No. 641,359. Patented Jan. 16, 1900.

J. BARRON.

ORE SEPARATOR.

(Application filed Apr. 6, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

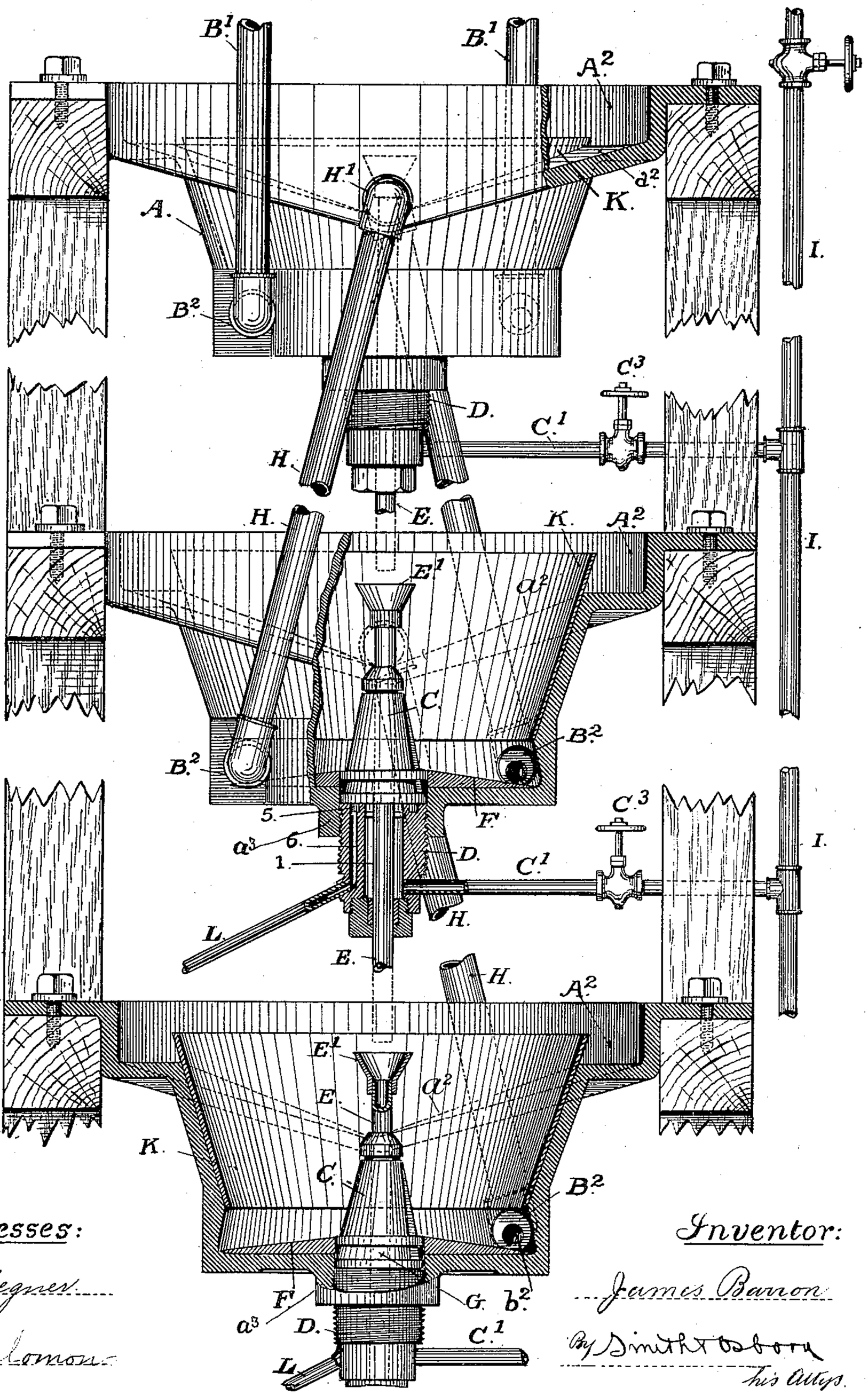


Fig. 2.

Fig. 3.

Witnesses:

M. Regner.

E. Salomon.

Inventor:

James Barron.

By Smith & Osborn

his Attys.

No. 641,359. Patented Jan. 16, 1900.

J. BARRON.

ORE SEPARATOR.

(Application filed Apr. 6, 1898.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

