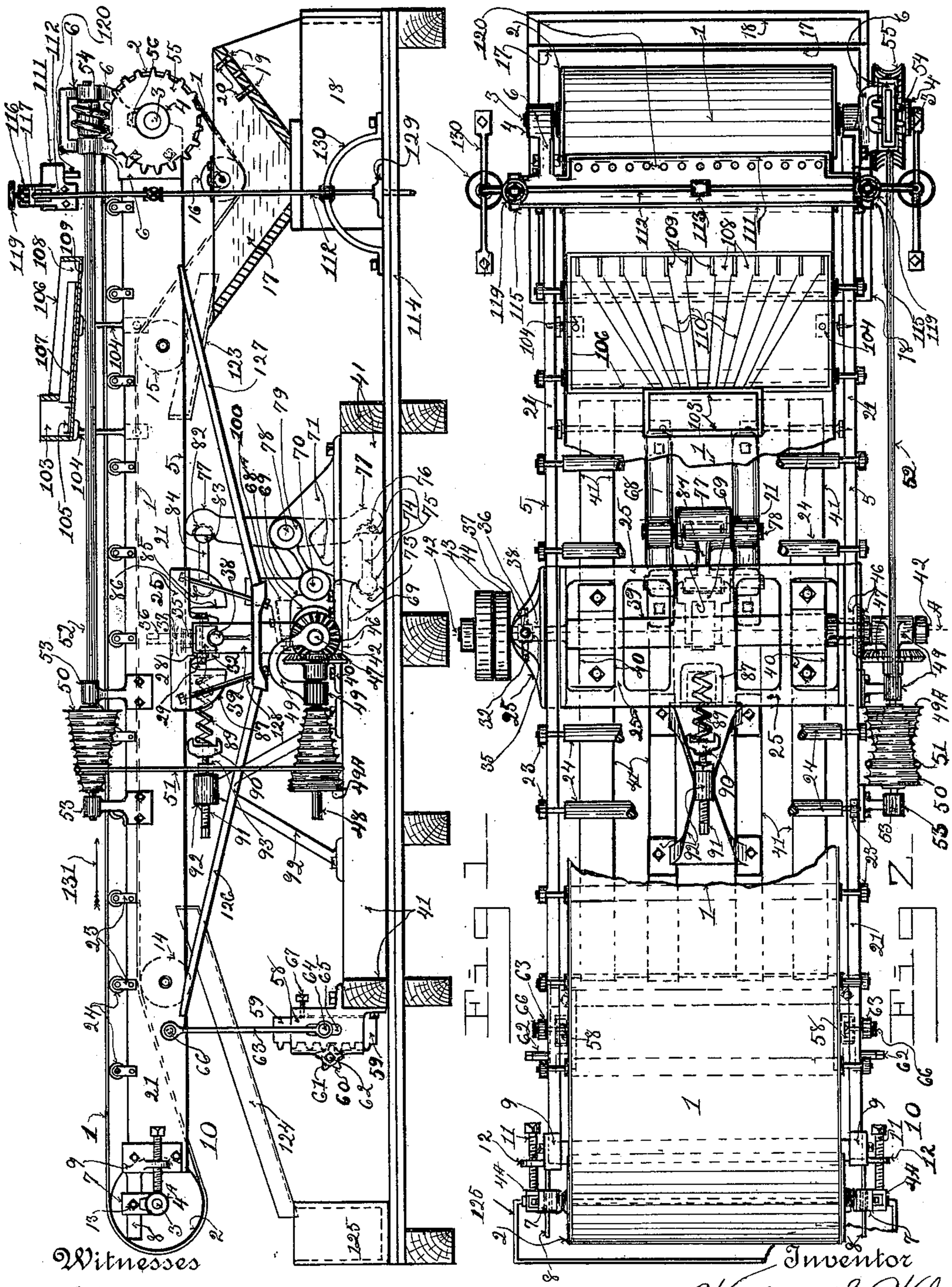
No. 645,987. Patented Mar. 27, 1900.

W. E. WILD.

ORE CONCENTRATOR.

(Application filed Nov. 17, 1898.)

