

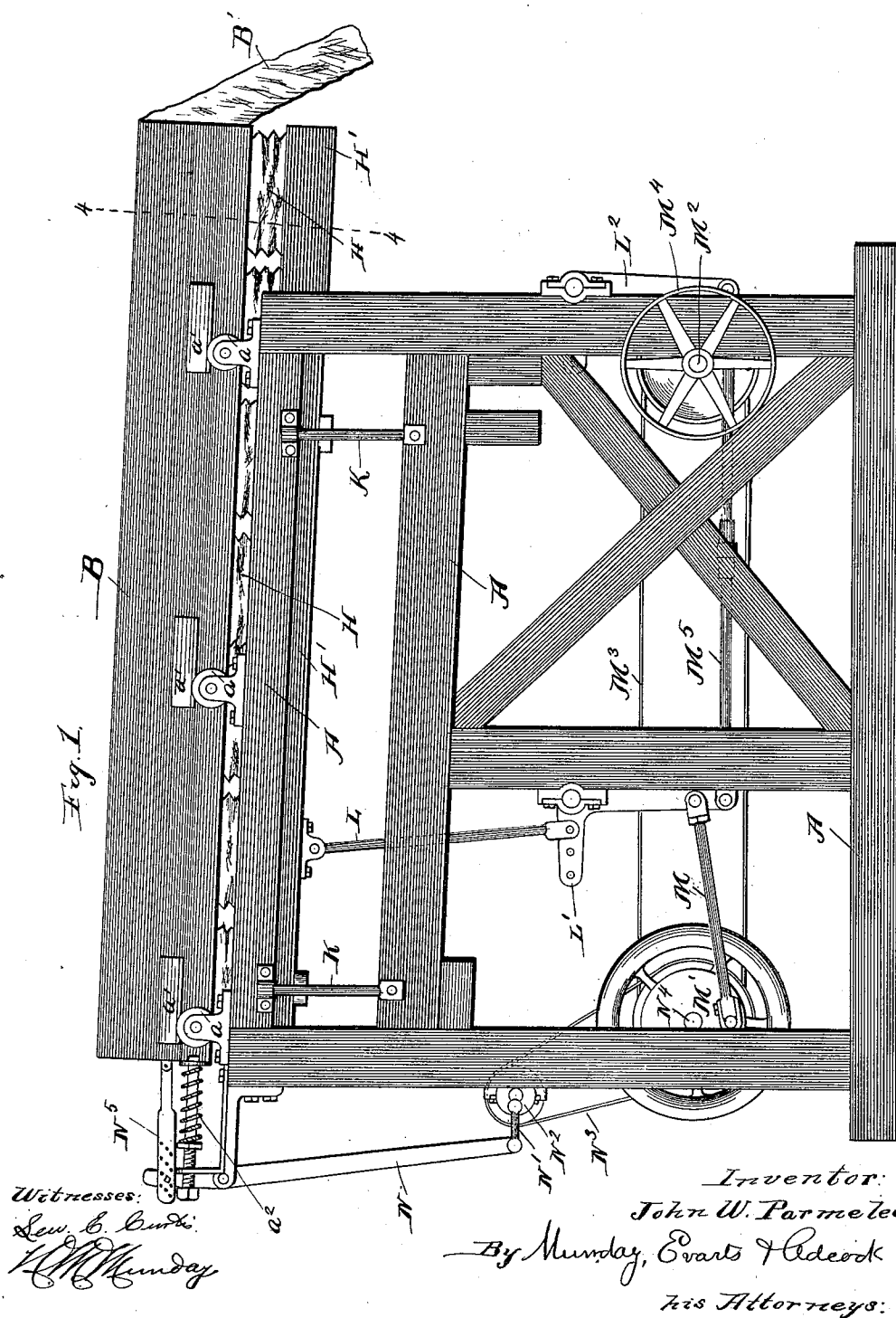
(No Model.)

