

No. 766,060.

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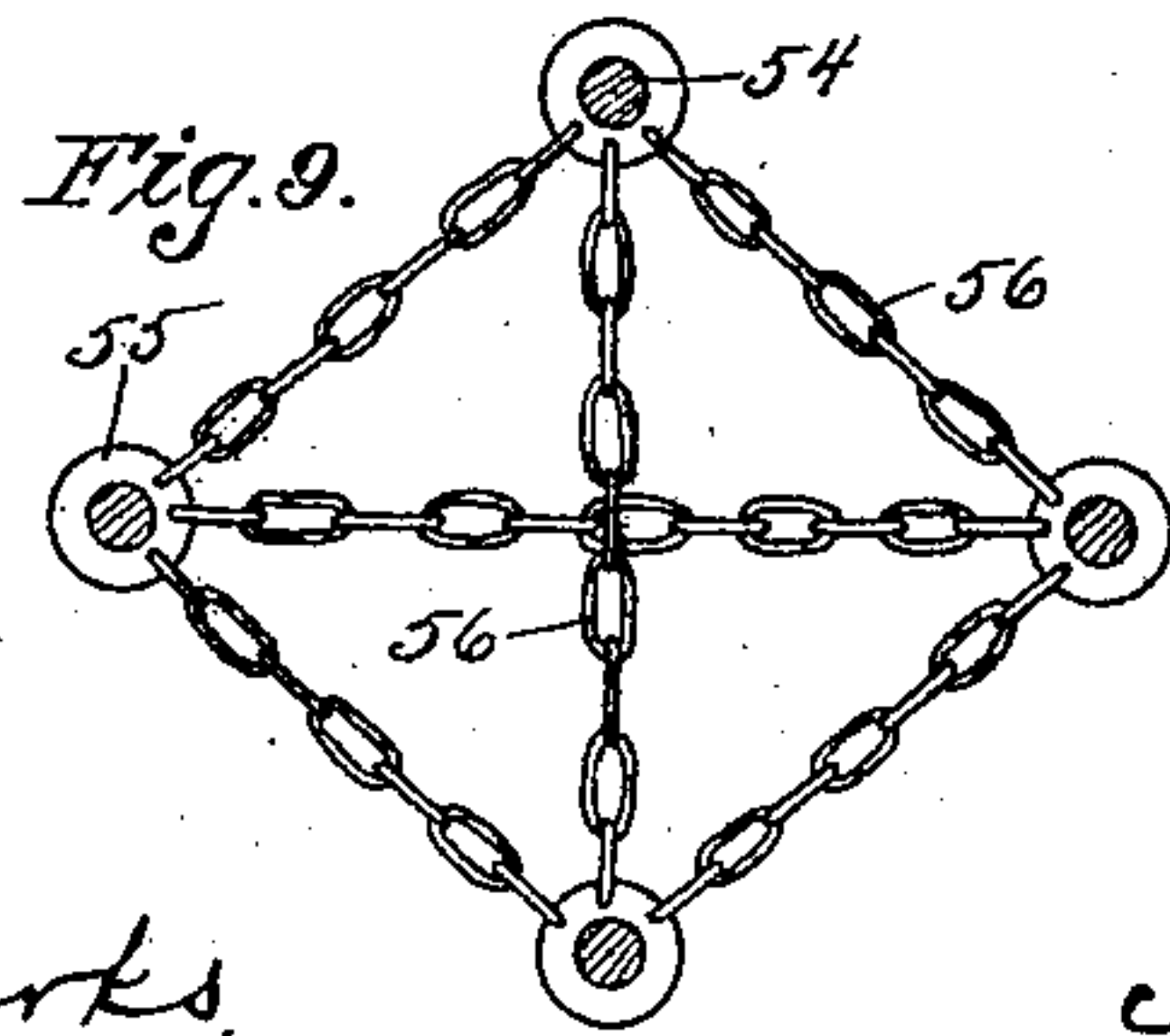
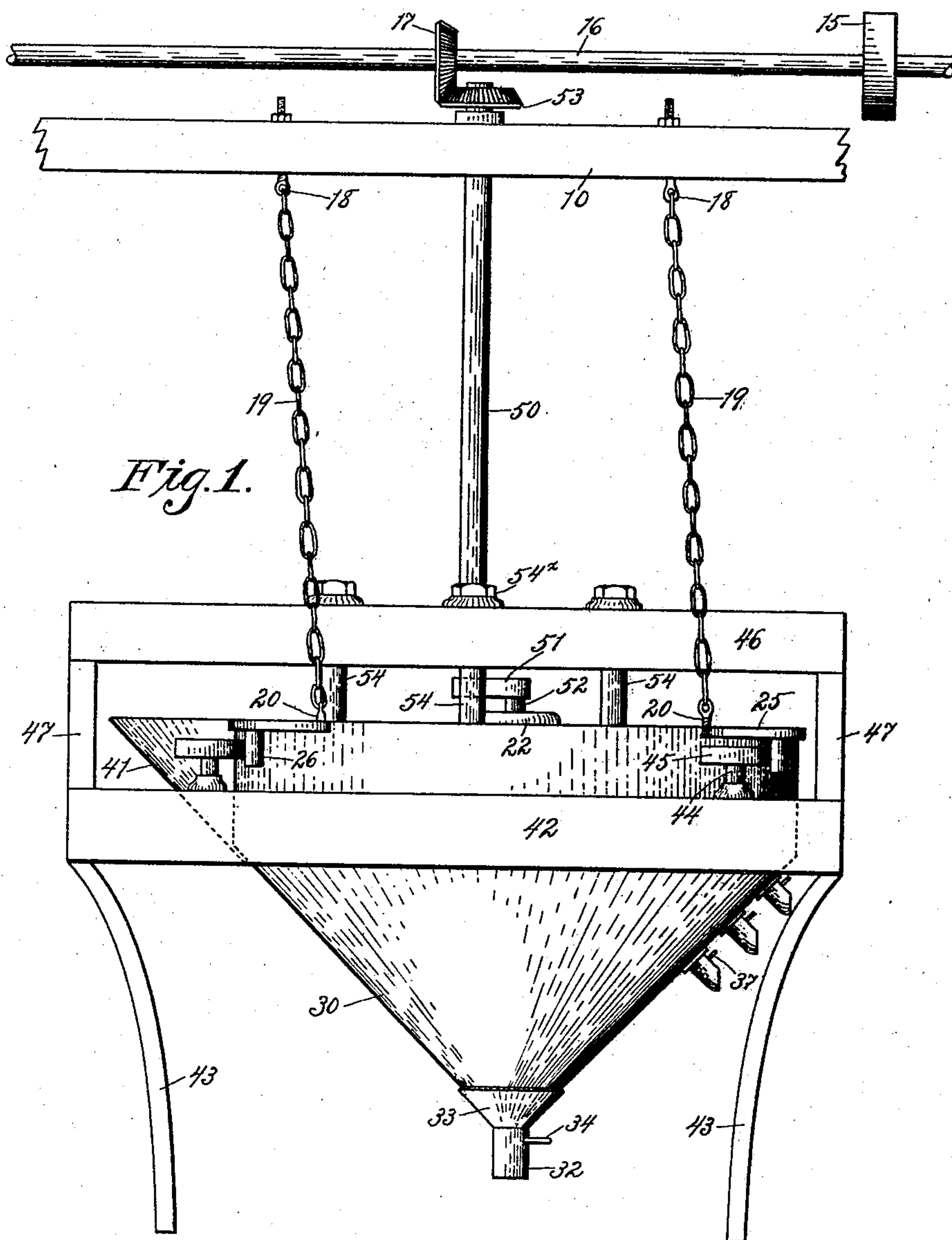
F. E. PARKER.