(No Model.) 3 Sheets—Sheet 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

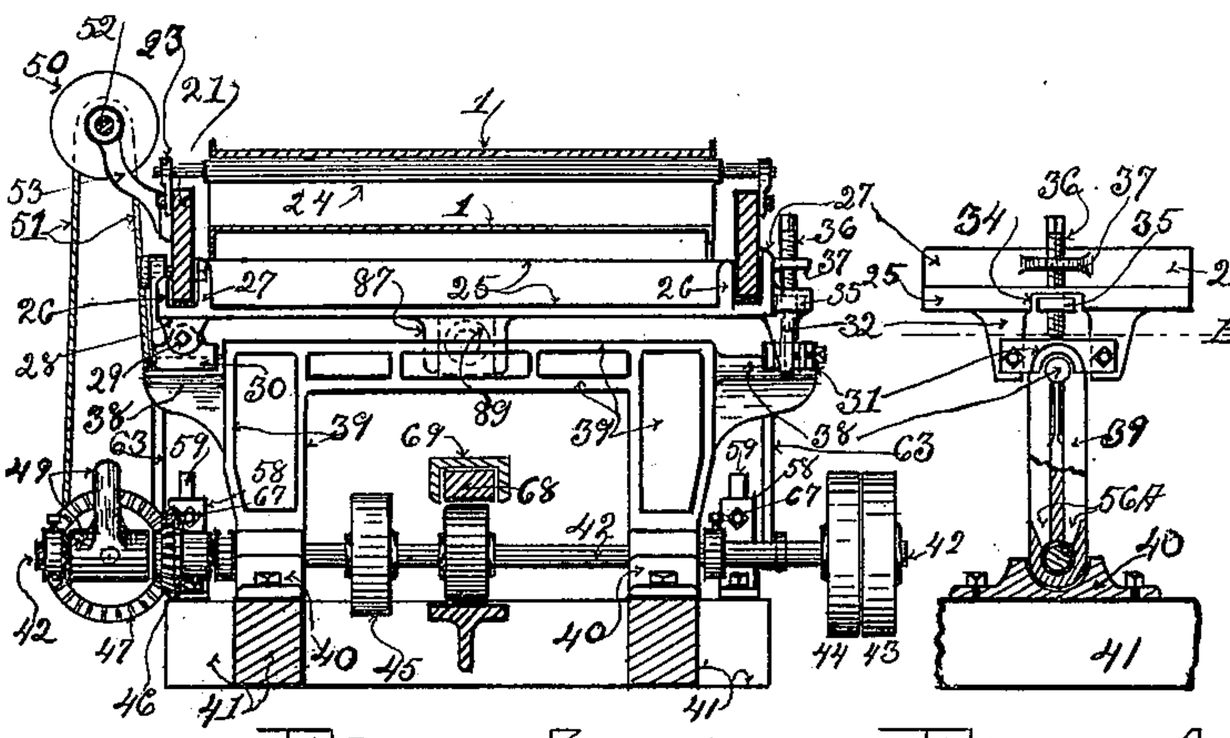

Fig 3.

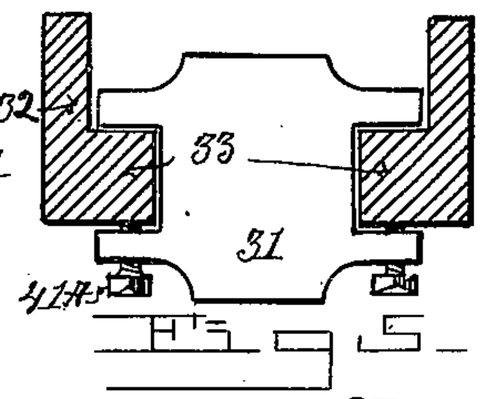

Fig 5.

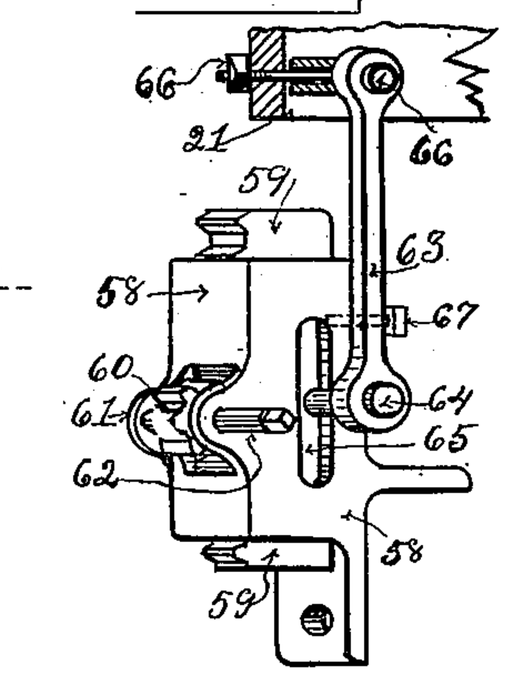

Fig 4.

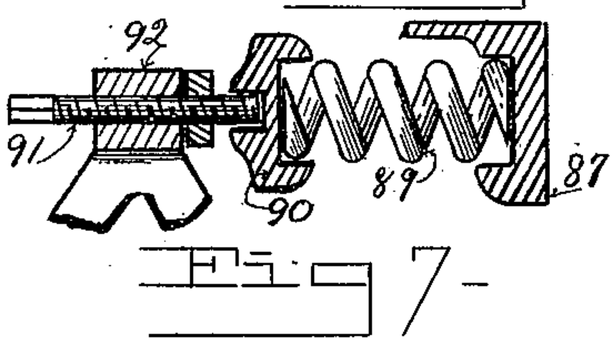

Fig 7.

Fig 8.