3 Sheets—Sheet 1.

J. W. PARMELEE.
CONCENTRATOR.

No. 373,600.

Patented Nov. 22, 1887.



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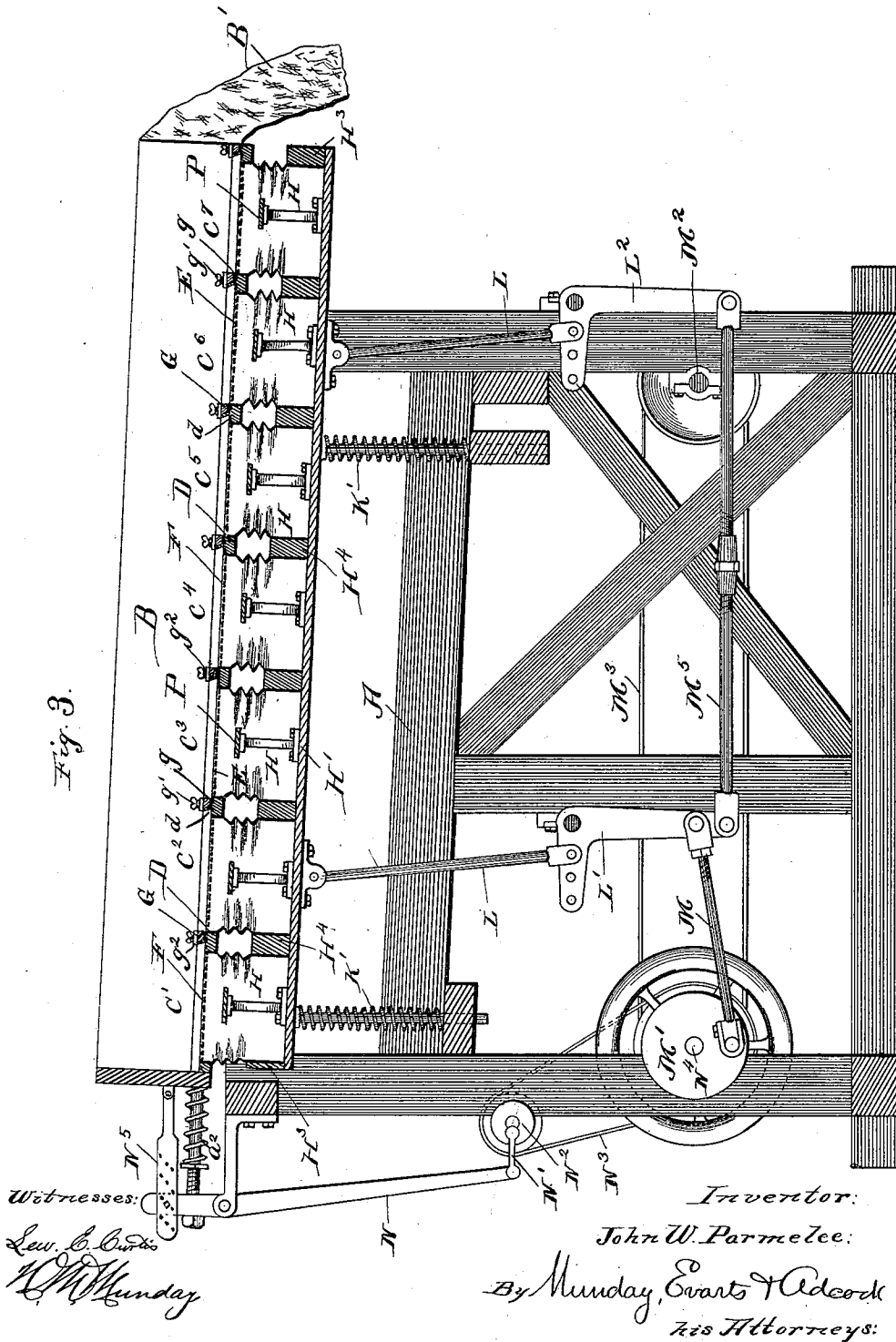
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Witnesses:

Lew. C. Curtis

W. M. Munday

Inventor:

John W. Parmelee.