ORE PULP WASHER AND CONCENTRATOR.

APPLIOATION FILED JULY 17, 1903.

NO MODEL.

3 SHEETS--SHEET 1.



WITNESSES:

Robert A. Pollock.
Theodore C. Sparks.

INVENTOR

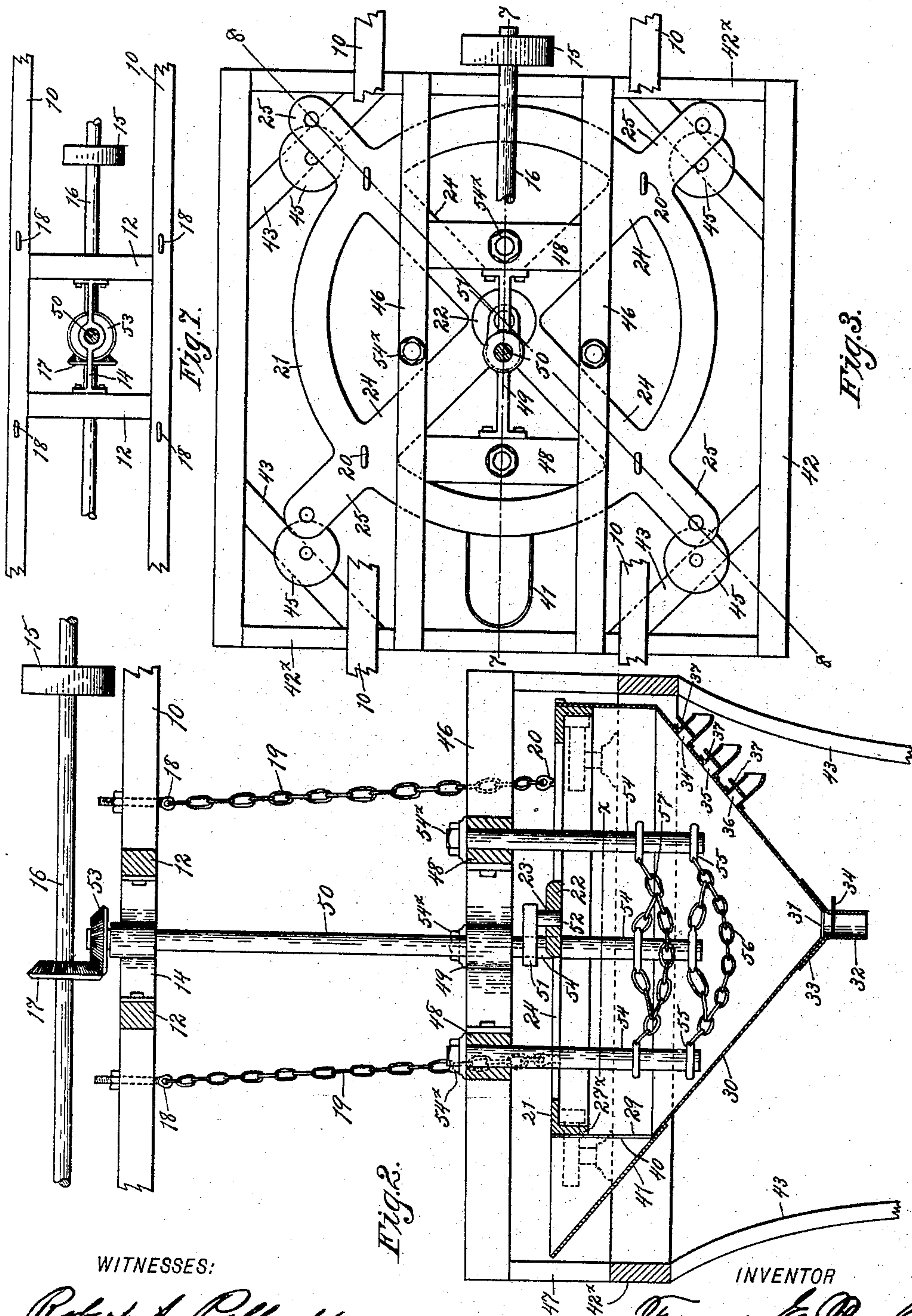