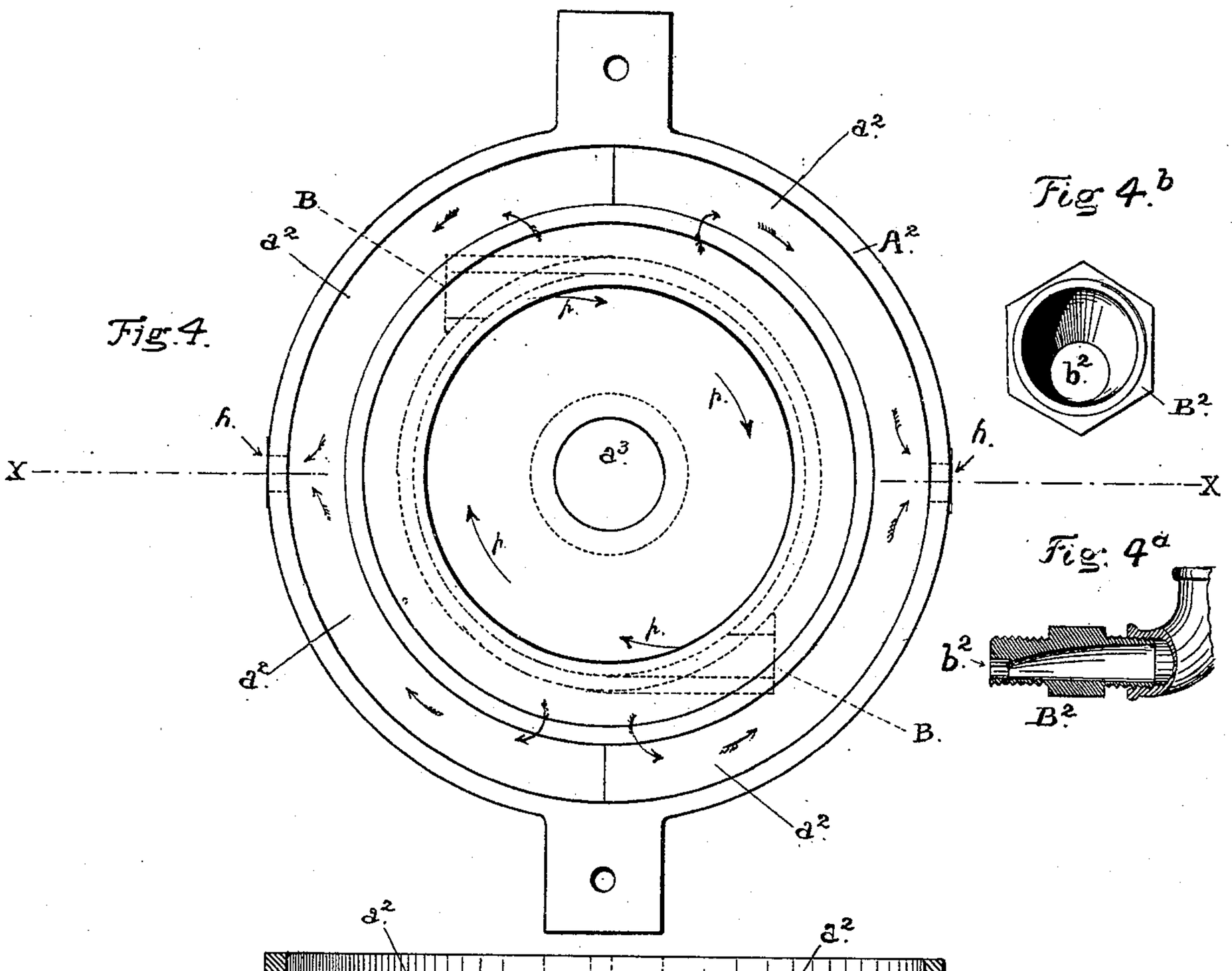


Fig. 4ᵇ

Fig. 4ᵃ

Fig. 5.

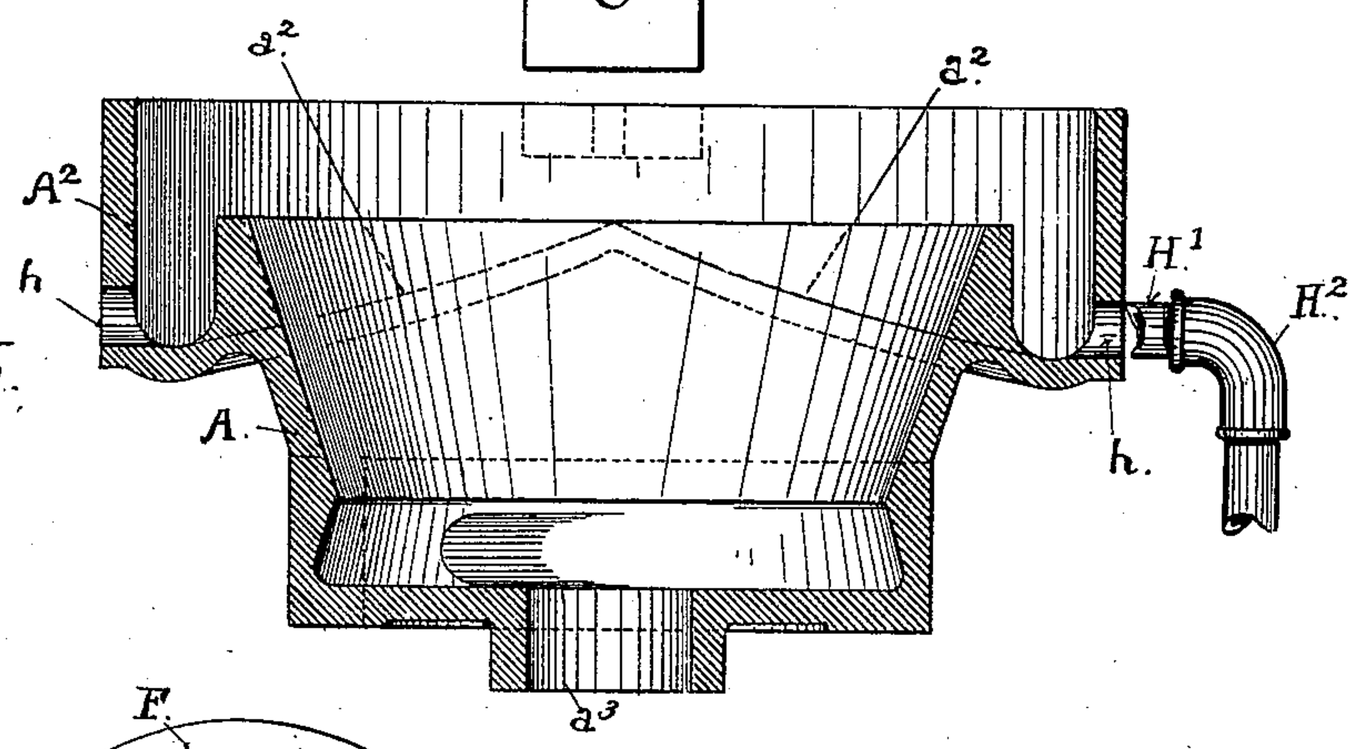


Fig. 6.