By Munday, Evans & Adcock
his Attorneys:

his Attorneys:

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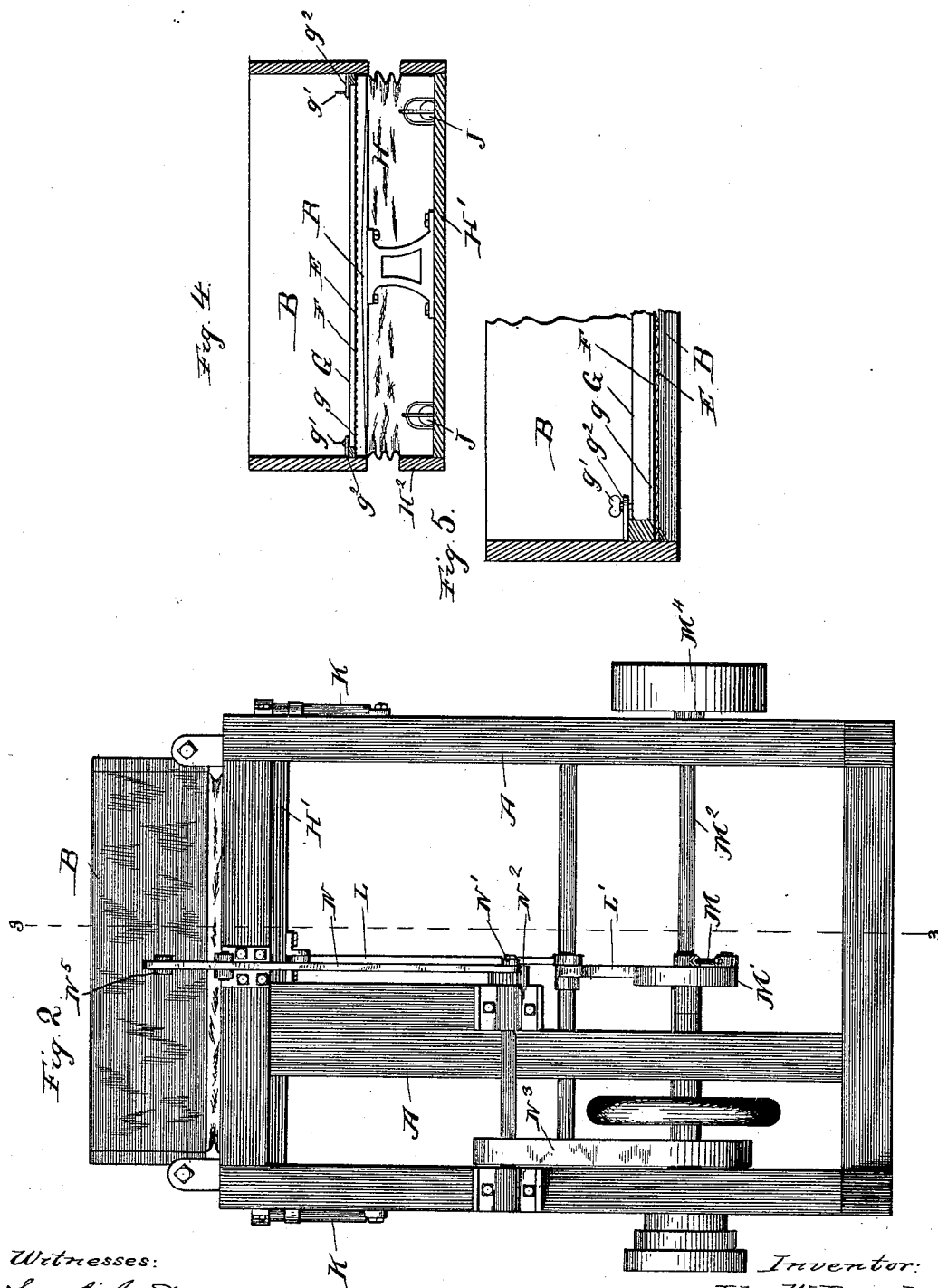
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UNITED STATES PATENT OFFICE.