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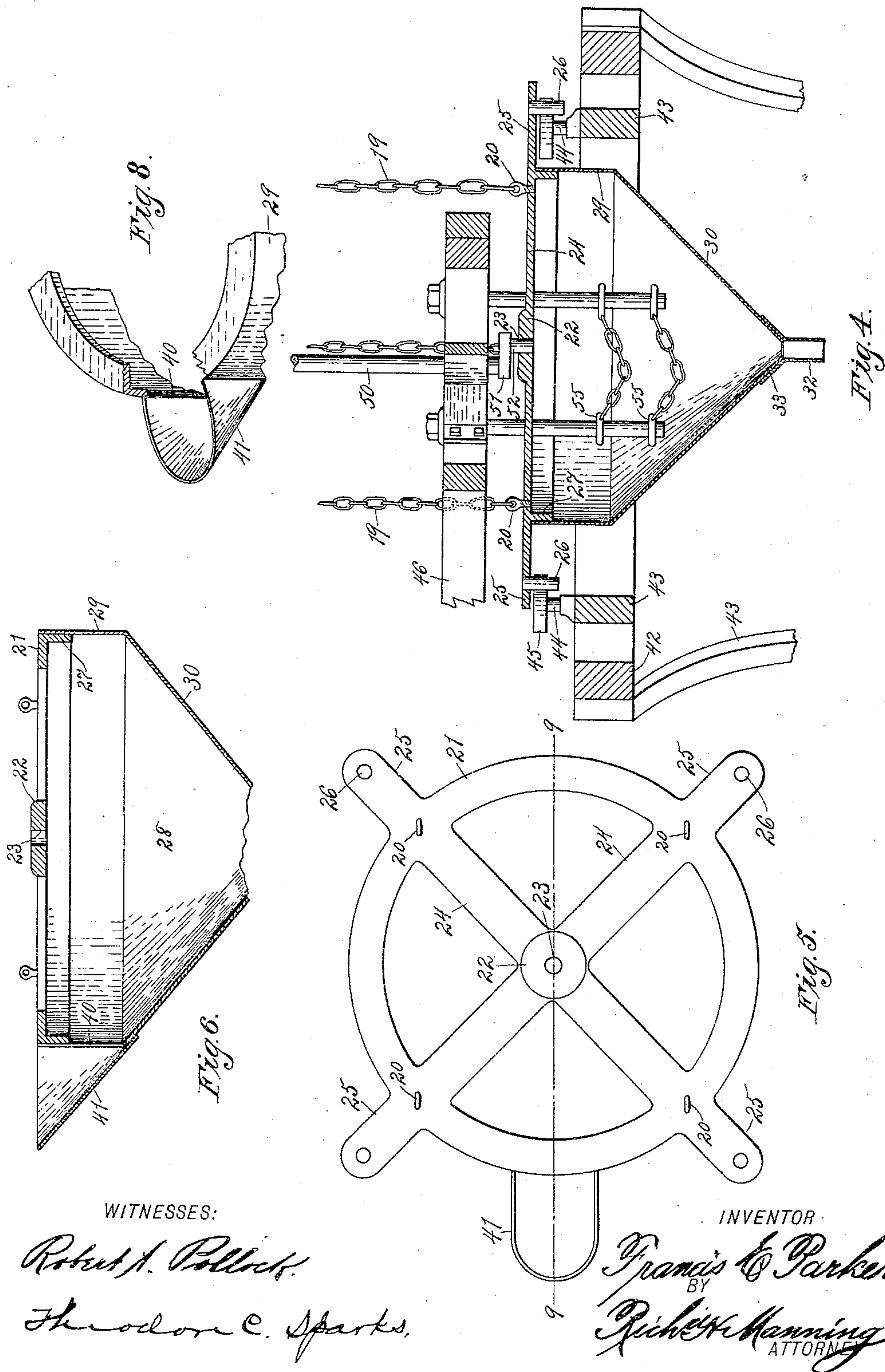
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UNITED STATES PATENT OFFICE.