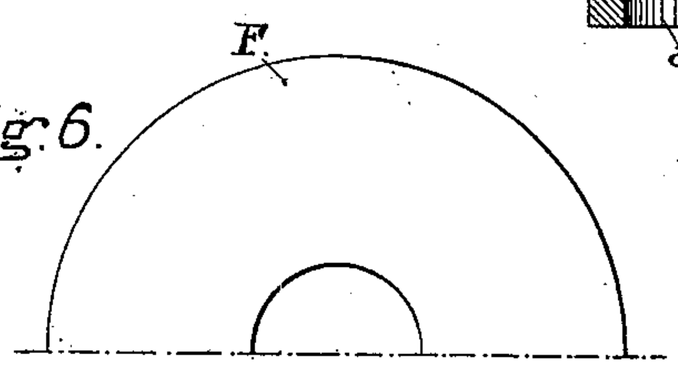
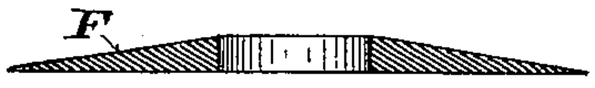


Fig. 7.



Witnesses:
M. Regnier.
E. Salomon.

Inventor:
James Barron.
By Smith & Dorr
his Attys.

No. 641,359. Patented Jan. 16, 1900.

J. BARRON.

ORE SEPARATOR.

(Application filed Apr. 6, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 12.

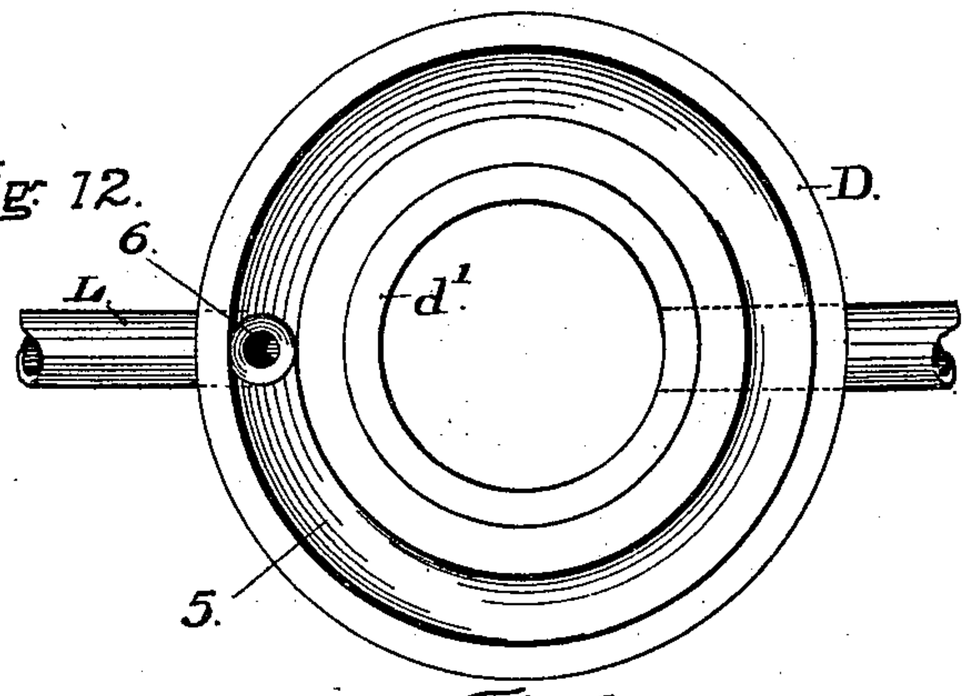


Fig. 8.

