No. 750,367. PATENTED JAN. 26, 1904.

E. M. JAHRAUS.

ORE CONCENTRATOR.

APPLICATION FILED NOV. 8, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

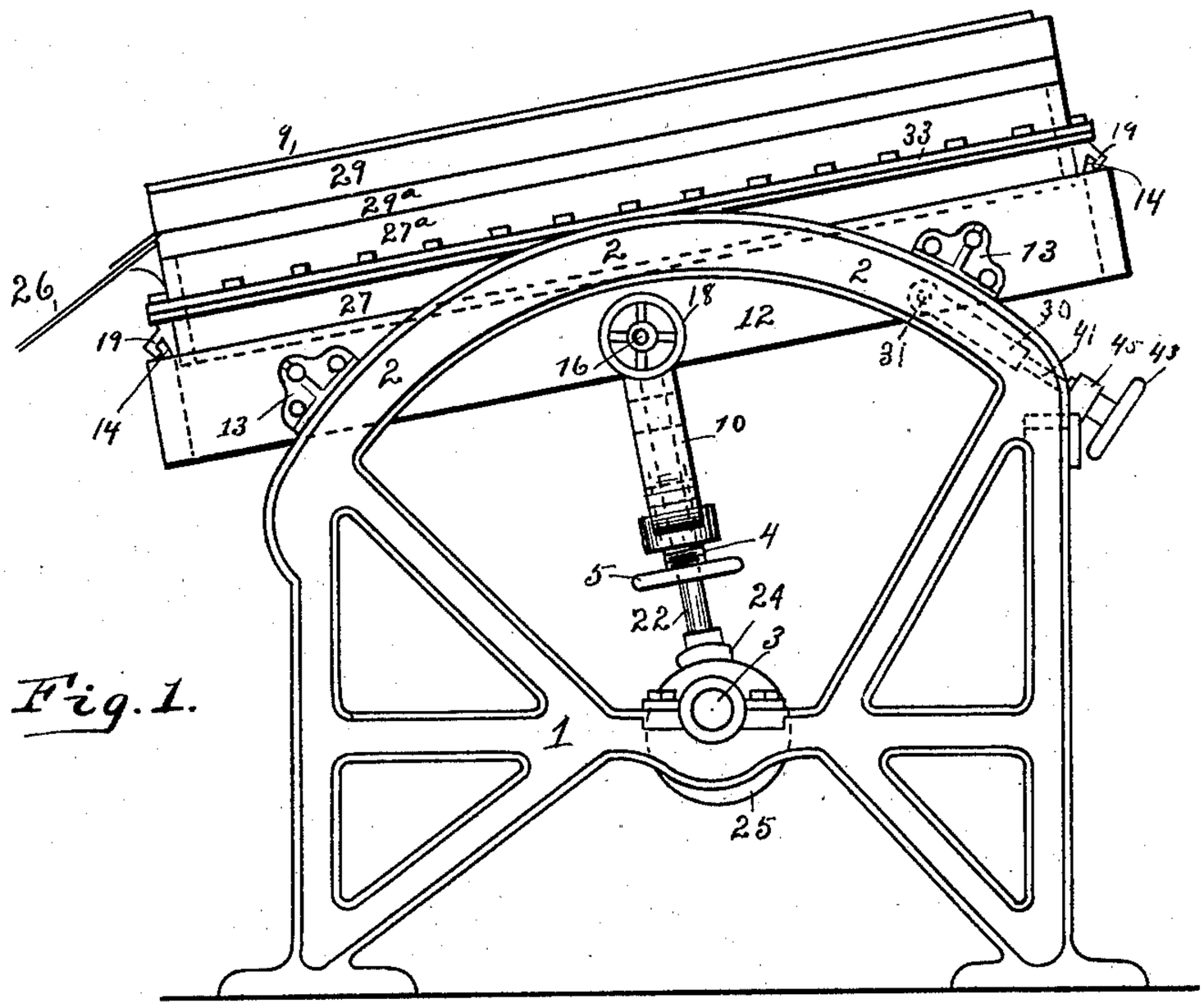


Fig. 1.