JOHN W. PARMELEE, OF ENGLEWOOD, ILLINOIS.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 373,600, dated November 22, 1887.

Application filed June 15, 1887. Serial No. 241,341. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. PARMELEE, a citizen of the United States, residing in Englewood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Concentrators, of which the following is a specification.

This invention relates to a concentrator which employs a vibrating chute in conjunction with blasts of air; and the improvement consists in the construction of the chute and the method of delivering the air to the material to be treated.

The invention is specially adapted to the treatment of gold-bearing earths which have been previously disintegrated and dried.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a side elevation of my improved concentrator. Fig. 2 is an end view of the same. Fig. 3 is a longitudinal vertical section on line 3 3 of Fig. 2. Fig. 4 is a cross section on line 4 4 of Fig. 1, and Fig. 5 is a detail sectional view of a portion of the chute upon a somewhat larger scale.

In said drawings, A represents a suitable frame-work, to and upon which the moving parts of the machine are connected and supported.

B is an inclined chute, into which the material to be treated is fed at the upper end. This chute is open at the lower end for the tailings to be discharged, and at this point may be furnished with a flexible apron, B', to cause the tailings to fall clear of the machine. The bottom of said chute B is divided into a series of pockets or compartments, C' C' C' C' C' C', by a series of bars, D. Above these bars I place a bottom, E, of wire-netting, extending the whole width and length of the chute and suitably secured thereto.

Upon the wire-netting E, I place a covering, F, of firm fabric, pervious to air, which may be closely-woven linen duck canvas made of hard-spun filament or very fine wire-cloth.

Above the cross-bars D, I place a series of removable clamping-bars, G, preferably furnished with india-rubber or other elastic pads *g* on their under surface where in contact with the canvas. These pads prevent the penetration of the fine gold beneath the riffles. Set-

screws *g'*, through an overset, *g''*, at each end of each bar, bear down upon the bars and compress them upon the canvas, holding the bars in place, so that they may be readily removed, and permitting the same to be tightened as much as necessary. The canvas and wire-netting are thus held at each cross-bar between the said bar G and the underlying bar D. The underlying bars D are wider than the clamping-bars G, so that a narrow space, *d*, of the canvas, an inch or two in width, is protected by the bar D from the air-blast, presently to be described. The object is to keep the blast from this part of the pocket, so that the metal or concentrations lying at this point may not be thrown over the bar G in case the compartment is nearly empty.

Underneath the chute I place a series of separate bellows, H H, &c., one for each pocket or compartment. A solid bottom, H', is furnished with side and end pieces, H² H³, and partitions H', forming a shallow box-like structure. Secured to this are the seven bellows-bags H, connected at their upper end with the chute B and at their lower end with said bottom H'. One or more ball-valves, J, in said bottom, at each of the bellows-bags, serve to admit air into the bellows. Of course any other well-known form of valve may be used. This bellows-frame is mounted upon the guides K K in such manner as to permit an up-and-down movement being given to it, and in order to counterbalance its weight as far as possible I prefer to suspend it upon the springs K'. Two pitman-rods, L L, adjustably connected to two bell-crank levers, L' L', serve to vibrate the bellows-frame in a vertical direction rapidly. The bell-crank L' is connected at its lower end by the pitman M to the crank-wheel M', which receives its motion from the driving-shaft M² through a belt, M³, and suitable pulleys. The chute is vibrated horizontally in the direction of its length by means of the lever N, pitman N', and crank-wheel N², receiving motion by the belt N³ from the counter-shaft N⁴ by suitable pulleys.