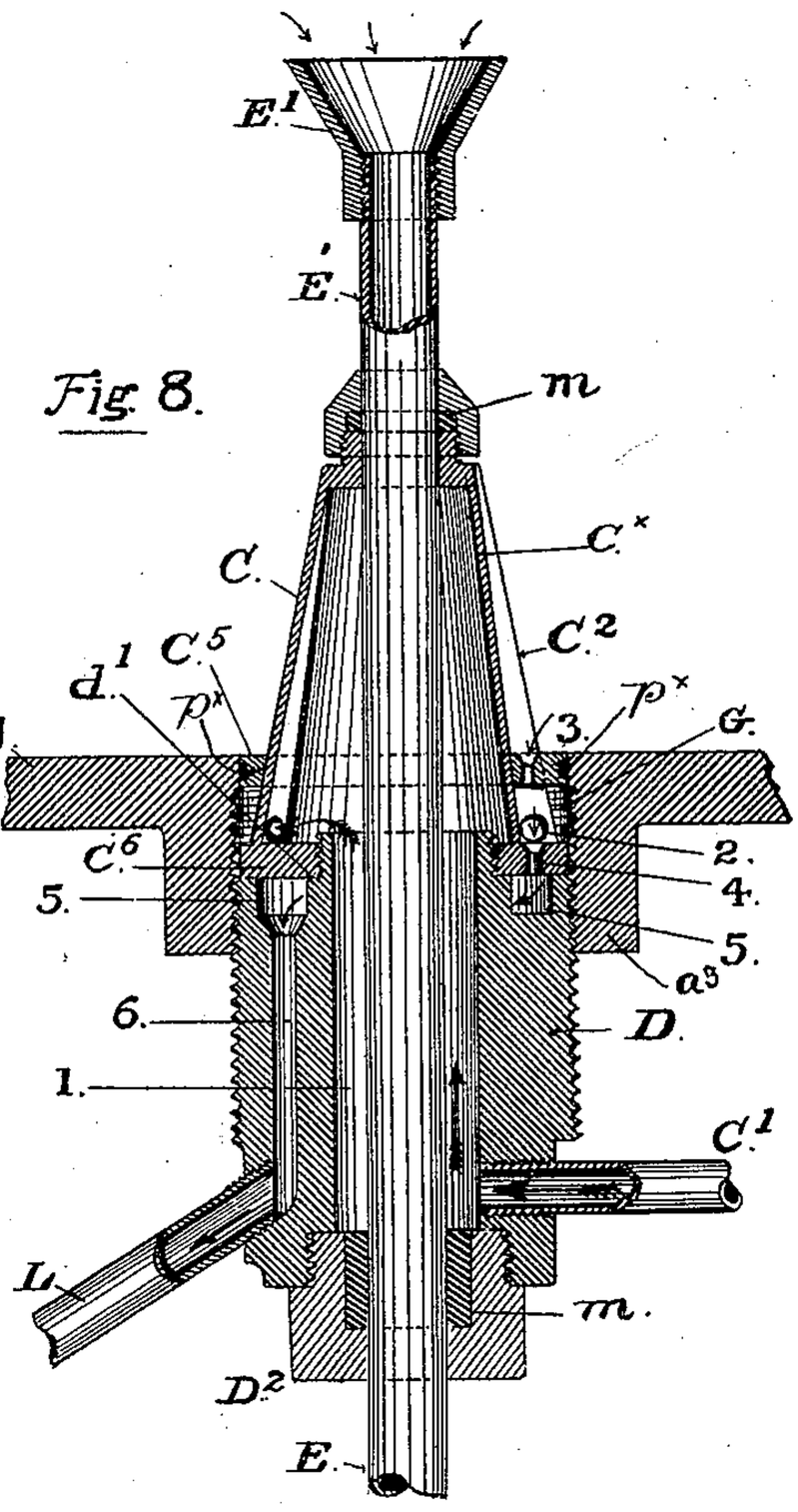


Fig. 10.

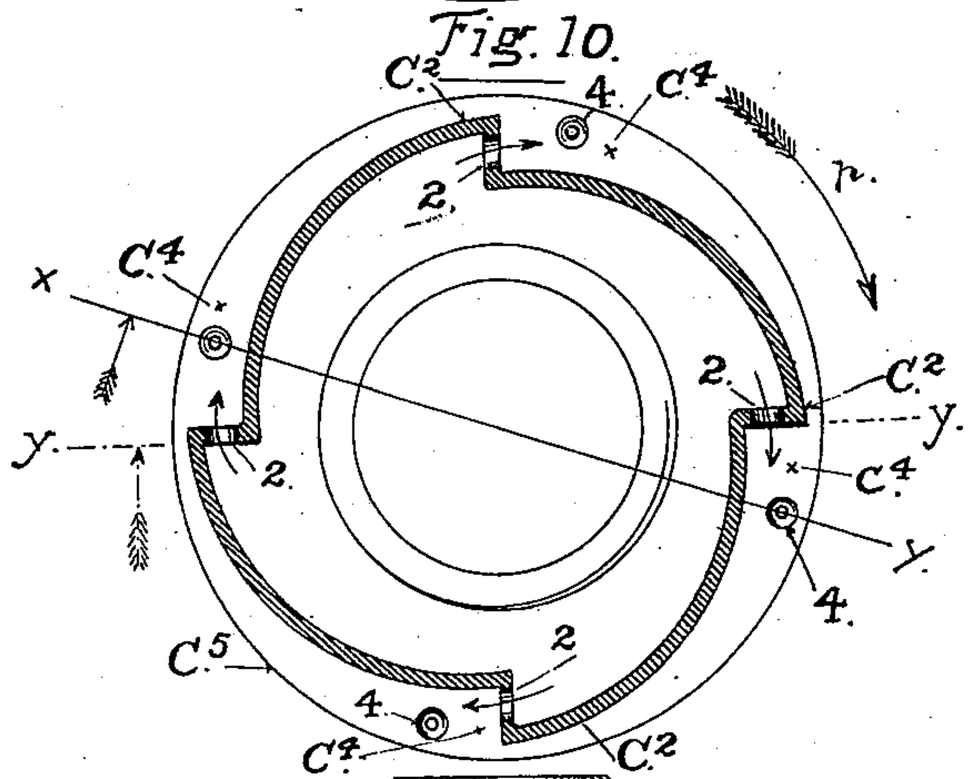


Fig. 9.