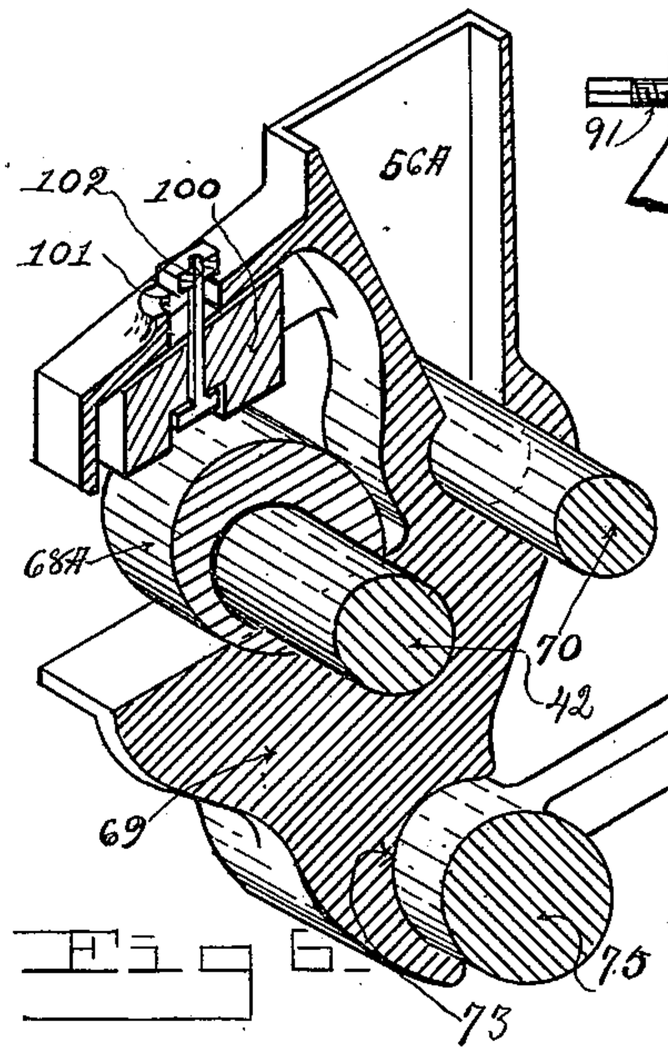

Fig 6.

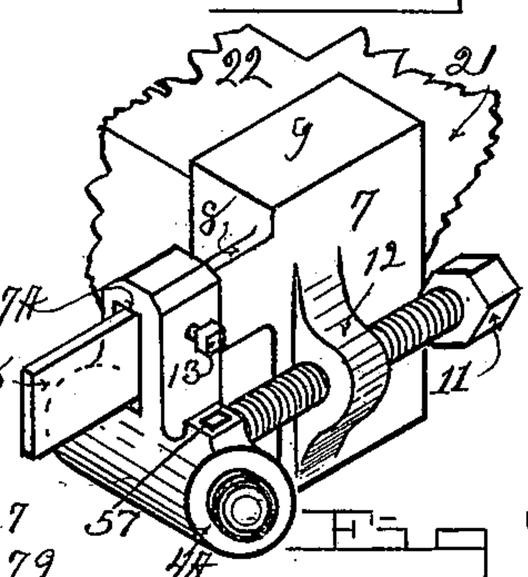

Fig 9.

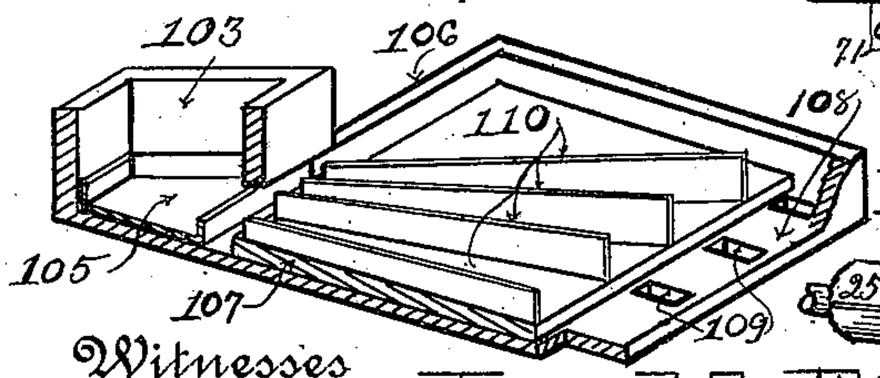

Fig 10.

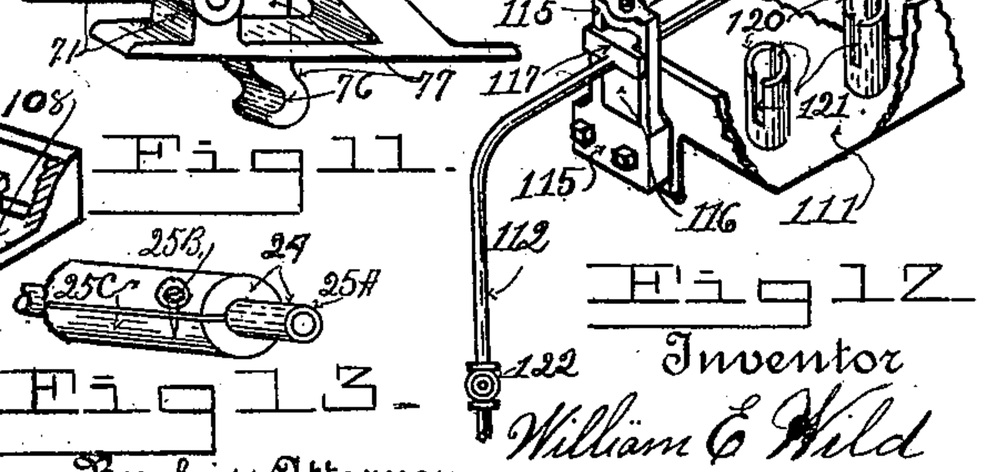

Fig 11.

Fig 13.

Fig 12.