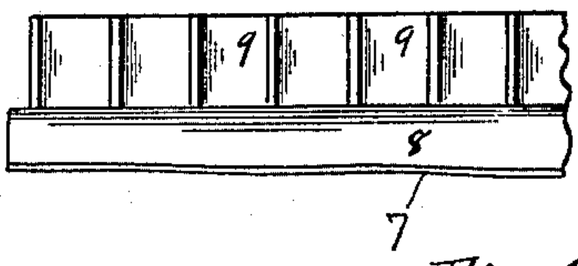
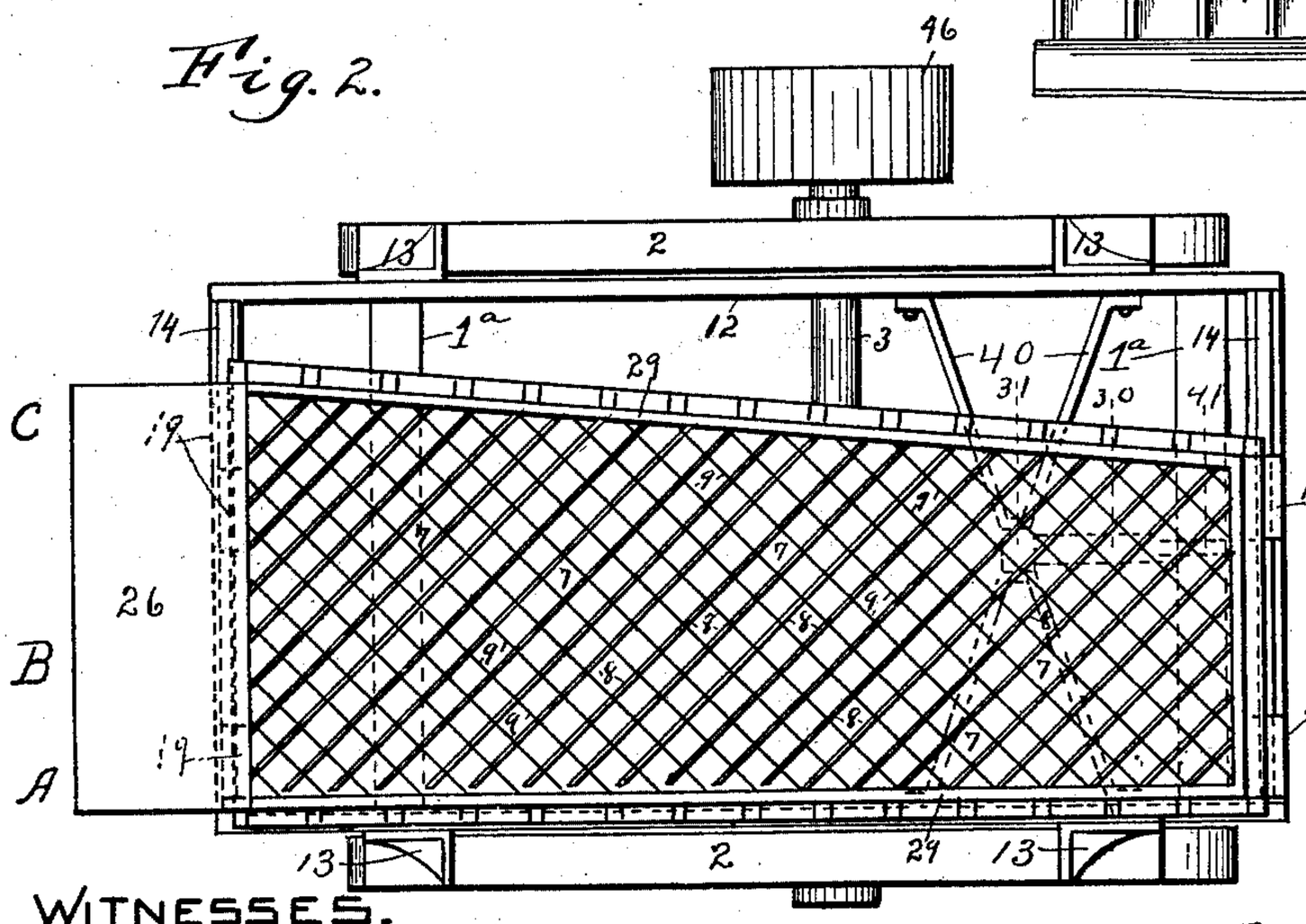


Fig. 11.

Fig. 2.



WITNESSES,
Matthew Sibler
C. M. Theobald.

E. M. Jahraus,
INVENTOR,
By R. J. McCarty,
His ATTORNEY

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 10.

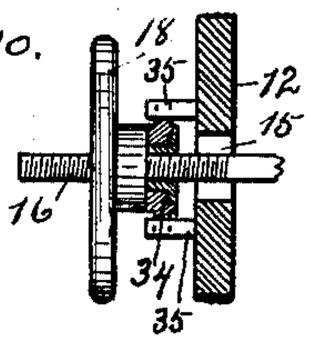
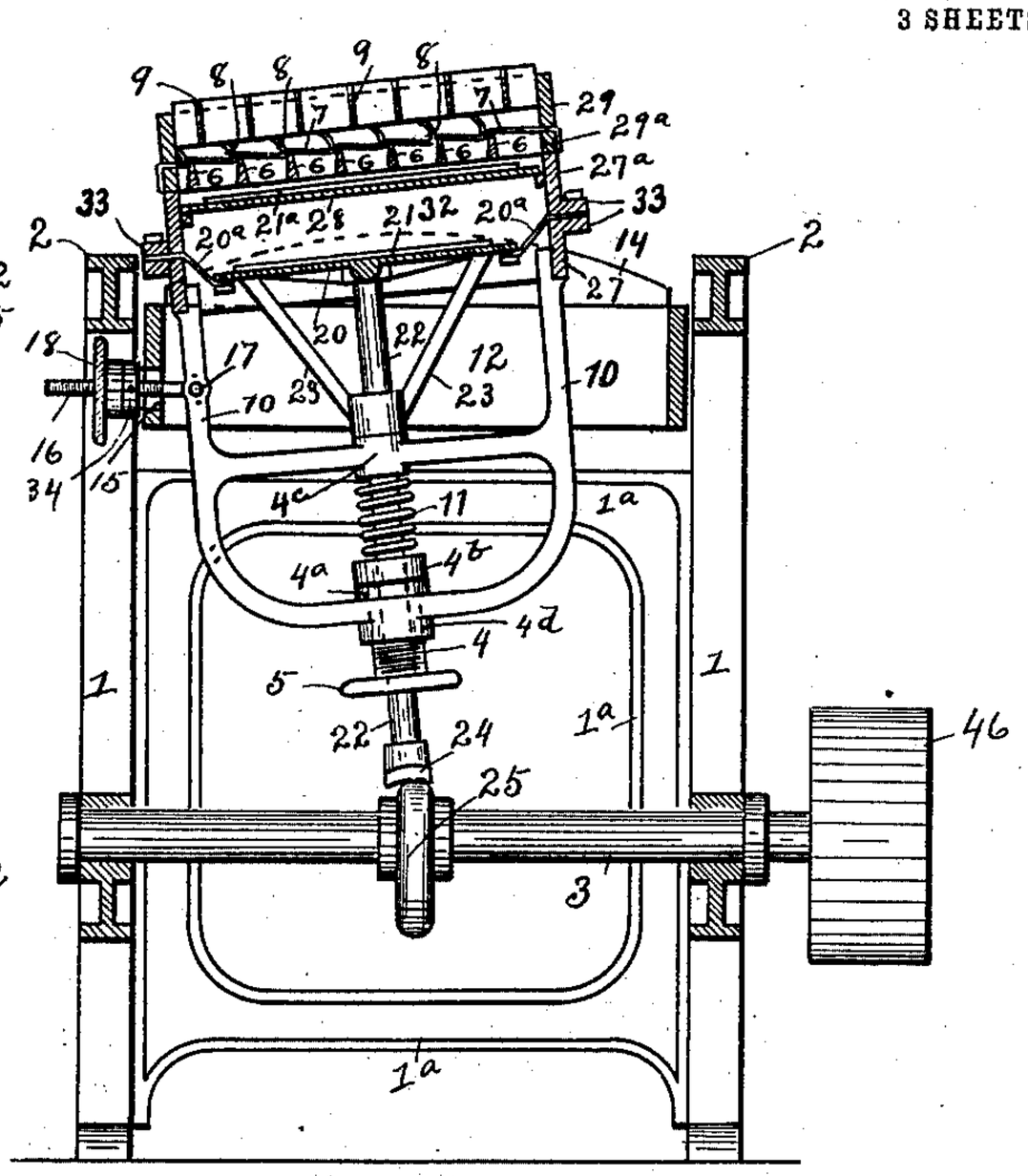


