and to assist in proper separation. The necessity of obtaining a good vibration or trembling action exists especially in centrifugal concentrators that discharge the refuse or particles of less specific gravity over the top of the pan or bowl centrifugally and the particles of greater specific gravity centripetally through the bottom of the pan.

In the operation of such a machine the ore or material to be treated takes its revolving motion from contact with the pan and the material of greater specific gravity has a tendency to cling to the outside or against the inner wall of the pan, and the revolving motion is transmitted from the pan to the material of greater specific gravity, which thus clings against the inner wall of the pan, and is transmitted through the mass with the effect of decreasing to some extent the speed of rotation and also vibration of the material being treated according to its distance away from the wall of the pan from which it receives its force. The material coming in contact with the revolving pan will, unless a trembling or vibrating action is given thereto, have a tendency to travel upward, in a pan of the shape I employ, by its too close contact to the pan under the centrifugal force imparted or transmitted to it, and I have therefore found that a vibrating movement of the particles to be treated is a very essential feature. I therefore impart a quick jar or bump to the pan continuously during both the high and low rates of speed of said pan, which not only has the effect of assisting in accomplishing the separation of the material and in preventing its packing, but at the same time materially assists in the discharge of the heavier particles centripetally, by throwing said heavier particles back toward the bottom of the pan, in close proximity to the point of discharge. This feature is also particularly adapted, although not necessarily, in combination with a concentrator adapted to discharge the material of greater specific gravity over the top periodically and centrifugally.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In an ore-concentrator, the combination, with an ore-receiving pan adapted to be revolved at a uniform or fast rate of speed during concentration or separation, of means for automatically decreasing the speed and means for discharging the contents centripetally under the reduced rate of speed, substantially as set forth.

2. In an ore-concentrator, the combination, of a pan or bowl, a disk therein provided with a discharge duct or opening, a valve normally closing said opening, and means for raising and lowering the disk and operating the valve, substantially as set forth.

3. In an ore-concentrator, the combination, of a pan or bowl, a central ring within said pan or bowl having discharge-ducts leading from the same, a disk within the pan or bowl provided with a discharge-opening adapted to convey the products of concentration to the central ring, a valve normally closing said opening, and means for raising and lowering the disk and operating the valve, substantially as set forth.

4. In an ore-concentrator, adapted to be revolved for the purpose of treating finely-pulverized materials centrifugally, the combination, of a pan or bowl, a disk having its outer edge or periphery supported on the inner side of the bowl and revoluble therewith, and means for raising and lowering the disk, substantially as set forth.

5. In an ore-concentrator, the combination, of a revoluble pan or bowl, a disk fixed on the inside of the pan or bowl so as to revolve with the same, a tube surrounding the bowl-shaft and forming a valve-opening, said tube provided with an angular flange secured to the edge of the disk bordering its central opening, a valve fitting the opening, said valve con-

structed normally to hold the disk in a raised position and close the opening, and means for raising and lowering the valve, the lowering thereof unseating the same and permitting the disk to drop, substantially as set forth.

6. In an ore-concentrator, the combination, of a revoluble pan or bowl constructed to be rotated at a high rate of speed for concentrating purposes, and at a slow rate of speed for discharging centripetally, a disk fixed on the inside of the pan or bowl so as to revolve with the same, said disk provided with a port or opening, and means for supporting the disk during the time the pan or bowl is revolving at a high rate of speed, and for lowering the same during the period of slow motion, to admit of the discharge of the materials centripetally through the port or opening, substantially as set forth.

7. In an ore-concentrator, the combination, of a pan or bowl constructed to be rotated at a high rate of speed for concentrating purposes, and at a slow rate of speed for discharging centripetally, a disk fixed on the inside of the pan or bowl and provided with a port or opening, means for supporting the disk and closing the opening thereof during the high rate of speed of the pan or bowl, and means for opening the port and depressing the disk so as to admit of discharging the contents of the pan or bowl centripetally during the slow period of motion, substantially as set forth.