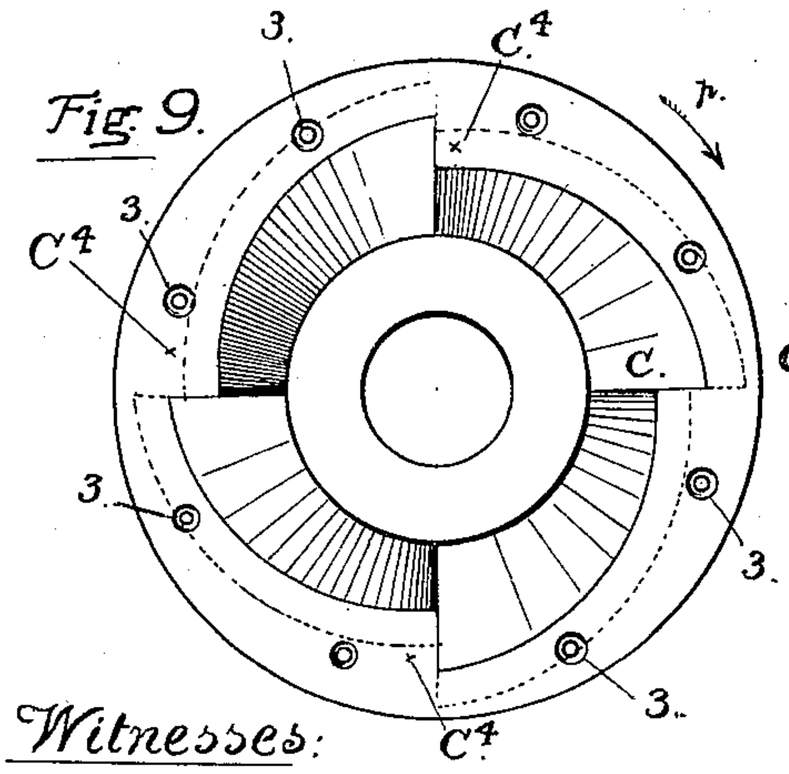
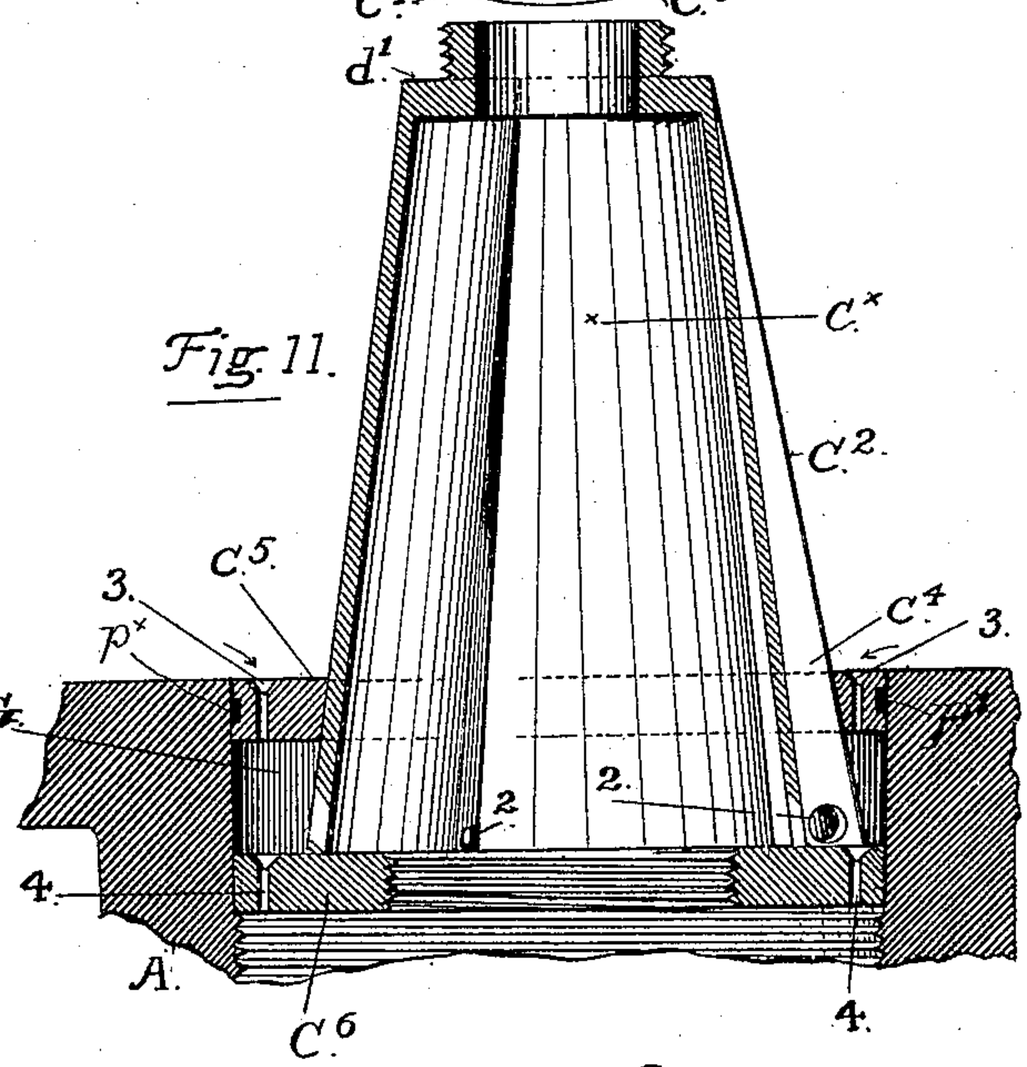


Fig. 11.



Witnesses:

M. Regner

E. Salomon

Inventor:

James Barron

By Smith & Osborne

his Attys.

UNITED STATES PATENT OFFICE.

JAMES BARRON, OF SAN FRANCISCO, CALIFORNIA.

ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 641,359, dated January 16, 1900.

Application filed April 6, 1898. Serial No. 676,650. (No model.)

To all whom it may concern:

Be it known that I, JAMES BARRON, a citizen of the United States of America, and a resident of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Ore-Separators, of which the following is a specification.

