B. F. COBB.

CONCENTRATOR.

APPLICATION FILED AUG. 16, 1910.

1,010,348.

Patented Nov. 28, 1911.

4 SHEETS—SHEET 1.

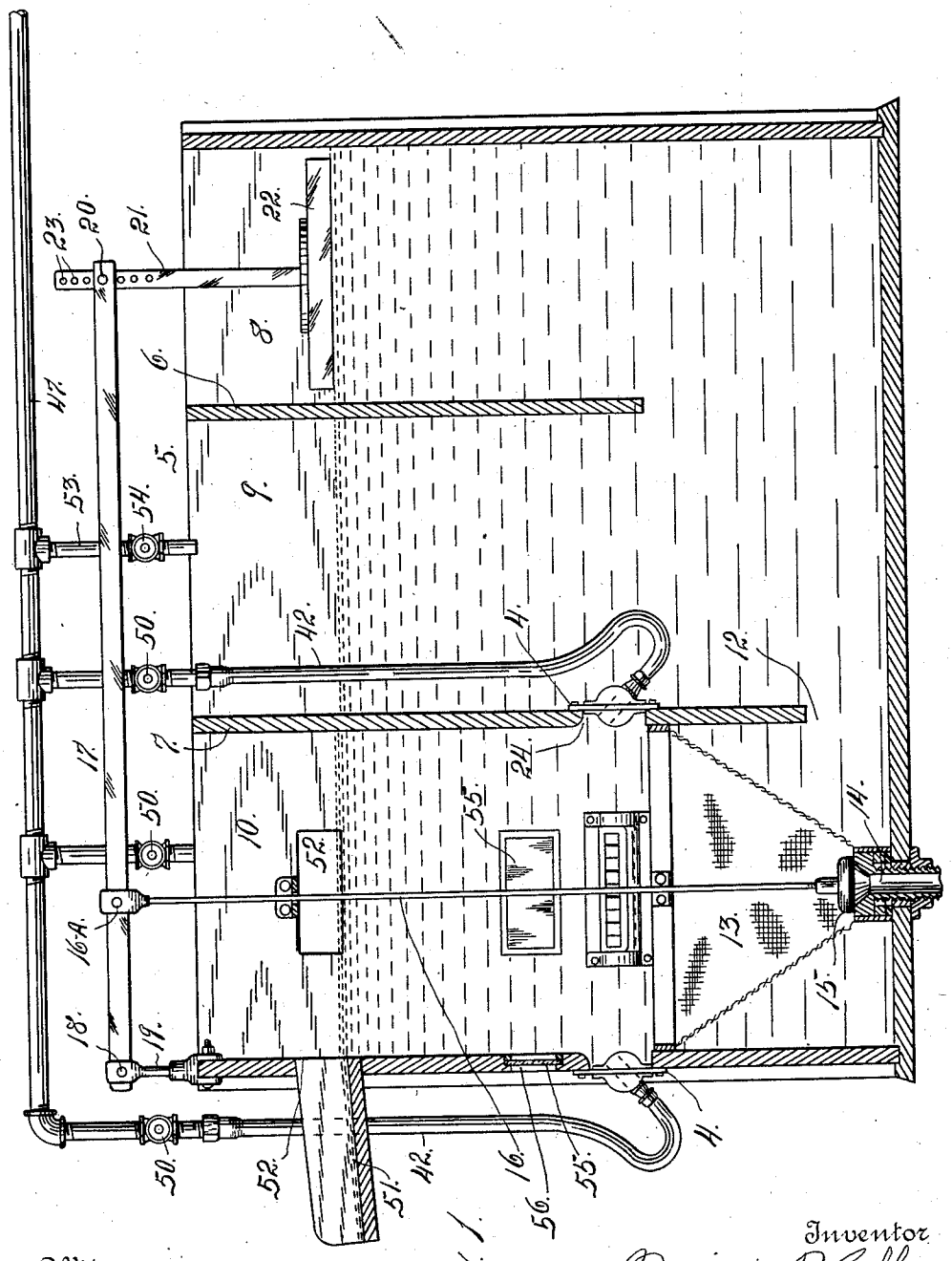

Fig. 1.

Witnesses
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4 SHEETS—SHEET 2.