FRANCIS E. PARKER, OF KANSAS CITY, MISSOURI.

ORE-PULP WASHER AND CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 766,060, dated July 26, 1904.

Application filed July 17, 1903. Serial No. 165,950. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS E. PARKER, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Ore-Pulp Washers and Concentrators; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use of the same, reference being had to the accompanying drawings, forming a part of this specification.

The object of my invention primarily is to accomplish the separation of the metals from ore-pulp by an oscillating curvilinear movement imparted to the receptacle in which the metals are deposited, and this movement constantly maintained under mechanical power communicates agitation to the pulp, the lighter material under irrigation, having an upward movement through which the metals filtrate, and a larger saving of the metals is effected.

The further object of my invention is to remove the strata of the lighter or waste material from which the metals are separated at waste levels from the receptacle and provide for a renewed supply of metal-bearing pulp, and also to prevent the accretion of the silicious and earthy constituents of the ores in a vortex within the moving pulp and to form eddies in the pulp.

The invention consists in the novel construction and combination of parts, such as will be first fully described and then specifically pointed out in the claims.

In the drawings, Figure 1 is a side view elevation of the novel ore washing and concentrating apparatus. Fig. 2 is a vertical sectional view of the novel ore washing and concentrating apparatus, taken upon the line 7 7 of Fig. 3. Fig. 3 is a plan view of the apparatus, showing portions of the upper beams from which the ore-concentrating receptacle is suspended and the power-transmitting shafts being broken away. Fig. 4 is a section view in detail of the ore-concentrating receptacle and of the stationary guide-frame within which the curvilinear movement of the receptacle is maintained, taken upon the line 8 8 of Fig. 3. Fig. 5 is a plan view in de-

tail, showing the spider supporting the ore-concentrating receptacle, the radial roller-carrying arms, and the pulp-receiving hopper or neck on the receiver. Fig. 6 is a vertical sectional view of the receptacle for the pulp, taken on the line 9 9 of Fig. 5, the lower part of the ore-receptacle being broken away. Fig. 7 is a view of the overhead or ceiling beams from which the receptacle is suspended looking upward. Fig. 8 is a detail broken view of the side of the ore-concentrating receptacle, showing the hopper. Fig. 9 is a detail cross-sectional view of the pulp-agitating rods, showing the bridging-chains, taken on the line *x x* of Fig. 2.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

Referring to the drawings, 10 represents separate longitudinal overhead or ceiling beams, from which the ore-concentrating receptacle is suspended. Extending transversely from one beam 10 to the other and spaced apart a short distance are tie-beams 12 12. (See Fig. 7.) Extending parallel with and between the longitudinal beams 12 and connected with the beams 10 is a shaft-hanger 14. Above the transverse beams 12 and journaled in a suitable support 15 is a horizontally-extended power-conveying shaft 16, upon which is a bevel-gear 17. Upon the lower edge of each of the beams 10 and at a considerable distance from the respective transverse beams 12 are secured the eyebolts 18. With the eyebolts are connected the upper ends of the chains 19, the lower ends of which chains extend downwardly a considerable distance and are connected with the eyebolts 20 upon the upper side of an annular spider or plate 21, which eyebolts are spaced at equal distances apart in the line of direction of the circumference of the said plate. At the vertical axis of the receptacle and upon plate 21 is a hub 22, having a vertical opening 23, from the sides of which plate extend the spokes or radial plates 24 24 24 24, the outer ends of said spokes or plates being connected with the inner edge of plate 21 near the respective eyebolts 20. From the outer edge of the annular plate 21 extend radially the pin-

carrying arms 25, which arms are in line radially with the arms 24 on the inner edge of said plate. Near the outer ends of the arms 25 and secured rigidly to the under side of each arm is a guide-pin 26. On the under side of the annular plate 21 a short distance inwardly from the outer edge of said plate is a downwardly-extended annular flange 27. Beneath the annular plate 21 is the metal-concentrating receptacle 28, the upper portion or sides 29 of which are cylindrical in form, the upper ends of said sides being secured firmly to the outer surface of the annular flange 27, the lower portion of said flange extending downwardly a short distance, the bottom 30 of said receptacle inclining downwardly and inwardly in the form of the frustum of a cone, the lines of said sides forming an apex and meeting at the vertical axis of the receptacle. In the apex of the bottom 30 of the receptacle is a discharge-opening 31 for the metals. Extending around the opening 31 is a conducting-tube 32, the upper end of said tube having an outwardly-flaring annular flange 33, which is secured to the outer surface of the bottom 30 of the receptacle. In the tube 32 is a knife-valve 34, which is moved laterally to discharge the metal from the tube.

In the bottom 30 of the receptacle are the separate discharge-openings 34 35 36 for the waste material. One of these openings, 34, is arranged a short distance below the line from which the bottom inclines from the side 29 and is the level of the waste material from which the metal is separated in a more complete manner. A short distance below the said opening is a similar discharge-opening 35, and below the line of the opening 35 is a discharge-opening 36. Upon the underside of the receptacle and extending around each opening is a spout 37, in which is a knife-valve 38.

In the side 29 of the receptacle is a transverse opening 40 for the reception of the ore pulp. From the sides of the opening 40 extend outwardly the ends of a hopper 41 in the arc of a circle, and the bottom of said hopper extends from the outer end of said hopper in a downwardly and onwardly inclined direction and meeting the surface of the bottom 30 of the receptacle, at which point the lower end of the opening 40 terminates.