This invention relates to improvements made in ore separating or concentrating apparatus; and the same comprises a novel form and construction of pan, in which the separation of the mineral particles from the gangue is effected entirely by hydraulic means or the flow and movements of the pulp and water into and out of the pan, while the pan itself is stationary. In this respect my said invention differs from other machines or apparatus which are worked with a vibratory or shaking motion.

The invention embraces certain novel parts and combination of parts producing an improved pan-concentrator and the production of an apparatus comprising several pans in a gang or battery for handling and effectively working a considerable quantity of material direct from a battery of stamps or a crushing-mill.

The nature of the said improvements and the manner in which I proceed to construct, produce, and apply the same are explained at length in the following description, the accompanying drawings, that form part of this specification, being referred to by figures and letters.

Figure 1 of the drawings represents in elevation a concentrating-pan embodying my said improvements, the wall of the overflow-trough being partially broken away. Fig. 2 is a similar view having a portion of the body of the pan broken away at one side. Fig. 3 is a longitudinal section taken diametrically through the pan, but not through the standing central cone. These three figures also illustrate the arrangement of several pans in a battery. Fig. 4 is a plan or top view of the pan. Fig. 4^a is a longitudinal section of the adjustable nozzle; Fig. 4^b, an end view of the nozzle on an enlarged scale. Fig. 5 is a sectional view through the line $x\ x$, Fig. 4. Fig. 6 is a one-half plan of the removable bottom plate. Fig. 7 is a transverse section through the center of the plate. Fig. 8 is a vertical section through the center of the standing cone and the screw-plug in the bottom of the pan, the section being taken through the line $y\ y$, Fig. 10. Fig. 9 shows the shell of the standing cone in top view. Fig. 10 is a cross-section taken horizontally through the shell of the cone above the bottom flange. Fig. 11 is a vertical section through the shell on the line $x\ y$, Fig. 10. Fig. 12 is a top view of the screw-plug.

The pan-body A is composed of a hub, a circular lower portion with substantially perpendicular walls, and an upper portion of greater diameter, the walls of which slope inwardly from the top rim down to the contracted lower portion.

B is an inlet-aperture through the side of the pan, and B^2 is a nozzle fixed in that aperture, to which is coupled a pipe B′, leading from the stamp-battery or crushing-mill. The nozzle is fixed in the opening B in position about tangent to the inner circumference of the pan, so as to direct the stream of material fed to it by the pipe B′ in a line close to the circle of the pan-bottom. In the complete machine I provide a plurality of these inlets, the number being governed by the diameter of the pan, two being shown herein for each pan, set diametrically opposite each other, so that as the inflowing mixed water and ore loses its force in traveling part way around the pan it meets the next incoming stream, joins with it, and thus maintains the constant whirling motion desired in this construction.

C is a hollow cone fixed in upright position in an opening in the pan-bottom and having an inner space or chamber $C^\times$ opening through the bottom of the cone. In the outer face of the cone and extending from the base to the top are formed several sections consisting of angular recesses or depressions with flat perpendicular faces C^4 and having curved outer surfaces C^2, each of which springs from the inner angle of one perpendicular face to the outer edge or corner of the next face around the circumference. In the face of these abutments C^4 apertures 2, near the base, open from the interior of the cone.

C^5 C^6 are flanges surrounding the base of

the cone and inclosing a groove or channel G, into which all the apertures 2 open.

When the cone is properly adjusted and fixed in the pan, the top face of the flange C^5 lies on a level with the pan-bottom and the channel G is within the hub, so that the wall of the central opening forms, in conjunction with the flanges C^5 C^6, a close groove or channel all around the base of the cone.

3 3 are apertures in the top flange, opening into the channel G, and 4 4 are apertures through the bottom flange, opening also into channel G, but at points just in front of the apertures 2 above mentioned.

D is a hollow plug threaded into the lower end of the hub a^3 and having a reduced neck d' at its upper end threaded into the bottom flange C^6, while 1 designates the central passage in the plug, opening into the chamber $C^\times$ and closed at the lower end by a screw-plug D^2.

C′ is a water-pipe connecting the passage 1 with a service-pipe I, through which clear water is carried into the cone.

5 is a circular channel in the top end of the plug directly under the apertures 4 4 in the flange C^6, which latter spans and closes said channel, and 6 is a passage extending from the bottom of that channel perpendicularly downward through the body of the plug to an outlet in one side. L is a tube fixed in this outlet. The office or function of this tube and the connected passage is to carry to the outside the concentrates or heaviest particles of matter which are deposited in the channel G and are carried through the apertures 4 into the channel 5. Those particles which, by virtue of their greater specific gravity and the comparatively quiet condition produced in the circulating body of water and material in the pan around the base of the cone, are collected and caused to settle on the top flange are carried through the apertures 3 and 4 by the small streams of water flowing continuously through these apertures and passages, and are conveyed by the tube L to a settling-box or other suitable receptacle provided at the end of that tube. In addition to the water supplied from the pan clear water is directed in jets or fine streams from the interior of the cone across the apertures 4 4 and into the channel G through the openings 2 2 for the purpose of keeping the apertures clear and maintaining a continuous and unobstructed discharge of the concentrates from the channel G.

A slight head or degree of pressure is sufficient to keep the lower outlets 4 free and to carry off the mineral particles; but by increasing the pressure in the service-pipe, and hence in the channel G, the water will be forced upward through the apertures 3 in the upper flange and into the pan around the standing cone. The application of clear water in this manner into the pan prevents the particles from settling upon and choking the apertures 2 and insures a free outlet for the concentrates as they gather in the pan and collect around the base of the standing cone.