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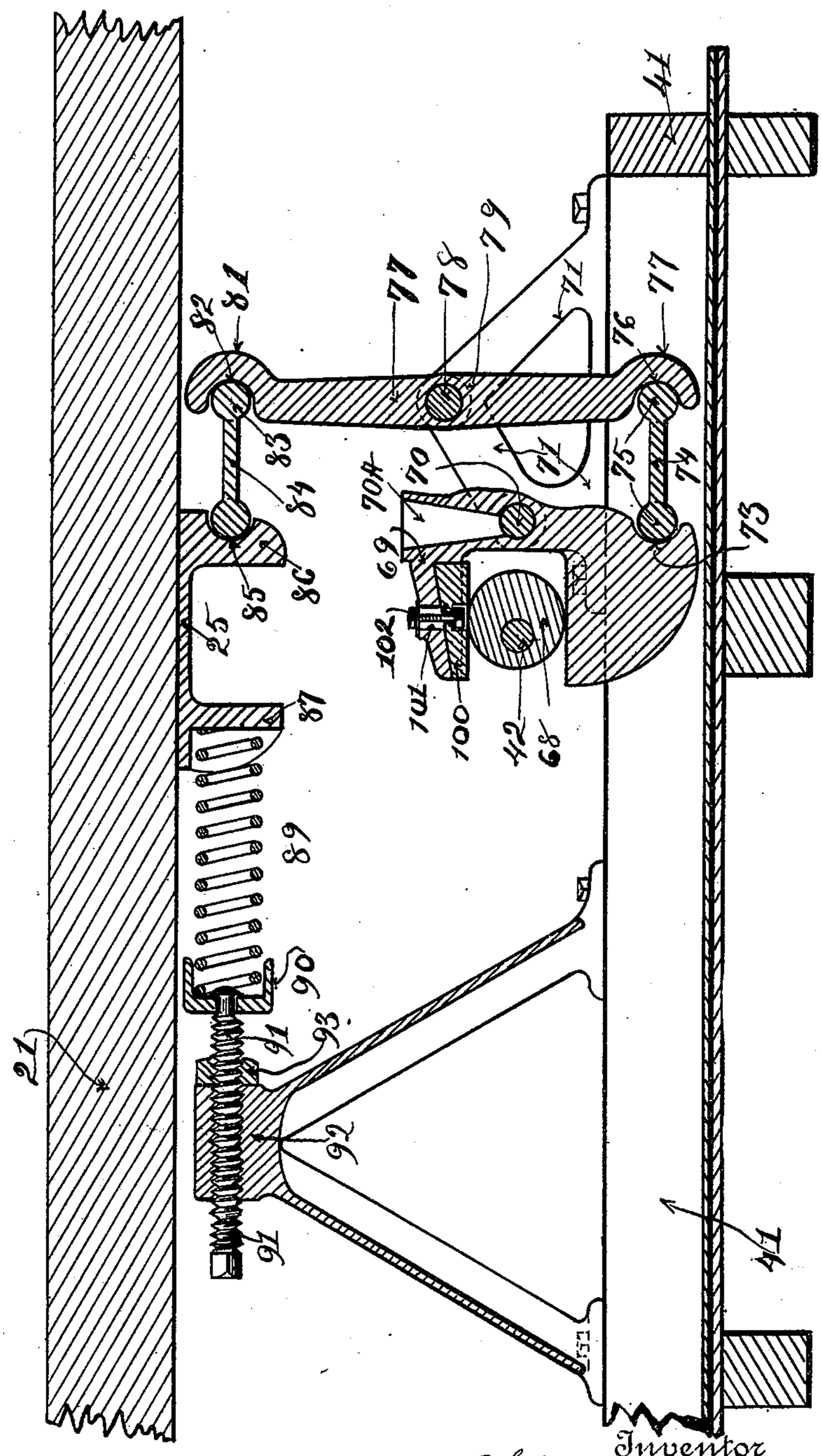
(No Model.)

3 Sheets—Sheet 3

FIG 5



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UNITED STATES PATENT OFFICE.

WILLIAM E. WILD, OF DENVER, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 645,987, dated March 27, 1900.

Application filed November 17, 1898. Serial No. 696,720. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. WILD, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in ore-concentrators; and the objects of my invention are, first, to provide a concentrator in which the concentrating-belt and its supporting-table are pivotally supported at or about its center of balance upon an oscillating support and that will have when in operation a short, rapid, continuous, reciprocal movement at its central portion and a combined reciprocal and vertical movement at its ends; second, to provide a variable-speed driving mechanism for imparting to the concentrator-belt different speeds of movement; third, to provide means for varying the longitudinal inclination and transverse level of the concentrator belt and table, and, fourth, to provide means for evenly distributing ore and water onto the concentrator-belt. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a concentrator embodying my invention. Fig. 2 is a plan view of Fig. 1 with the central portion of the belt and belt-supporting rollers broken away to show more clearly the parts under the belt. Fig. 3 is an end sectional view of the belt-supporting frame on line A of Fig. 2, showing the pivotal yoke and the saddle and adjacent parts in elevation. Fig. 4 is a fragmentary view of the opposite side of the saddle from that shown in Fig. 1 and illustrates the transverse leveling mechanism in Fig. 1. Fig. 5 is a sectional fragmentary plan view on line B of Fig. 4, showing the trunnion-box and its guides. Fig. 6 is a perspective fragmentary view of the eccentric and the cross-head that imparts a reciprocating movement to the concentrator-table and its belt. Fig. 7 is a fragmentary section view of the buffer-spring and its abutments. Fig. 8 is a perspective view of the mechanism used to raise and lower the tailings end of the concentrator-table. Fig. 9 is a perspective view of the mechanism for supporting the pulley over which the tailings end of the concentrator-belt runs and for adjusting the longitudinal tension of the belt. Fig. 10 is a fragmentary section of the ore-distributing hopper. Fig. 11 is a perspective view of the support for the eccentric cross-head and the walking-beam of the concentrator's reciprocating mechanism. Fig. 12 is a fragmentary section of the water-supply hopper. Fig. 13 is a fragmentary perspective of one of the belt-rollers, and Fig. 14 is a central vertical longitudinal section of the middle third of the concentrator.

Similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawings, the numeral 1 designates the concentrating-belt. This belt is an endless rubber belt with upwardly-turned flanged edges. I mount this belt upon pulleys 2. These pulleys are supported by shafts 3, which are journaled in boxes 4 and 4ª. These boxes are attached to opposite ends of the table portion 5 of the concentrator. The boxes 4 are formed in the castings 6, which are secured by bolts to the opposite corners of the head end of the table 5, while the boxes 4ª are formed on a block 7. This block contains a slot 7ª. The block is slidably mounted on an arm 8, that projects from a casting 9 and extends through said slot. The castings 9 are formed to fit on the opposite corners of the tailings end 10 of the table 5 and are bolted thereto. The blocks 7 and castings 9, a perspective view of which is shown in Fig. 9, are placed on opposite ends of the shaft that supports the belt-carrying pulley at the tailings end 10 of the belt, and the blocks are adjusted along the arms 8 to tighten the concentrator-belt by screws 11, which extend through lugs 12, formed on the sides of the castings 9 and bear against the sides of the boxes 4ª. After adjustment of the belt the blocks are clamped to the arms by set-screws 13. The belt also runs over pulleys 14, 15, and 16, the pulleys 14 and 15

of which are journaled in any suitable manner to the sides of the table. The pulley 16 is suitably supported on the top of a tank 17 and is arranged to carry the belt down into the tank after it leaves the head of the table into a body of water which is kept high enough in the tank to keep the belt submerged in it as it travels around this pulley. The tank 17 is placed upon a settling-tank 18, which contains water and which receives the overflow from the belt-washing tank 17 through holes 19 placed in three rows across the outer end of the belt-washing tank. These holes are arranged in rows one above another in order to allow of three different depths of water being kept in the tank, which is required to keep the belt submerged as the inclination of the table and belt is changed to suit ore under treatment, and when the head end of the table and belt is raised above the water-level of the lowest row of holes they are plugged by the plugs 20 and the water is raised to the second or third row, as required, and any floating mineral on the water flows through the open holes and drops into the settling-tank, while the heavier concentrates settle in the belt-washing tank.

The table portion 5 of the concentrator, which supports the concentrating-belt, consists of a frame of timbers, of which 21 designates the opposite sides, and 22 the ends. To the sides at suitable intervals throughout its length are journaled in suitable bearings 23 rollers 24, which support the belt in a substantially-horizontal plane. At the central portion of the table, at preferably its balancing-point, I secure a casting 25, which I term a "saddle." This saddle extends transversely across the table from side to side and receives between two upwardly-extending flanges 26 and 27, formed at its ends, the side timbers 21 of the table, the saddle thus supporting and carrying the table and belt. Upon the under side of one end of the saddle are two depending lugs 28, between which is pivotally supported, by a bolt 29, in order that it can adjust itself to an even seat upon a journal independent of the table, a box 30, the journal-bearing surface of which is arranged to extend at right angles to the longitudinal axis of the table and belt. Upon the opposite end of the saddle I place a similar box 31, but support it between two depending guides 32, that are cast integral with the saddle. These guides contain slideways 33, and the box is also provided with slideways which fit over them, so that it is free to move on them. Above the box and between the guides a recess 34 is formed, in which is housed a nut 35, through which is threaded a screw 36, which bears on top of the box. This screw extends above the guides and is threaded through and extends above a lug 37, cast on the end of the saddle. The upper end of the screw is squared to receive a wrench. These boxes 30 and 31 bear on trunnions 38, (see Fig. 3,) which project from opposite ends of a yoke 39, which has an oscillating bearing in the boxes 40, which are bolted to the bed-plate timbers 41. The sliding box 31 and the screw 36 are used to raise and lower the adjacent side of the table and belt until it stands transversely level, and to keep it level the box is stationary on the trunnion, and when the screw is turned the adjacent side of the saddle, table, and belt are either raised or lowered, and as the opposite side pivots on its box 30 the boxes bear evenly on the trunnions of the yoke, which pivotally carry the saddle, table, and belt. Set-screws 41^a clamp the box to the guide when adjusted. The main driving-shaft 42 is journaled in the lower ends of the yoke, preferably concentric to their bearing-surface in the boxes, as shown clearly in Fig. 4. This shaft carries at one end a tight and a loose pulley 43 and 44, which are belted to a suitable source of power. A fly-wheel 45 is placed on the shaft and adjacent to the opposite end a bevel-pinion 46 is secured. This pinion meshes into bevel-gear 47, which is supported by a shaft 48. This shaft is journaled in one end of a bracket 49, that is pivotally mounted on the end of the main driving-shaft. A cone-pulley 49^A is also secured to the shaft 48. The bracket is all the support the bevel gear-shaft and cone-pulley have, as the cone-pulley, which is preferably grooved for a rope belt, must be free to swing up and down, so that it will move in unison with its opposing cone 50, which is journaled to the side of the table above it and is connected with the lower cone by a rope belt 51. The cone 50 moves with a reciprocal movement of the table, and as the inclination of the table and belt is frequently changed the lower cone must move up or down with the upper one. This it does, as the lower cone is freely suspended from the upper rope belt and swings by pivoting on the end of the main shaft. The shaft 52, which supports the upper cone, is journaled in bearings 53, which are secured to the side of the table. This shaft extends to the head of the table and is journaled in a casting 6. This casting contains a gap in the shaft-bearing portion of the shaft in which is positioned and secured on the shaft a worm-wheel 54, which meshes with a worm-gear 55, that is secured on the end of the shaft 4 in suitable bearings formed in the castings 6. An oil or grease cup 56 is formed on top of the projecting bosses which form the shaft-bearings of the worm and gear similar to the grease-cup 57, which is formed on the boss that forms the shaft-bearing on the block 7 in Fig. 9. Similar grease-cups 56^a are formed in the sides of the yoke above its bearings that surround the main driving-shaft (see Fig. 4) and also in the eccentric cross-head, as shown in Fig. 6. These shaft-bearings on the castings 6 are formed similar to those shown on the block 7 in Fig. 9. The main driving-shaft drives the lower cone through the medium of the bevel-gears. The lower cone drives the