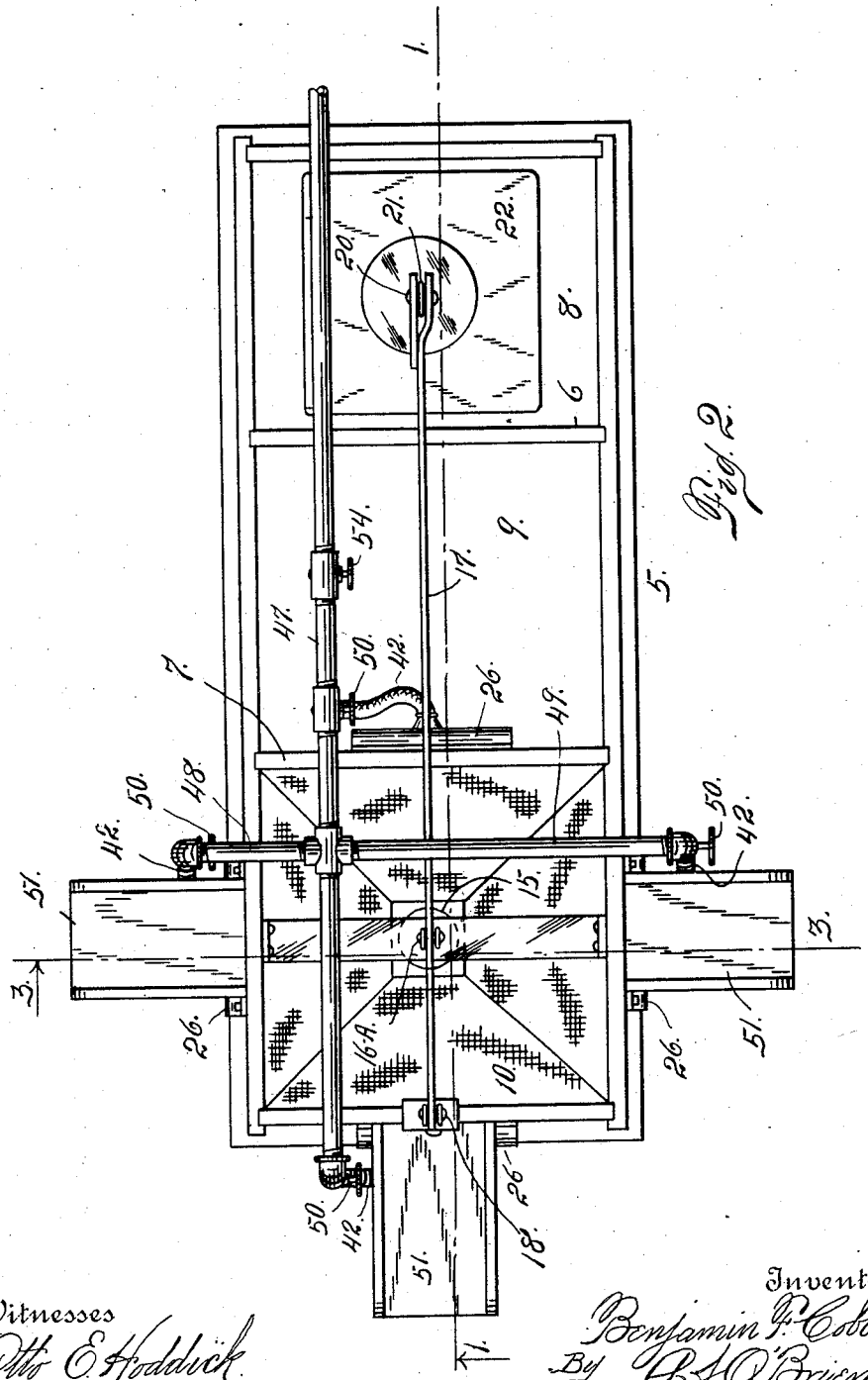

Fig. 2.

Witnesses

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4 SHEETS—SHEET 3.