A^2 is an overflow-trough around the rim of the pan, and H is a waste-pipe coupled to an outlet h in the side of the trough for conducting the overflow into a settling-box or to another pan for further concentration.

The adjustable nozzle B^2, screwed into the inlet-aperture B, controls the size of the stream of material and also serves to regulate the position of the inlet-aperture with relation to the bottom of the pan, for which purpose the passage through the nozzle is contracted at one end b^2 and is located eccentrically to one side of the center, while at the other end, to which the conductor H is coupled, the passage is concentric, so that by turning the nozzle in its threaded socket B the aperture b^2 in the inner end can be raised or lowered with reference to the pan-bottom. Thus the incoming stream can be set to work quite closely to the bottom of the pan, or it can be elevated to enter the pan at a greater or less distance above the bottom, as required.

F is a removable false bottom composed of a disk with a flat bottom face and a conical or slanting top surface, having its greatest height in the center and from that point sloping with a gradual inclination all around out to the circumference or edge of the disk. The office or function of this disk is to elevate the bottom of the pan at the center and give it a pitch or inclination downward in a small degree from the center outward to the circumference and also to furnish an amalgamating-surface that will catch and retain the finest particles, the surface of the disk being properly coated with amalgam for that purpose. When this disk F is used, the nozzles B are adjusted to throw the aperture b^2 above or on a line with the inclined surface of the disk.

The trough A^2 around the rim of the pan to catch the material discharged over the rim is formed with an inclined bottom pitching from the rim downward to the outlet h, and in the construction illustrated in the drawings, where the trough is provided with two outlet-apertures, the bottom of the trough is formed of double inclines a^2 a^2, pitching from points diametrically opposite to each other and around the circumference to the outlet.

The water-pipe H is connected to the outlet h by a threaded coupling H′ and an elbow H^2 to turn that pipe downward.

The inlet B for the material is located in the side of the pan and at or close to the bottom, so as to deliver the material in a stream substantially tangent to the circumference or in such direction that a rapid circular motion will be set up and maintained within the pan. Usually two inlets are placed at points diametrically opposite, so as to direct the two streams of mingled water and solid matter in the same direction of rotation, as indicated

by the arrows *p* in Figs. 9 and 10 of the drawings, and a plurality of tangential inlet-streams affords the advantage set forth above.

As shown in the details, Figs. 9, 10, and 11, the outlet-apertures 3 for the concentrates are situated in the recesses behind the abutments C^4, the curved faces of which are set in the direction of the rotary motion, so that the abutments act upon the material to produce eddies and quiet corners in the angles where the concentrates will collect, and thus find an outlet through the apertures 3 in the upper flange.

The top face of the upper flange or ring is set flush with the bottom of the pan when the conical disk F is not used; but when that disk is used the cone C is adjusted vertically by screwing the plug D farther into the nut a^3, so as to bring the top face of the flange C^5 level with the top of the disk. In both positions the channel G between the two flanges is below the working surface of the pan, as shown in Figs. 3 and 8.

In addition to the overflow at the periphery around the rim of the pan there is provided a surface-discharge downward through the center of the pan for the purpose of carrying off the scum or light particles of matter that are brought to the surface in the center of the pan by the centripetal force set up by the rotary motion of the water. This scum-outlet is an upright tube E, fixed in the center of the standing cone and extending through that part and the plug D to the outside and provided on the upper end with a funnel-shaped top E′. This tube is adjustable vertically in the standing cone for the purpose of regulating the height of the rim of the funnel above the bottom of the pan. It is carried through the screw-plug D^2, and the joints at *m m* are packed, as shown in Fig. 8, to prevent the escape of water between the cone and the tube, and packing $p^\times$ is also set in a groove in the edge of the flange C^5 to make a tight joint.

As the level of the body of water in the pan will vary with the head under which the material is fed into the pan and under other conditions, the outlet-tube E is adjusted vertically to bring the rim of its funnel-shaped top E′ about on a level with or somewhat below the surface of the vortex or conical depression which is produced in the center of the body of liquid by the centrifugal motion set up in the pan.

K is a flaring lining of copper coated with amalgam and fitted into the pan to form an amalgamating-surface. In some cases this lining K is of greater height than the pan-body, so as to bring the rim or top edge above the inner rim of the overflow-trough, and thereby increase the working depth of the pan. Thus the overflow-rim can be raised to any desired height by inserting a lining K of greater or less vertical measurement.

Figs. 1 and 2 represent the use of linings of different heights.

Two or more of the pans when arranged in a gang or battery are connected by coupling the overflow-pipes H from the trough of the first pan into which the material is introduced from the mill or battery to the inlets B in the side of the pan next below, the pans being supported one below the other in a frame, as illustrated in Figs. 1, 2, and 3 of the drawings. The material from the last pan is discharged into a sluice-box or settler or is allowed to run off through a waste-pipe. The scum-pipes E are then arranged to discharge one into the other next below and the last one into a settling-tank.

The concentrates are deposited from the pipes L into suitable receptacles fixed in the frame, and the clear-water-supply pipes are connected to a common service-pipe I, and each one is provided with a hand-valve C^3 for regulating the head of water supplied to each pan.

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

1. In an ore-separator, the combination with a pan, and an outlet therefor; of an inlet directed on a substantially tangential line through the side of the pan near its bottom, and a nozzle swiveled to said inlet and having a contracted outlet end standing eccentric to its axis, as and for the purpose set forth.