upper cone and shaft and worm and worm-gear by means of the rope belt, and the worm-gear drives the shaft of concentrator-belt pulley and the pulley the belt. I provide the cones with numerous belt-steps in order to have numerous different speeds of belt movement as the concentration of different characters or ores and of the same ore under different conditions require different speeds of and careful manipulation of belt movement. Different ores also require different longitudinal inclination or pitch of the concentrator-belt from the head end downward toward the tailings end, and it is necessary that the belt and its table be provided with means for quickly adjusting them to any desired inclination and also that it can be locked in any adjusted position against displacement without interfering with their other movements. I preferably carry out this feature of my invention in the following manner: Upon opposite corners of the bed-plate timbers I bolt a casting 58, which is formed to incase slidably a toothed rack 59. A pinion 60 is pivotally mounted on a shaft 62, one end of which is adapted to receive a wrench. The shaft 62 is journaled in the ears 61, which are cast on the casing. This shaft is positioned to hold the pinion in operative mesh with the teeth of the rack. To the side of the rack I pivot a lever 63 by a stud 64, which projects through a slot 65, formed in the side of the casing, and is secured to the rack. The opposite end of the lever 63 is pivotally secured to the sides 21 of the table by a bolt 66, and as both sides of the table are thus provided with this raising and lowering device it is very easy by applying a wrench to first one pinion-shaft and then the other to raise or lower the rack, levers, table, and belt quickly. After an adjustment is made the racks are clamped in the casings by a set-screw 67, which is threaded in the casing. This device does not interfere with the reciprocal and other movements of the table and belt, as the levers are pivoted at both ends and at their upper end travel with them.

My concentrator-belt and its supporting-table are bodily reciprocated at about two hundred strokes per minute when in operation, and in addition to this movement the ends, the head end in particular, are also given a vertical movement, and the two movements also blend into a rotary movement, which causes them to make or describe at each stroke an elliptical movement, which I find is of great value in assisting the regular endless travel of the belt in concentrating ore, as it keeps the ore in motion and forces the lighter particles of gangue up through the heavier and tends to settle the heavier through the lighter onto the surface of the belt. It also allows the water to percolate more evenly and quickly through the finely-pulverized particles of ore. The mechanism by which these movements are given to the belt and table is located under the central portion of the table and belt, and enlarged fragments of it are shown in Figs. 6, 11, and 14. It consists of an eccentric 68^{A}, which is secured to the main driving-shaft, and a cross-head 69, which embraces opposite sides of this eccentric. This cross-head is pivoted on shaft 70, which is journaled in a pedestal 71, a perspective view of which is shown in Fig. 11. A grease-cup 56^{A} is formed on the top of the upper jaw of the cross-head, by which the bearing between the shaft 70 and cross-head is lubricated. The lower jaw has a depending portion in which is formed a knuckle-bearing 73. In this knuckle-bearing fits one end of a lever 74, both ends of which have oppositely-disposed trunnions 75 formed on them. The opposite end fits into a knuckle-bearing 76, formed in the lower end of a walking-beam 77, which is pivoted to a shaft 78, that is journaled in a second bearing 79 on the pedestal 71. This pedestal is bolted to the bed-timbers of the machine. The upper end of the walking-beam is also provided with a knuckle-bearing 82, in which is seated one end 83 of a trunnion-ended lever 84, similar in form and size to the lever 74. The opposite end of this lever is seated in a knuckle-bearing 85, formed in a depending abutment 86 on the under side of the central portion of the saddle close to one of its side edges. On the opposite side edge of the saddle and opposite this depending abutment is a similar depending abutment 87, which is adapted to receive one end of an expansive spring 89, the opposite end of which is confined in a cupped washer 90, that is held against the spring by a screw 91. This screw is threaded to the top of a bracket 92, which is bolted to the bed-timbers. A check-nut 93 is placed on the screw against the bracket to prevent its accidental movement. This reciprocating mechanism works in the following manner: The spring is compressed by the screw to satisfactorily cushion the rapid reciprocating movement of the table and belt and to keep the trunnioned levers tightly seated in the walking-beam and cross-head and saddle. Then the eccentric as it is rotated by the main driving-shaft imparts an oscillating movement to the cross-head, which rocks on its shaft. This movement causes it to rock the walking-beam on its shaft, and upon the downward movement of the cross-head the walking-beam, through the medium of the lower trunnioned lever, and the top of the walking-lever, through the medium of the upper trunnioned lever, moves the saddle, table, and belt against the spring, which is compressed between its abutment and the screw and washer and by its expansive power moves the table and belt back the instant the walking-beam and its levers and the cross-head commence their opposite movement of oscillation. The main shaft is speeded to operate this mechanism to give, preferably, about two hundred reciprocations per minute

to the table and belt, as this speed gives the best results. This movement does not impart the slightest bump or jar to the table or belt, but gives to them a smooth continuous reciprocal movement at the center of the table and belt and an elliptical movement at the ends, particularly at the head end, where this peculiar movement is most effective in concentrating the ore. As the table and belt reciprocate, the yoke 39, upon which they are journaled, oscillates with them, rocking in its bearings in the boxes 40.