The receptacle 28 is suspended in position within a rectangular stationary frame 42, so that the position of the spider 21 will be above the plane of the upper surface of the said frame. The frame 42 is supported in position upon the ground by the supports 43 43. The sides 42^x of said frame are arranged the proper distances apart to permit of the oscillating movement of the receptacle without contact. At each right angle or corner formed by the sides of the frame 42 are the roller-supporting beams 43, which extend diagonally from one beam on one side of the frame to an adjoining side beam. Upon the upper side of

each diagonal beam 43 is a vertical stud-shaft 44, upon the upper end of which shaft is journaled a horizontal roller 45, in contact with which series of rollers the pins 26 upon the radial arms come into contact and move in a circle with the rollers.

Above the frame 42 a short distance are arranged horizontally the parallel beams 46, the ends of which extend to a position above the side beams of the frame 42 and are supported rigidly upon the vertical posts 47 47, extending from the under side of the beams 46 to the upper surface of said side beams. Extending transversely to the beams 46 are tie-beams 48, which are in position directly above the receptacle 28 and secured rigidly to the beams 46 at their respective ends. With the tie-beams 48 are connected the respective ends of a shaft-hanger 49, which is arranged parallel with and at a point equidistant from the beams 46 46. In the shaft-hanger 49 is journaled the lower end of a vertical power-shaft 50, the lower end of said shaft extending downwardly in the direction of and nearly to the outer edge of the hub 22 on the plate 21 on the receptacle 28 and eccentrically to the vertical axis of the receptacle, and upon said lower end of the shaft is an arm 51, upon the under side and outer end of which arm is a wrist-pin 52, extending loosely within the opening 23 in the hub 22, thus normally retaining the position of the receptacle so that its vertical axis is upon the side of the vertical line of the shaft 50.

The upper end of shaft 50 extends upward and is journaled in shaft-hanger 14 on the ceiling-beams 10, and upon said end of the shaft above the hanger is a bevel-gear 53, which meshes with the bevel-gear 17 in the power-shaft 16. Through the tie-beams 48 on the beams 46, and also said beams 46, extend the lower ends of the ore-agitator rods 54, which are arranged opposite in position and at right angles thereto, said ends passing between the plates or spokes 24 24 of the annular plate 21 and downwardly within the receptacle 28 to a position a short distance below the lower portion of the side 29 of said receptacle. Upon the upper ends of said rods are the nuts 54^x, which nuts bear on the upper surface of the beams 48. Upon the lower ends of the rods 54 are secured the chain-rings 55, with one of which rings on one rod is connected one end of the bridging-chain 56, the other end being connected with the chain-ring on each of the other rods 55, as seen in Fig. 9. A short distance above the rings 55 on said rods are similar chain-rings 55, with which are connected the bridging devices or chains 57, these chains being attached to form a rectangle and made to sag at an intermediate point from the rods and also arranged so that one pair of chains will extend diagonally to the other chains. (See Fig. 9.)

In operation the ores for treatment are re-

duced by milling to a pulp. This pulp is supplied to the hopper 41 initially in a small quantity, which passes within the receptacle 28 through the opening 40, the valves in the 5 respective discharge-tubes 32 and 34 being opened to a slight extent. The receptacle 28 being partially filled with pulp to the height of the opening or tube 34, water is supplied to the receptacle in the proper quantity. Power 10 from any suitable source is then communicated to the shaft 16, thence to shaft 50 through gears 17 and 53, and an oscillating movement is communicated through the crank-arm 51 to the concentrating-receptacle 28. 15 The pins or bearings 26 on the arms 25 move in concentric circles in contact with and consequently in larger arcs of circles than the periphery of the roller 45, the rollers acting as guides during the oscillating movements of 20 the suspended receptacle and take up lost motion without jar and also communicate a curvilinear movement to the ore-separating receptacle. This movement of the receptacle has a tendency to cause a rotary movement 25 of the pulp, during which agitation the heaviest substances, such as gold and silver, fall within the apex of the receptacle and are discharged through the opening 34, the valve 34 being opened in a slight degree, so that the 30 continuous discharge will be regulated in proportion to the quantity of metal separated from the pulp, the lighter material working upwardly and separating according to the specific gravity and is discharged through 35 the discharge-opening 34, the valve in said opening being also opened the requisite degree to effect a continuous flow. During the movement of the pulp from the action of the receptacle 28 the tendency of the heavier 40 particles, such as sand and earthy constituents of the ores, is toward the center of the moving mass, and is constantly intercepted by the rods 54 and the chains 56 and 57 and caused to loosen up and mix with the other 45 constituents of the ores, and as the pulp moves around each link of the chains in the curvilinear movement of the receptacle eddies are formed in nearly all portions of the pulp, which facilitates the separation, and the metal fol- 50 lows these eddies to the bottom of the receptacle.