8. In an ore-concentrator, the combination, of a pan or bowl, a disk therein provided with a discharge-opening, a valve normally closing said opening and supporting the disk in a raised position, a lever engaging the stem of the valve, a tripping-lever, and connections between the tripping-lever and the lever controlling the valve, whereby when said tripping-lever is moved forward the valve is unseated and the disk left unsupported, and, when said lever is returned to its initial position, the disk is raised by the valve and the opening thereof closed, substantially as set forth.

9. In an ore-concentrator, the combination, of a pan or bowl, a disk therein provided with a discharge-opening, a valve normally closing said opening, a lever engaging the stem of the valve, a rope or cable secured to the lever extending upward and over a pulley and provided with a weight upon its free end to effect the elevation of the valve and consequent elevation of the disk, and means for lowering the lever against the gravity of the weight, substantially as set forth.

10. In an ore-concentrator, the combination, of a pan or bowl, a disk therein provided with a discharge-opening, a valve closing said opening and supporting the disk in a raised position, a lever engaging the stem of the valve, a tripping-lever, connections between the tripping-lever and the lever controlling the valve, a cable carrying a button for operating the tripping-lever, means for revolving the pan or bowl, and connections between the tripping-lever and said bowl-revolving mechanism, whereby when the tripping-lever is thrown forward the speed of the bowl will be decreased from a normal high rate, and at the same time the valve unseated and the disk left unsupported, and when the tripping-lever is returned to its initial position the speed of the pan or bowl is again changed to a high rate and the disk raised by the valve and the opening thereof closed, substantially as set forth.

11. In an ore-concentrator, the combination, of a pan or bowl constructed to be rotated at a fast rate of speed for concentrating purposes and at a slow speed for discharging its contents centripetally, a supply-tank, a conductor leading from the supply-tank to the bowl, a valve controlling the flow through the conductor, and mechanism for controlling the valve to admit the material to pass to the pan or bowl during the fast speed and to close the valve during the slow motion or discharging period to stop the flow of the material, substantially as set forth.

12. In an ore-concentrator, constructed to be rotated at a fast rate of speed for concentrating purposes and at a slow rate of speed for discharging the contents centripetally, the combination, of a pan or bowl, pulp and water supply tanks, conductors leading from said tanks to the bowl or pan, valves controlling the flow through said conductors, and mechanism for operating the valves, whereby the pulp-valve is open during the fast or concentrating period, and the water-valve closed, and vice versa, the pulp-valve closed and the water-valve opened during the slow motion or discharging period, substantially as set forth.

13. In an ore-concentrator, the combination, of a pan or bowl, a disk therein provided with a discharge-opening, a valve closing said opening and supporting the disk in a raised position, a lever engaging the stem of the valve, a tripping-lever, connections between the tripping-lever and the lever controlling the valve, a cable carrying a button for operating the tripping-lever, means for revolving the pan or bowl, connections between the tripping-lever and the bowl-revolving mechanism, whereby when the tripping-lever is thrown forward the speed of the bowl will be decreased from a normal high rate of speed, and at the same time the valve unseated and the disk left unsupported, and when the tripping-lever is returned to its initial position the speed of the pan or bowl is again changed to a high rate and the disk raised by the valve and the opening of said disk closed thereby, pulp and water supply tanks, conductors leading from said tanks to the bowl or pan, valves controlling the flow through said conductors, and connections between the tripping-lever and the valves whereby the pulp-valve is opened during the fast or concentrating period, and the water-valve closed, and vice versa, the pulp-valve closed and the water-valve opened during the slow motion

or discharging period, substantially as set forth.

14. In an ore-concentrator, the combination, with a thin sheet-metal pan constructed to be revolved at a high rate of speed for the purpose of discharging the lighter particles, or particles of less specific gravity, over the top of the pan, and at a less rate of speed for discharging the heavy particles, or particles of greater specific gravity centripetally, of means for giving the pan or bowl a quick jar or bump continuously during both the high and low rates of speed for the purpose of transmitting a trembling movement to the material to prevent its packing, to assist in the separation of the same and to throw the heavier particles back toward the bottom of the pan to assist in the discharge of said particles centripetally, substantially as set forth.

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

CHARLES E. SEYMOUR.

Witnesses:
ARTHUR L. MORSELL,
C. T. BENEDICT.