As the rapid rotation of the eccentric in the cross-head would wear both parts, it is necessary that an adjustable shoe be employed on one jaw of the cross-head to keep the parts in such proper operative relation as to avoid any lost motion between them. In carrying out this feature of my invention I preferably arrange the upper jaw with an inclined top and to incase on three sides a wedge-shaped block 100 of any suitable material, which I bolt to the inclined top of the jaw, arranging a slot 101 in the top for the bolt 102 to slide in as the shoe is adjusted down the inclined surface of the top, which would move it close to the eccentric to compensate for the wear on the jaws. 103 designates the ore-pulp receiving-hopper and distributer. It is supported upon brackets 104, which are secured to the sides of the table. In the bottom of the hopper I place an amalgamated copper plate 105, the edges of which are turned up to prevent anything of value which it may catch from being carried away by the flowing ore-pulp, which is in the form of pulp, finely-pulverized ore, and water and is fed to the hopper from wet stamps or pulverizers. From the lower portion of the hopper a distributing-table 106 extends toward the head of the belt. This table has a slightly-raised floor 107 extending across it, except in the hopper portion and for a narrow strip along its discharging side, which forms a trough 108. This raised floor allows a quantity of pulp to accumulate both in the bottom of the hopper and also in the narrow trough, which spreading out level in the hopper overflows evenly along the length of the raised floor and also acts in a similar manner in the trough, except that here the pulp flows down through a series of discharge-slots 109, made in the bottom of the trough, onto the belt. In order, however, that the pulp may flow evenly over the surface of the raised floor into the trough along its whole length, and thus discharge onto the belt in even quantities, I arrange upon the raised floor a plurality of thin strips 110, preferably of galvanized iron, placing them on edge and arranging one end of each strip adjacent to or under the discharge edge of the hopper end at a short distance apart and diverging the strips from the hopper across the raised floor, with their ends terminating at the edge of the raised floor at equal distances apart. By this arrangement an overflow of pulp is obtained across the floor into the trough at all points and also onto the belt through the discharge-slots. Between the ore-hopper and the head end of the belt I arrange to extend across the belt a water hopper and distributer 111. I preferably support this hopper upon the water-supply pipe 112, which I carry up on each side of the machine and over the top, placing one or more discharge-outlets, such as the T 113, in it to supply the hopper. The water-supply pipe extends to below the floor 114 and is there connected with a suitable water-supply. The hopper is supported directly on the water-pipe by a bracket 115, which is secured to each end of the hopper. The upper end of this bracket extends above the water-pipe and contains a slot 116, through which the pipe passes. A block 117 fits loosely in the slot and down on the pipe. A screw 118 is threaded to the top of the bracket and extends to and bears on top of said block. The top of the screw is provided with a hand-wheel 119. By this arrangement the water-hopper can be raised or lowered on the pipe toward or away from the belt by turning the screw.

It is necessary to change the position of the water-distributing hopper every time the inclinations of the belt and table are changed, because it is necessary to feed the water very carefully on the belt and ore, and in order to do this it must be kept quite close to the belt. In order to discharge the water evenly over the width, I arrange in the bottom of the hopper a row of small tubes 120, through which the water flows and falls on the belt, and as some ores require more water than others I arrange these tubes so that I can vary and gage the amount of water that flows through them. To accomplish this, I cut across the top of each tube a slot 121 (see Fig. 12) and extend it down the side of the tube far enough to give me an area of slot when its width and length are taken together that will equal the internal area of the tube. Then if the water in the hopper is kept at such a height that it will flow into the tubes the whole length of the slots I know that each tube is discharging its entire capacity; but if I am working an ore that does not require one-quarter as much water I keep the water in the tank by means of a valve 122 at a height that will flow into the slots at only one-quarter of their length. The tubes are then discharging one-quarter of their capacity. In this way I gage the quantity of water flowing through the row of tubes.

123 and 124 designate chutes, which are placed under the belt at opposite ends of the machine to catch the drippings from the belt, which they convey to the tanks 17 and 125.

The members 126 and 127 and bolts 128 each designate coöperating parts of a truss which I employ on each of the sides of the table to brace them against sagging or warping out of shape.

The pipe 112 is supported at the floor by a flange 129 and above the flange by a bracket 130, which is bolted to the floor.

I preferably construct the rollers 24, which support the concentrator-belt, as follows: For the axle I use a piece of tubing 25^A, around which I clamp, with screws 25^B, two pieces of wood 25^C, fitting and halving them around the tube, as shown in Fig. 3. I then turn the wood to make a roller of the desired size.

The operation of my improved concentrator is as follows: The ore-pulp is fed from the machinery, which crushes it, into the ore hopper and distributer by any suitable conveyer. In the hopper the amalgamating-plate catches most of the free gold the ore contains. The pulp then flows through the partitions of the distributer and is discharged across the width of the concentrator-belt, which is moved slowly in the direction of the arrow 131 by the driving mechanism above described. Water is then fed through the water-hopper and its discharge-tubes in sufficient quantities to wash the light gangue down toward the tailings end of the belt a little faster than the heavier mineral is separated from the gangue. The mineral is carried along by the belt toward the head end. The belt is slightly inclined toward the tailings end 10 to assist the downward travel of the gangue. In addition to the travel of the belt around its pulleys it is always when in operation reciprocated bodily longitudinally, with its table, upon its pivotal support, (the yoke,) the bottom of which pivotally rocks in its bearings below the table, while its top, where it supports the table on trunnions, oscillates under the reciprocating movement of the table imparted to it by the eccentric, cross-head, walking-beam, levers, and the resilient opposing spring above described. This peculiar reciprocal oscillating motion at the center of the table results in an elliptical movement at the ends of the table and belt, which I claim is of great value in separating the lighter from the heavier grains of ore, inasmuch as it imparts to the grains four different opposite centrifugal movements as they lie buoyantly in the water on the belt. These movements, coöperating with the travel of the belt and wash of the water, act to quickly concentrate the ore and enable my machine to handle a much greater amount of ore and to make a better separation and to effect a greater saving of values than it would without them. The concentrates are carried by the belt into the belt-washing tank, where they wash off and settle, while any float mineral overflows through the outlets into the settling-tank. The gangue or tailings discharge from the tailings or opposite end of the belt.