The rods 54 act as stirrers to the pulp, and being stationary in position the moving pulp is constantly diverted as the receptacle 28 55 moves in its orbit.

When the discharge of the metal through the opening 31 is such as to afford complete separation and the level of the pulp is below the discharge-opening 36, a renewed supply of 60 the pulp is permissible and the operation continued. The supply of the ore-pulp may be introduced to the hopper 41 during the action of the receptacle or its movement checked for the purpose, the separation afforded depend-

ing on the grade of ores subjected to treat- 65 ment and as the metal finds its way to the apex of the receptacle. In the event that a separation of the metal leaves a quantity of the waste in the upper part of the receptacle and requires its removal the valve in the open- 70 ing 35 is opened and to the required extent, and also the valve in the opening 36, thus permitting the amount of the waste discharged from the receptacle to occur in quantity as the separation proceeds. In the lowest stage in 75 which the pulp is discharged from a receptacle a comparatively small amount of pulp remains, and this may be subjected in another ore-separator of like construction to a final treatment with other pulp. 80

I am aware that an oscillating movement has been communicated to a suspended ore-receptacle by crank and eccentric operating de- 85 vices and that shaking-screens have been supported upon rollers and gyrated in movement; but I am not aware of a suspended ore-receptacle in which the oscillatory and gyratory movements are combined. In practical oper- 90 ation the oscillatory movements of the receptacle are such that the roller-bearings must be non-frictional and free to abut on the guide-rollers as the circuit is made around each roller, thus relieving the receptacle from 95 shock, which would arrest the full gyrations of the suspended receptacle and the rotary action of the pulp.

It is obvious that the position of the driving-shafts may be varied and a closer connection of the power-transmitting gear effected 100 by the reduction in the length of shaft 50, if preferred. I may also increase and diminish the speed of the reciprocating movement by the obvious increase and decrease of the length of the crank-arms and that of the circumfer- 105 ence of the rollers 45, the action being desirable at greater speed in some instances, where less speed is required in another. I may also vary the construction of the receptacle 28. Any placer material may be treated in my in- 110 vention and in large quantities, the saving of the metal being expeditiously accomplished and more effectually than heretofore.

Such modifications of the invention may be employed as are in the scope of the invention.

Having fully described my invention, what 115 I now claim as new, and desire to secure by Letters Patent, is—

1. The combination with the receptacle for the concentration of metals from ore-pulp having valved discharge-openings for the 120 waste material, of suspensory devices for said receptacle means for communicating an oscillatory movement to said receptacle and a series of stud-shafts located at the limit of oscillation of said receptacle in pairs, horizontal 125 guide-rollers on said shafts, arms extending radially from the side of said receptacle and guide-pins on said arms contacting with said

rollers, and controlling the curvilinear movement of said arms, and stationary pulp-agitating devices located above the receptacle and extending downwardly within the same
5 and adapted to loosen the material at the discharge-openings in the receptacle.

2. In ore-concentrators a suspended receptacle for the ores, having cylindrical sides, and a bottom inclined inwardly and downwardly, and a valved discharge-opening at the
10 apex of said bottom, and one or more valved discharge-openings in said bottom in separate horizontal planes; material-agitating rods extending within said receptacle, chains connected
15 at one end with one of said rods and extending horizontally and connected at the other end with the other rod, and means for com-

municating an oscillating curvilinear movement to said receptacle.

3. In an ore-concentrator, a suspended ore-
concentrating receptacle; means for communicating an oscillating curvilinear movement to said receptacle, separate pulp-agitating rods
extending within said receptacle, and a fixed
support therefor, chains connected at one end
25 with one of the said rods and extending horizontally and connected at the other end with the other rod, the links thereof adapted to form eddies in the pulp in the movement of said receptacle.

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Witnesses:

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