Fig. 3.



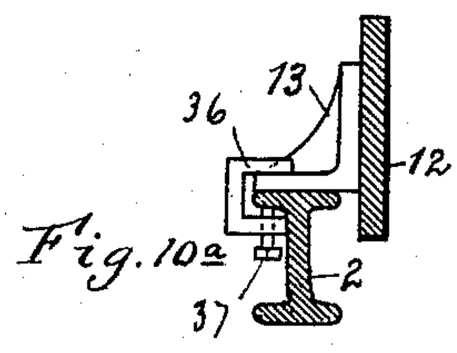
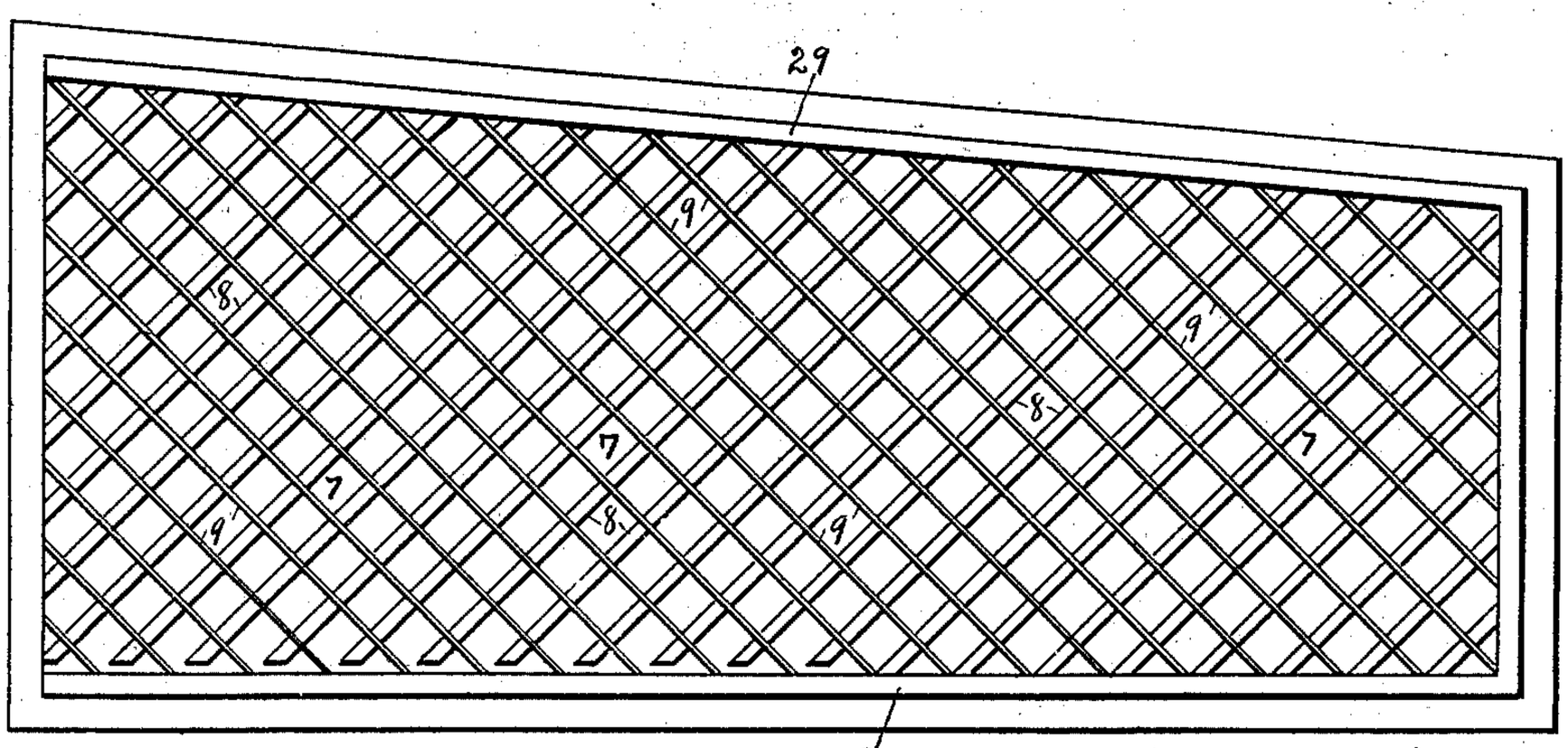


Fig. 10a

Fig. 4



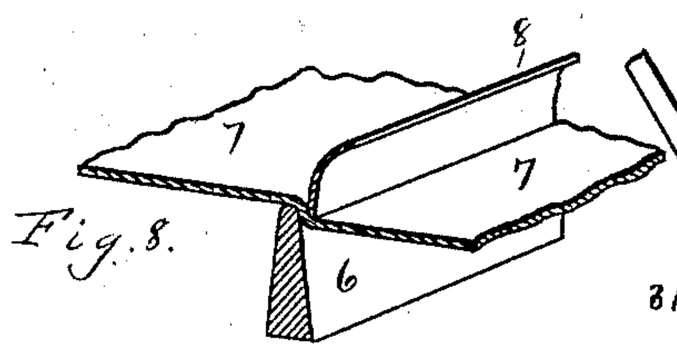


Fig. 8.