In order that the chute may be easily vibrated, I mount on the frame of the machine rollers *a*, and provide the chute with short track-pieces *a'*, which rest upon the rollers and support the weight of the chute. Balance

ing-springs a^2 are provided to steady the motion. The lever N is connected to the chute by means of the pitman-bar N⁵. Under each compartment, C' C², &c., I place a tappet-bar, P, supported from the bellows-frame and extending nearly the entire length of the compartment. The upper surface of this bar is placed at such a height that when the bellows-frame is at the uppermost portion of its stroke the upper surface of the tappet-bar will gently strike the wire-netting and superimposed pervious canvas bottom, the purpose being to give the material undergoing treatment an upward and longitudinal movement at each blast of air. The bottom of the chute is sufficiently flexible to permit this impulse to be felt through it. The longitudinal vibration of the chute is much more rapid than the vertical movement of the tappet-bars. The consequence is that from the moment that the tappets on their upward movement come in contact with the under surface of the chute-bottom, during the short interval that they are flexing said bottom upward and until they leave the bottom on their downward movement, the chute-bottom will rub across the tappets in one direction or the other, according to the relative position of the actuating mechanisms. The result of this peculiar impact of the chute-bottom and tappets is that the material in the chute will ebb and flow instead of moving steadily toward the lower end, thus thoroughly working the heavier particles downward through the mass.

The operation is as follows: Power is applied to the driving-pulley M⁴ and communicated by the belt M³ to the shaft N⁴. From this shaft the pitman M and the connecting-rod M⁵ vibrate the bell-cranks L' L², which in turn give motion to the vertical pitman-rods L L and vibrate vertically with a parallel motion the bellows-frame, causing the bellows to operate. I prefer a speed for the bellows of about two hundred and fifty vibrations per minute. The shaft N⁴ in turn, by means of belt N³, gives motion, through the pitman N', lever N, and pitman-bar N⁵, to the chute B, vibrating the same rapidly in the direction of its length with a short stroke. I prefer that the rate of vibration of the chute should be about twice as rapid as the vibration of the bellows-frame—i.e., about five hundred strokes per minute. It should not be exactly twice as rapid, as the same relative positions of the tappets and chute should not recur so often as upon every other reciprocation. The material containing the metal to be concentrated and separated is thrown into the upper end of the rapidly-vibrating chute and rests upon the canvas bottom of the same. Of course it must be in a dry condition and as completely disintegrated as possible, for this machine is not intended to disintegrate the ore. The vibration of the chute shakes the material rapidly, while at the same time blasts of air are sent through the canvas bottom of each compartment by the several bellows, and at each

stroke of the bellows an upward and wave-like impulse is given to the flexible pervious bottom and its superimposed material by the tappet-bars placed beneath each compartment upon the bellows-frame. I find that by this operation upon the material it is caused to pass down through the chute and out over the tail thereof with great rapidity, in exact proportion as it is fed into the upper end of the chute, making it a matter of indifference in this machine whether the material to be treated be fed fast or slow, within reasonable limits. The material will pass out over the end of the chute more rapidly at the moments when the impact of the tappets is such as to throw the material toward the lower end than it will when the relation of the tappets is such as to retard the material or drive it temporarily toward the upper end of the chute. At times, during what may be called the "ebb" of the material, the discharge over the lower end of the chute will cease. The lightest part of the mass of loose disintegrated material fed into the machine comes immediately to the top, while the heaviest part sinks immediately to the bottom. That portion having the greatest specific gravity will be found immediately back of the riffle-bars G, or a little below the middles of the pockets of the chute. Thus all of the gold, if gold is being treated, will be found to have lodged back of the riffle-bars in each pocket or compartment.