2. In an ore-separator, the combination with a pan having a flat bottom, an amalgamating-disk removably resting thereon and having a sloping surface highest in the center, and an outlet for the pan; of an inlet directed on a substantially tangential line through the side of the pan near its bottom and above the edge of said disk, and a nozzle swiveled to said inlet and having a contracted outlet end standing eccentric to its axis, as and for the purpose set forth.

3. In an ore-separator, the combination with a pan having sloping walls and a flat bottom, an inlet-aperture in the sides at the bottom adapted to deliver the material and water in a stream at and substantially tangential to the circumference of the pan, a surface-overflow around the rim, and central outlet-apertures in the bottom of the pan for discharge of the concentrates from the locality of least motion; of the removable amalgamating-disk having a sloping surface highest in the center at the outlet-apertures and sloping regularly outward to the circumference of the pan, as and for the purpose set forth.

4. In an ore-separator, the combination with a pan having substantially perpendicular walls at its lower portion, thence flaring upwardly, and finally formed into an overflow-trough, an outlet from this trough, and a tangential inlet to said lower portion of the pan; of amalgam-coated linings of various heights shaped to removably and interchangeably fit the flaring portion of the pan but not to extend to its bottom, as and for the purpose set forth.

5. In an ore-separator, the combination with a pan having flaring sides, an overflow-trough surrounding its edge, and tangential inlets for supplying mixed water and ore with a swirling motion; of a vertically-adjustable tube rising within and extending through the center of the pan, a series of exits for the concentrates formed through the bottom of the pan around said tube, a channel to which they lead, and a passage delivering from this channel, as and for the purpose set forth.

6. In an ore-separator, the combination with a pan having a central hub pierced with a hole, an outlet, and a tangential inlet for said pan; of a hollow plug engaging said hole from beneath and having a channel in its upper end, apertures for the concentrates leading to this channel, an exit-passage leading therefrom, a scum-exit consisting of a tube extending upwardly through said plug and having a funnel-shaped top, and a screw-plug attached to the lower end of said hollow plug and packed around the tube, as and for the purpose set forth.

7. In an ore-separator, the combination with a pan having a central hole, an outlet, and a tangential inlet; of a plug in said hole, a reduced and exteriorly-threaded neck at the upper end of the plug, a channel around said neck, an outlet from this channel, a flange screwed onto the neck and having openings for the concentrates, and a cone mounted on the flange and rising within the pan, as and for the purpose set forth.

8. In an ore-separator, the combination with a pan having a central hole, an outlet, and a tangential inlet; of a hollow plug seated in the hole from below, an adjustable flange at its upper end, a cone supported on this flange and having outlet-springs, a channel adjacent said openings, concentrate inlet and outlet apertures to and from said channel, and a source of clear-water supply upward through the plug into the cone, out its openings, and through said apertures, substantially as described.

9. In an ore-separator, the combination with a pan having a central hole, a hollow plug therein, an outlet-passage bored through the wall of the plug, a source of clear-water supply upward through the bore of the plug, an outlet for the pan, and a tangential inlet therefor; of spaced flanges within said hole above the plug and each having apertures, a hollow cone mounted on the lower flange and contacting with the upper to form a channel between the flanges, said channel communicating through the upper apertures with the pan and through the lower apertures with said outlet-passage and the interior of the cone communicating with the bore of the plug, and outlet-openings through the wall of the cone into said channel, substantially as described.

10. In an ore-separator, the combination with a pan having a central depending hub pierced with a threaded hole, a plug inserted therein from below and provided with clear-water inlet and concentrate-outlet passages, a tangential inlet for mixed ore and water to the pan, and an overflow over the rim of the latter; of an annular channel in the upper end of the plug communicating with the outlet-passage therethrough, two spaced flanges fitted into said hole, the lower one resting upon said plug and the upper one being normally flush with the bottom of the pan, concentrate-apertures through both flanges, and a hollow cone contacting with both flanges, rising above the uppermost, standing upright within the center of the pan, communicating interiorly with the water-inlet passage of the plug, and having openings through its wall leading into the channel between the flanges, substantially as described.

11. In an ore-separator, the combination with a pan having an outlet over the rim, a tangential inlet at the bottom of the pan, and a standing hollow cone at the center having a series of flat radial abutments having openings beneath the level of the bottom of the pan; of a channel surrounding the base of the cone opposite its openings and having apertured top and bottom walls, a collecting-channel below the lower apertures communicating with a discharge-passage, and a source of supply of clear water under pressure to the interior of said cone and out its openings into the channel, as and for the purpose set forth.

12. In an ore-separator, the combination with a pan having an outlet, a tangential inlet thereto, and a standing hollow cone at the center of the pan made in sections with curved outer faces and flat radial abutments, the latter having openings beneath the level of the bottom of the pan; of flanges closely surrounding the cone above and below said openings so as to form a channel, inlet-apertures for the concentrates through the upper flange, outlet-apertures therefor through the lower flange just forward of said openings in the abutments, and a source of clear-water supply leading to the interior of the cone and directing the water out the openings and across said outlet-apertures, all as and for the purpose set forth.

13. In an ore-separator, the combination with a pan having flaring sides, an overflow-trough surrounding its edge, and tangential inlets for supplying mixed water and ore with a swirling motion; of a scum-exit consisting of an upright tube rising through the center of the pan and open at its upper end, means for adjusting this tube vertically, and exits for the concentrates arranged in a ring around said tube and opening through the bottom of the pan, as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

JAMES BARRON. [L. S.]

Witnesses:
H. J. LANG,
GEO. T. KNOX.