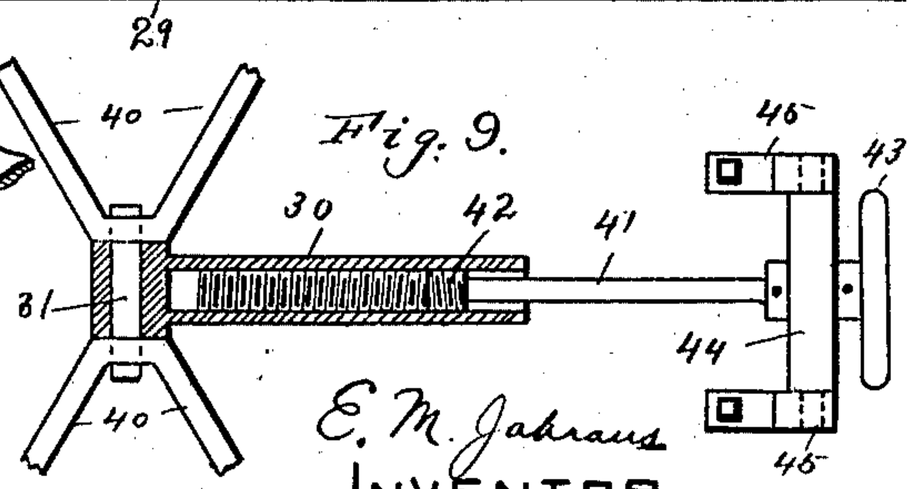


Fig. 9.

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ORE CONCENTRATOR.

APPLICATION FILED NOV. 8, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

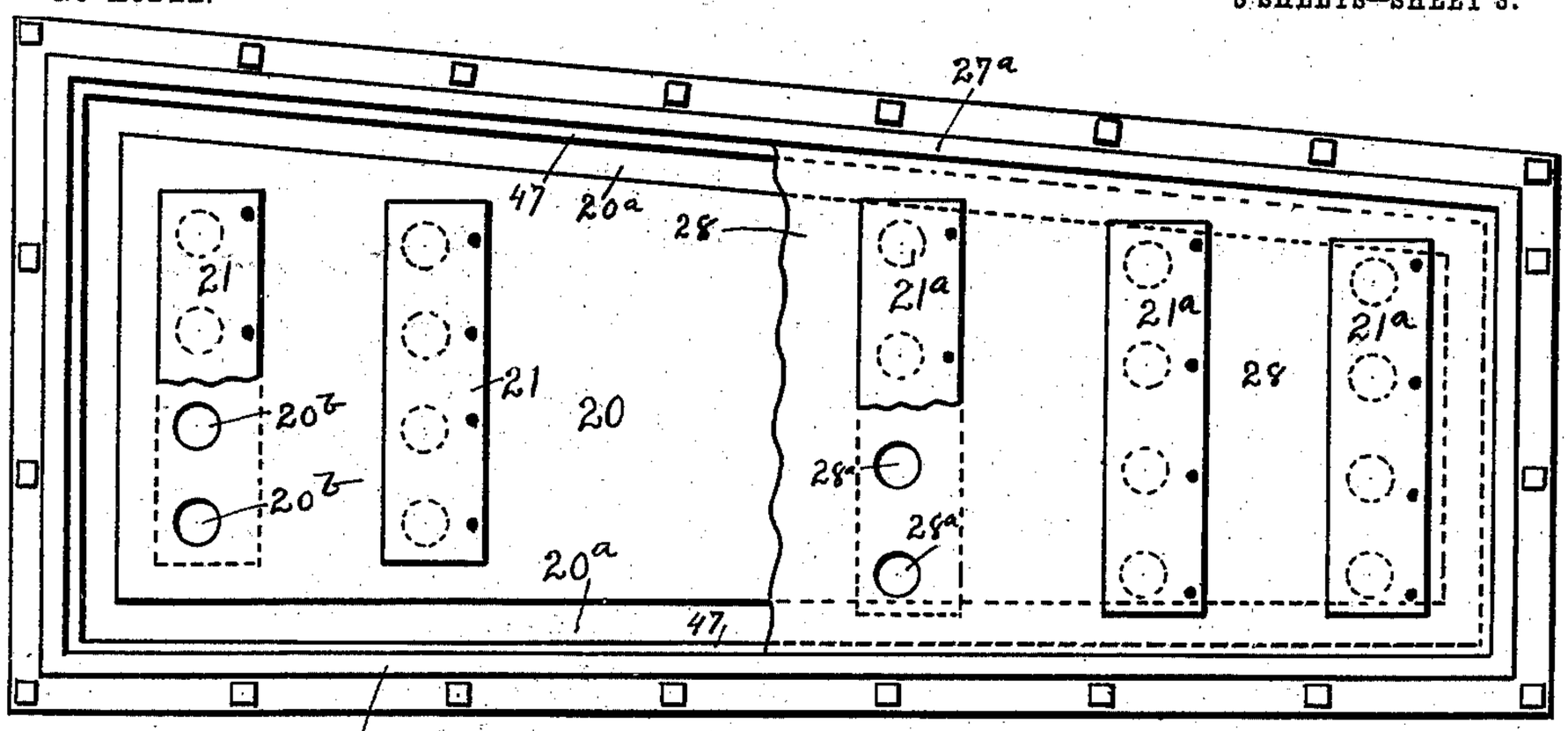

Fig. 5.