When the machine is running full of dry material, the entire mass seems to be in a state of flotation, and where a heavy body, like a small iron tack or a flat coin, is thrown upon the surface of the mass it immediately sinks to the bottom as though it were thrown into a liquid, while on the other hand, if a small piece of cork or paper or other light substance be plunged into the mass, it immediately floats to the top. Gold, even in a very fine state of subdivision or powder and when present in only small percentage, is separated with great ease and certainty from the material treated. When the machine has been run for a suitable length of time, depending upon the richness of the material, I clean up, to gather the gold or other metal, by removing all of the riffle-bars except the last one or two, and, finally, all except the last one, and running the machine at a slower rate of speed until almost all the worthless earth is finally shaken over the tail, leaving the metal behind the last riffle-bar, together with whatever impurities are of sufficient specific gravity to have remained in company with it.

The purpose of having a number of separate disconnected bellows or sources of air-supply instead of a single one or a single air-pressure chamber is in order that a greater uniformity of air-pressure under the whole bottom may be attained. In a first experimental machine I put a single continuous pressure-chamber beneath the entire bottom, and found that this necessitated a very careful attention to the feed of the machine, as the air would always

seek the easiest road out, and consequently the blast through the canvas would always be greatest at that portion of the chute where there was the least material, the pressure thus being perhaps too great in force at some points, while insufficient or wholly lacking at other points. This necessitated a careful watching to distribute by raking the earth evenly over the bottom. A separate air-chamber or source of supply to each pocket obviates this difficulty by confining the difference in blast to difference in thickness of layer that may exist within the limits of each pocket or compartment.

15 I claim—

1. In a concentrator, the combination of an undivided vibratory chute having a bottom pervious to air, air-blast chambers beneath the chute, from which air may be forced through its bottom, mechanism connected with the chute for reciprocating the same rapidly in a substantially horizontal plane, tappet-bars mounted beneath the bottom of the vibratory chute and vertically movable toward and from the same, and mechanism connected with the tappets for reciprocating the same more slowly, whereby the bottom of the chute will rub upon the tappets and an alternate ebb and flow of the material be produced, substantially as and for the purpose specified.

2. In a concentrator, the combination of an inclined vibratory chute having a bottom pervious to air, air-blast chambers beneath the chute and having a solid reciprocatory bottom, tappet-bars mounted on said bottom, springs connected with the latter for forcing it upward, and mechanism for vibrating the chute and reciprocating the bottom, whereby the reciprocation of said bottom will produce the ebb and flow of the material, substantially as specified.

3. In a concentrator, the combination of an inclined vibratory chute having a bottom pervious to air, air-blast chambers beneath the chute and having a solid reciprocatory bottom, tappet-bars mounted on said bottom, and

mechanism for vibrating the chute and reciprocating the bottom, whereby the reciprocation of said bottom will produce the ebb and flow of the material, substantially as specified.

4. In a concentrator, the combination of an inclined vibratory chute having a bottom pervious to air, air-blast chambers beneath the chute and having a solid bottom, a transverse shaft, N^2 , a lever connected with said shaft by one arm and with the vibratory chute by the other, transverse rock-shafts, radial arms carried thereby, rods connected with said arms and with the solid bottom, and connecting-rods between the transverse shaft N^2 and said rock-shafts for oscillating the latter, substantially as specified.

5. In a concentrator, the combination of an inclined vibratory chute having a bottom pervious to air, air-blast chambers beneath the chute from which air may be forced through its bottom, mechanism for vibrating the chute, vertically-reciprocatory tappet-bars mounted beneath the bottom of the chute, adjustable rods L , for reciprocating the tappets vertically, whereby the height of the stroke of the tappets may be regulated, and mechanism for actuating said rods, substantially as specified.

6. In a concentrator, the combination of an inclined vibratory chute having a bottom pervious to air, an air-blast mechanism and ducts extending to the under side of the pervious bottom for forcing air upward through the same, mechanism for horizontally vibrating the chute, vertically-movable tappet-bars beneath the chute, and mechanism connected with the tappets for striking them intermittently against the pervious bottom of the vibrating chute to produce an ebb and flow of the material, substantially as set forth.

Signed at Chicago, Illinois, this 9th day of June, 1887.

J. W. PARMELEE.

Witnesses:

H. M. MUNDAY,
EDMUND ADCOCK.