While I have described the preferred construction and arrangement of the various elements that comprise my concentrator, I do not wish to be limited to them, as it is obvious that many changes might be made in them without departing from the spirit of my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the concentrating-belt and table and their oscillating support and main driving-shaft, of means for varying and maintaining any desired angle of longitudinal inclination of the belt and table while under their operative reciprocal movement comprising a toothed rack-bar vertically supported in a suitable guide-casing, a pinion journaled in said casing and in mesh with said toothed rack-bar, means for rotating said pinion to raise and lower said rack-bar, an arm pivoted at one end to said toothed rack-bar and at the opposite end to said table and means for clamping said toothed rack-bar to said casing after adjustment, and with the belt-driving mechanism, comprising the rope-cones, one of which is suspended from the other, a yoke or bracket journaled at one end to support said suspended cone and at its opposite end journaled to said main driving-shaft, whereby the relative position of cones is maintained in the various adjustments of the device, substantially as described.

2. The combination with any suitable concentrator-belt and suitable belt-supporting pulleys and a supporting-table or framework for said belt and pulleys, of a suitable foundation or bed-plate of timbers adapted to form the base of said concentrator, journal-boxes secured to opposite sides of said bed-plate, a vertically-disposed supporting-frame pivotally journaled in said boxes and arranged transversely across said belt and table and at the central portions of their length and having trunnions on its opposite ends, a saddle-plate secured transversely across the bottom of said belt-supporting frame or table and a box secured on one side of said saddle and arranged to adjust itself independent of the movements of said table, to one of said trunnions of said vertical frame and a box on the opposite side of said saddle supported in vertical guideways formed in said saddle and bearing on the opposite trunnion of said supporting-frame, a screw threaded to said saddle and arranged to bear on said box, and means including a check-nut for securing said screw in an adjusted position, substantially as described.

3. The combination with the concentrator-belt and table of the ore-hopper having an amalgamating-plate in its bottom, a distributing-table extending from said hopper and provided with a raised floor, a plurality of partitions extending across said floor and diverging from the discharging-outlet of said hopper across the width of said distributing-table, whereby a plurality of independent water-channels are formed from the hopper across the distributing-table, a trough along the edge of said distributing-table lower than

said raised floor and a plurality of discharge-slots through the bottom of said trough opposite to and registering with the discharge ends of said water-channel, substantially as described.

4. The combination with the concentrator-belt, its supporting-table, the pivotal oscillating support and the belt differential-speed driving mechanism, with the ore-hopper, the amalgamating-plate therein and the ore-distributing table, and with a water-hopper supported above said belt and arranged to be raised and lowered to and from said belt and containing a row of water-discharging pipes which depend from it and extend above the floor of the hopper within it and each having a diametrical slot cut in its end and along its length above the floor of said hopper of an area substantially equal to the area of each pipe, a water-supply pipe leading to said water-hopper and a valve for controlling said supply, whereby the volume of water flowing through said discharge-tubes is gaged substantially as described.

5. The combination with the belt and the table the oscillating support and the driving mechanism, of a water-supply pipe extending up on each side of said belt and table and supported independent of said belt and table and extending transversely across said belt, a water-hopper adjustably secured to and arranged to be lowered to and from said belt, a plurality of tubes arranged to discharge water transversely across and onto said belt from said hopper and means including a diametrical slot in each tube for predetermining the flow of water through each tube, substantially as described.

6. The combination with the endless belt and its supporting-table, of a water-supply supported on opposite sides of said belt and table and independently of them and extending above and transversely across said belt, a water-supply hopper supported by said water-supply pipe, a water-inlet from said pipe into said hopper and means for lowering and raising said hopper between said pipe and belt comprising a bracket secured to each end of said hopper and extending above it, a slot in said bracket through which said pipe passes, a block slidable in said slot and partially embracing said pipe and a hand operating-screw threaded through the top of said bracket and bearing on the top of said block whereby by turning said screw said hopper may be moved toward or from said belt or pipe and means including a row of tubes depending from said hopper and containing vertical slots for distributing water across said belt, substantially as described.

7. The combination with the belt, the table, the saddle and the pivotal oscillating yoke, of the driving-shaft journaled in the pivotally-journaled end of said pivotal oscillating support, the eccentric movement thereon; a cross-head arranged to embrace and to be oscillated on a pivotal bearing by the rotative movement of said eccentric, and an adjustable removable shoe secured to said cross-head to receive the wear of said eccentric, an extension depending from said cross-head, a pivotal bearing in the end of said extension and a lever journaled at one end in said pivotal bearing and at its opposite end pivotally journaled to one end of a walking-beam, substantially as described.

8. The combination in an ore-concentrator, the belt with a differential driving mechanism for said belt comprising a grooved rope-belt conical pulley, a rope belt for said grooved pulley, a second oppositely-disposed conical grooved pulley suspended by said rope belt from said first-named pulley, a shaft carried by said suspended cone, a driving-shaft, means including a yoke-shaped bracket for pivotally connecting the free end of said cone-shaft to said driving-shaft, means for driving said suspended cone from said driving-shaft and means including a shaft for driving said belt from said cones, substantially as described.

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

WILLIAM E. WILD.

Witnesses:
CLAUD A. DUNN,
BESSIE THOMPSON.