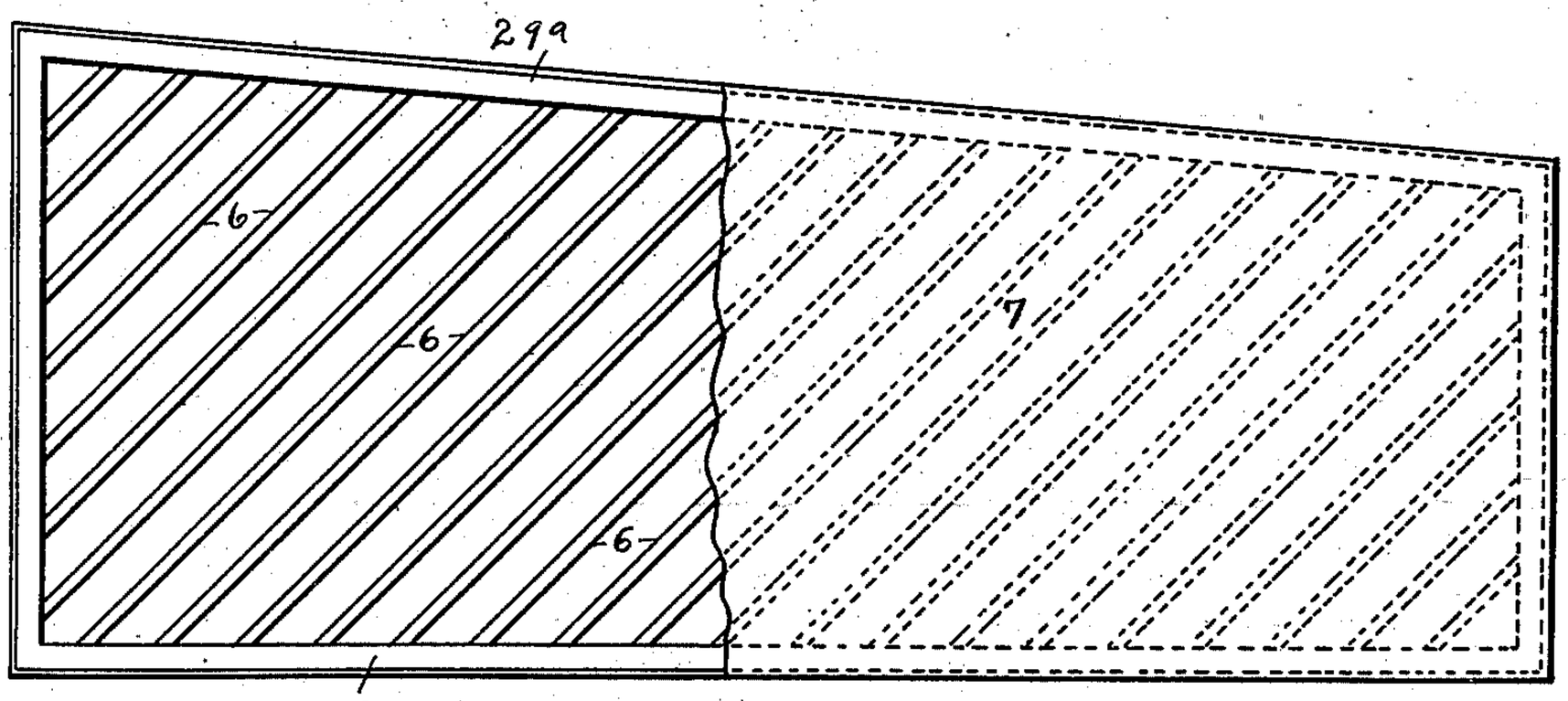

Fig. 6.

Discharge End. Feed End

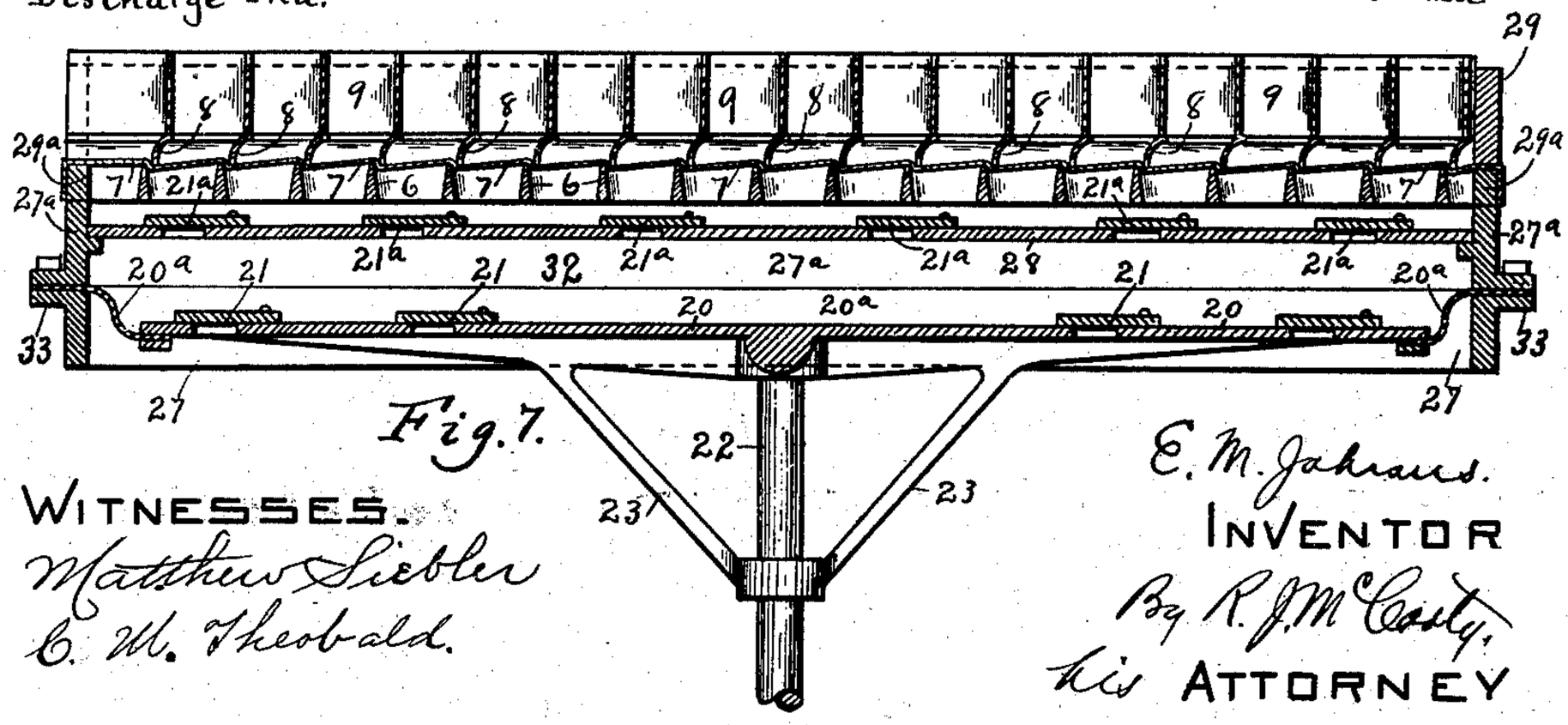

Fig. 7.

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No. 750,367. Patented January 26, 1904.

UNITED STATES PATENT OFFICE.

EDWIN M. JAHRAUS, OF DAYTON, OHIO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 750,367, dated January 26, 1904.

Application filed November 8, 1902. Serial No. 130,487. (No model.)

To all whom it may concern:

Be it known that I, EDWIN M. JAHRAUS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, 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 characters of reference marked thereon, which form a part of this specification.

This invention relates to ore-concentrators, and has for its object to provide a structure wherein the ore-bed may be readily adjusted, both longitudinally and transversely, without affecting the distribution of the air-blast or the continuity of its operation.

The invention has for a further object the improvement of certain structural features hereinafter referred to.

To these ends the invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

Preceding a detail description of my invention, reference is made to the accompanying drawings, of which—

Figure 1 is a side elevation of my improved ore-concentrator. Fig. 2 is a top plan view of the same. Fig. 3 is a transverse sectional view on either side of the pivotal support, as shown in Fig. 1. Fig. 4 is a plan view of the skimmer and riffles detached from the machine. Fig. 5 is a top plan view of the air-box showing the valve-diaphragm, a portion of which is broken away to expose the piston lying below said diaphragm. Fig. 6 is a top plan view of the grid or grating with a portion of the cloth thereon. Fig. 7 is a vertical longitudinal mid-sectional elevation of the ore-box and the air-box. Fig. 8 is a detail perspective view of a portion of the riffles, grating, and the cloth constituting the ore-bed. Fig. 9 is a detail view of the adjusting devices through which the longitudinal adjustments of the ore-bed are obtained. Fig. 10 is a detail of the adjusting device by which the transverse inclination of the ore-bed is obtained. Fig. 10[a] is a detail cross-sectional view of one side of the rectangular supporting-frame and the adjacent segmental track. Fig. 11 is a detail showing one of the riffle-bars of modified form.

Throughout the specification similar reference characters indicate corresponding parts.

Referring to Figs. 1 and 3, 1 designates two side frames of similar construction and which terminate in segmental tracks 2 2, upon which the ore-bed is given its longitudinal inclination. These tracks are arcs of a circle having for their common centers the axis of the driving-shaft 3. From Fig. 1 it will be noted that the centers of said tracks are on one side of a line extending perpendicularly from driving-shaft 3. This is a desirable structural feature, as thereby the proper longitudinal inclination of the ore-bed is obtained. The side frames 1 1 are connected by end frames 1[a] 1[a], the whole constituting the main framework of the machine, which is comparatively light and substantial.

12 designates a rectangular frame placed between the side frames 1 1 and supported upon the segmental tracks 2 2 by means of lugs 13, which are secured to opposite sides of said frame. (See Figs. 1 and 10[a].) The ends of the frame 12 are provided with curved surfaces or tracks 14 14, (see Figs. 2 and 3,) which are engaged by lugs 19 on the ends of the air-box and constitute the support for said air-box as well as the ore-box. The lugs 19 are shifted on the tracks 14 14, according to the extent of lateral or transverse inclination given the ore-bed by the adjusting devices hereinafter specified.

10 designates a yoke, which is connected at its upper end to the air-box, consisting of two sections 27 27[a], which are united by flanges 33. This yoke 10 is a support for the piston 20 and the piston-rod 22.

The piston forms the bottom closure of the air-chamber 32 and has the requisite number of valve-openings 20[b], which are covered by a series of flap-valves 21. These valves are opened by atmospheric pressure in the downward movements of the piston and admit air to the chamber 32. The air-chamber 32

around the edges of the piston is sealed from the atmosphere by an impermeable and flexible closure 20^a, which is secured to the edges of the piston and between the flanges 33. Owing to the flexible character of the closure 20^a, which may be leather, rubber cloth, or any suitable material, the free reciprocable movements of the piston are not retarded. The piston is connected at its center to the upper end of rod 22 and also has brace connections with the middle portion of said piston-rod through arms 23. The said piston-rod passes loosely through hubs 4^c 4^d of the yoke 10 and has upon its lower end a shoe 24, which is adjustable in the path of a cam 25, fixed to the main shaft 3, the latter having driving-pulley 46. A portion of said piston-rod is inclosed by a coil-spring 11, the ends of which are confined between the hub 4^c and a collar 4^b, the latter made fast to the piston-rod 22. The function of the spring 11 is to return the piston to its lower position through the pressure due to the expansion of said spring when the lowest point of the cam moves below the shoe 24. The piston-rod is adjusted longitudinally for the purpose of increasing or decreasing its throw from the cam 25 by means of an exteriorly-screw-threaded sleeve 4, having a head 4^a, which lies just below the fixed collar 4^b. The said sleeve 4 screws into the hub 4^d of the yoke, and through it the piston 22 passes loosely. The sleeve 4 has a hand-wheel 5, by which it is turned. The collar 4^b being fixed to the piston-rod, the sleeve 4 in its upper adjustment will cause the head 4^b thereof to come in contact with said collar and will thereby elevate the piston-rod to the desired extent to place the shoe 24 in a proper position relatively to the cam 25.

28 designates a valve-diaphragm mounted on an interior ledge in the upper portion of the air-box and forming the top closure of the air-chamber 32. The said diaphragm is provided with a suitable number of valve-openings 28^a, which are closed by flap-valves 21^a. In the upward movements of the piston the valves 21^a in the diaphragm are opened by the compression of the air between the piston and said diaphragm, and the air is discharged through said valves against the under side of a cloth 7, hereinafter again referred to. As before stated, the downward movements of the piston opens the piston-valves 21 and causes the air-chamber 32 to fill, and it may be further added that these downward movements of the piston also close the diaphragm-valves 21^a. Placed above the diaphragm 28 is a grid or grating consisting of a series of diagonal bars 6, arranged in parallel relation and having their ends secured to a marginal frame 29^a, which is secured to the top of the air-box. These grate-bars taper on both sides from top to bottom. Consequently they are wider at their base.

7 designates a permeable cloth, hereinbefore referred to, of suitable texture and arranged above and supported upon the grating 6, with its edges secured in a proper manner to the grating-frame 29^a. This cloth and the grate-bars form the ore-bed, above which is arranged a series of riffle-bars 8, the diagonal positions of which are identical with those of the grate-bars. These riefffl-bars are preferably constructed of sheet metal, with a curved or rounded form in cross-section, substantially as shown in Fig. 8. It will be noted from this view of the drawings that the lower edges of said riffle-bars are out of alinement with the upper curved edges. These upper curvatures are uniform in all of said riffle-bars and form a sort of groove or longitudinal channel throughout the lengths of said riffles, in which the heavier particles of the ore—for example, the galena or lead—travel to one side of the ore-bed. The tailings being of lighter specific gravity are carried to the opposite side of said ore-bed. The upper curved edges of the riffle-bars provide barriers which prevent these heavier metallic portions of the ore from riding over said riffles in the operation of the apparatus. The fabric 7 is continuous and is stretched taut in the frame 29^a, and the lower edge of each riffle-bar extends below the plane of the top of the corresponding grate-bar immediately adjacent thereto, so that the fabric is strained over the top or upper edge of each grate-bar and under the lower edge of each riffle-bar. This makes a tight joint between the fabric and riffle-bars, which will prevent the material from passing under said bars, and the fabric being flexible and under tension will adjust itself to any variations in the planes of the edges of the bars over and under which it is stretched.

In Fig. 11 I have shown a somewhat modified form of riffle-bar which consists in making the lower edge thereof on a taper from end to end or from an intermediate point to the end and leaving the top edge of said riffle straight or level, so that the skimmer-bars may set in a level position on said riffle-bars. The utility of this construction consists in gradually narrowing the distance between a portion of the fabric 7 and the skimmer-bars. For example, the portions of the spaces between the riffle-bars at the discharge ends of the ore-bed will be narrowed gradually. The heavier particles of the ore crowding within these spaces will be acted upon by the skimmer-bars and more thoroughly cleansed. Secured above the grate-frame 29^a is a rectangular frame 29 of similar dimensions and within which is arranged the said riffle-bars 8 and the portion of the apparatus termed the "skimmer."

The skimmer comprises a series of diagonally-disposed bars 9, consisting of thin narrow strips of sheet metal arranged at right angles to the riffle-bars 8 and having their lower

edges in contact throughout with the upper curved edges of said riffle-bars, as shown in Fig. 7. The ore-bed is given the proper longitudinal inclination, as in Fig. 1, by means of adjusting devices shown in detail in Figs. 2 and 9 and consisting of a tubular member 30, having its inner end supported on a pivot-pin 31, mounted between brace-arms 40, which are secured to the interior sides of the frame 12. 41 is an adjusting-rod supported and turnable in a keeper 44, the ends of which are journaled in brackets 45, secured in any suitable manner to the side frames 1 1. This rod 41 has a head 42, which screws in the tube 30 by turning the hand-wheel 43. By this means the ore-box is given the exact endwise or longitudinal inclination desired, as the adjusting devices above described permit of a nicety of adjustment. It will be understood that in turning the adjusting-rod 41 the shaft 3 acts as a center around which the piston-rod moves, and the lugs 13, which form the supporting connections between the ore-box as a whole and the side frames 1 1, will be shifted on the segment-tracks 2 2, depending upon the degree of endwise inclination to be given the ore-bed. The degree of such inclination varies with the nature of the ore to be treated. In practice the inclination of the ore-bed is considerable, and for this reason the centers of the tracks 2 2, as hereinbefore stated, are not in a line perpendicular with the shaft 3, but are on one side of such perpendicular line. This arrangement places one end of each of said tracks in a lower plane than the other end of each of said tracks. The ore is fed to the ore-box at the elevated end of said box, as seen in Figs. 1 and 6. It will therefore be understood that the longitudinal inclination is for the purpose of permitting the separated constituents of the ore—namely, the reclaimed mineral, such, for example, as galena or lead, the tailings, and the middlings—to gravitate to the runway 26, which is attached to the lower end of the apparatus. The lateral or transverse inclination (shown in Fig. 3) is obtained through the adjusting-screw 16, which is pivoted to one side of the yoke 10 at 17 and passes through an opening 15 in a side of the frame 12 and is supported on the outside of said frame 12 in a pivot 34, which has its ends loosely mounted in brackets 35 35, projecting from the frame 12. (See Fig. 10.) The screw 16 has a hand-wheel 18, by which it is turned to impart the necessary transverse arc movement to the yoke and the ore-bed. The purpose of this transverse inclination of the ore-bed is to hasten or retard the movement of the heavier particles of the ore to one side of the ore-bed, depending upon the character of the ore treated. The center of curvature of the way 14 is such as to maintain the operative relations between the lower end of the piston-rod and the cam.

The operation of the concentrator is briefly as follows: The ore is fed to the apparatus at the feed end, as shown in Fig. 6, and finds lodgment upon the ore-bed, consisting of the cloth 7 between the skimmer-bars 9 and the riffles 8. The shaft 3 is given motion, causing the cam 25 to rotate at the proper speed to impart to the piston 20 a rapidly-reciprocating movement, during which the ore-bed is given a series of rapid pulsations. These pulsations keep the ore moving or in a constant state of agitation, causing it to separate and gravitate to the lower end of the inclined bed. The heavier particles—for example, the galena metal, lead, or other heavier metal—will lie in a lower strata adjacent to the cloth or bed 7 and between the riffles 8 and will gravitate through the channels formed between said riffles to the lower side of the inclined bed, as shown in Fig. 3, and thence to the lower end of said inclined bed, as in Fig. 1, where it will discharge to the run-board 26 at point A. The middlings having the next greatest specific gravity will pass over the riffles and between the skimmer-bars and escape or discharge to the run-board at B. The tailings being of the least specific gravity will pass over the riffles and be conducted by the skimmer to the run-board at point C. If the nature of the ore being treated is such that the crosswise or transverse inclination of the ore-bed is required to be the reverse of that shown in Fig. 3 or to be less of an inclination than that shown in said figure, such adjustment may be readily obtained by means of the adjusting-screw 16.

It will be observed that the air-box is adjusted along with the ore-bed, which forms the top thereof, so that the supply of air to the ore-bed is always the same and its distribution equal throughout the area thereof, whatever the position of these parts may be. In furtherance of this the operating mechanism of the air-box, comprising the piston and its rod and the associated parts, are adjusted along with the air-box, and the centers of curvature of the two sets of ways on which these adjustments are made are so located as to maintain the operative relations between the lower end of the piston-rod and the cam, so as to permit the adjustments to be effected while the machine is in operation and prevent any variation in the stroke from arising from the shifting of the position of the ore-bed.

Having described my invention, I claim—

1. In a concentrator, a main supporting-frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft, an inner supporting-frame adjustable on said tracks, an ore-bed and air-box carried by said inner frame, and operating mechanism between said air-box and shaft and adjustable along with the air-box, substantially as described.

2. In a concentrator, a main supporting-

frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft provided with a cam, an inner supporting-frame with means for support and adjustable on said tracks, an ore-bed and air-box carried by said inner frame, and an actuating-rod carried by the air-box and arranged in the path of the cam, substantially as described.

3. In a concentrator, a main supporting-frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft, an inner supporting-frame with means for support and adjustable on said tracks, an ore-bed and air-box carried by said inner frame, the ore-bed constituting the top of the air-box and the said bed and box being relatively fixed so as to maintain their relations throughout their adjustment, and operating mechanism between said air-box and shaft and adjustable along with the air-box, substantially as described.

4. In a concentrator, a main supporting-frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft, an inner supporting-frame with means for support and adjustable on said tracks, an ore-bed and air-box carried by said inner frame, the ore-bed constituting the top of the air-box and the said bed and box being relatively fixed so as to maintain their relations throughout their adjustment, a yoke secured to the air-box and provided with bearings and stroke-regulating means, and an operating-rod for the air-box mounted in said bearings and having its lower end in operative relation with the cam throughout the range of adjustment of the air-box and ore-bed, substantially as described.

5. In a concentrator, a main supporting-frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft, an inner supporting-frame with means for support and adjustable on said tracks and itself provided with segmental tracks at right angles to those of the main frame and having bearing-surfaces which are arcs of circles of a radius adapted to maintain the proper relative position of the parts of the air-box-operating mechanism, an ore-bed and air-box adjustable on the tracks of said inner frame, and operating mechanism between said air-box and shaft and adjustable along with the ore-box, substantially as described.

6. In a concentrator, a main supporting-frame having segmental tracks thereon, the bearing-surfaces of which are arcs of circles concentric with the main driving-shaft, a main driving-shaft provided with a cam, an inner supporting-frame with means for support and adjustable on said tracks and itself provided with segmental tracks located at right angles to those of the main supporting-frame, an ore-bed and air-box, adjustable in unison on the tracks of said inner frame, and an operating-rod for the air-box carried by and adjustable along with said box, the center of curvature of the tracks of the inner frame being such as to preserve the operative relations between said operating-rod and the cam, substantially as described.

7. In a concentrator, a main and an inner supporting-frame having segmental tracks at right angles to each other, a main driving-shaft, an ore-bed and air-box provided with operating mechanism and mounted on the tracks of the inner frame, and adjusting mechanism for moving the inner frame on the tracks of the outer frame and the air-box and ore-bed on the tracks of the inner frame while the machine is in operation, the curvatures of the segmental tracks being arranged to maintain operative contact between that portion of the operating mechanism carried by the main drive-shaft and that portion of the operating mechanism carried by the air-boxes, substantially as described.

8. In a concentrator, supporting-frames, an ore-bed and air-box adjustable in unison or curved tracks at right angles to each other, a main driving-shaft provided with a cam, a yoke secured to the air-box and provided with bearings and stroke-regulating means, and an operating-rod for the air-box mounted in said bearings and having its lower end in operative relation with the cam throughout the range of adjustment of the air-box and ore-bed, substantially as described.

9. In an ore-concentrator, an air-box, an ore-bed forming the top of the air-box and comprising parallel grate-bars, a continuous fabric stretched above said grate-bars, and riffle-bars located above the fabric, one adjacent to and parallel with each grate-bar, the lower edge of each riffle-bar extending below the plane of the top of the corresponding grate-bar immediately adjacent thereto, whereby the fabric is strained over the tops of the grate-bars and under the lower edges of the riffle-bars without being clamped between said bars, so that its tension is maintained throughout its entire body, substantially as described.

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

EDWIN M. JAHRAUS.

Witnesses:
R. J. McCarty,
J. J. Snider.