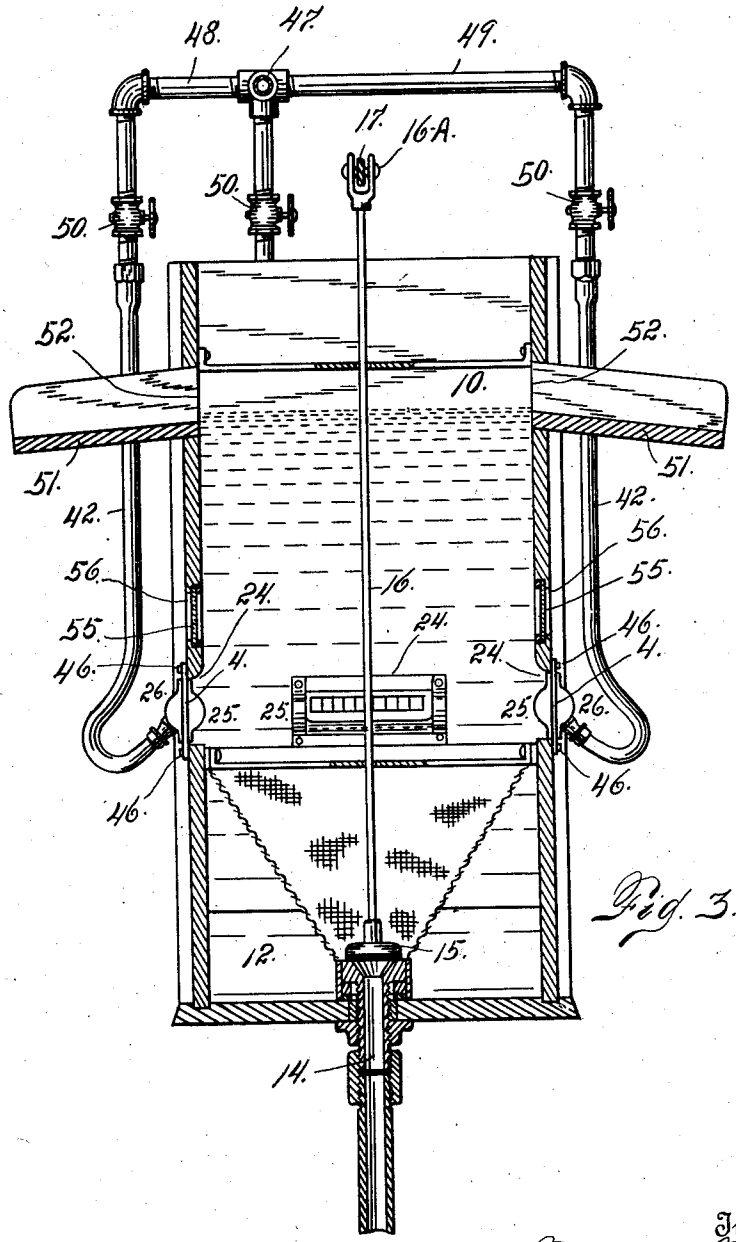

Fig. 3.

Witnesses

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4 SHEETS—SHEET 4.

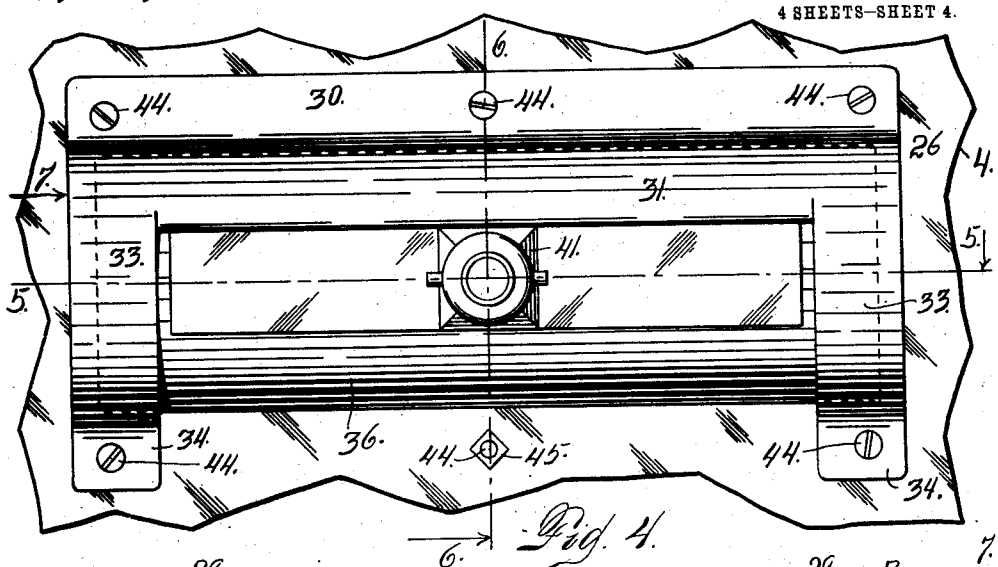

Fig. 4.

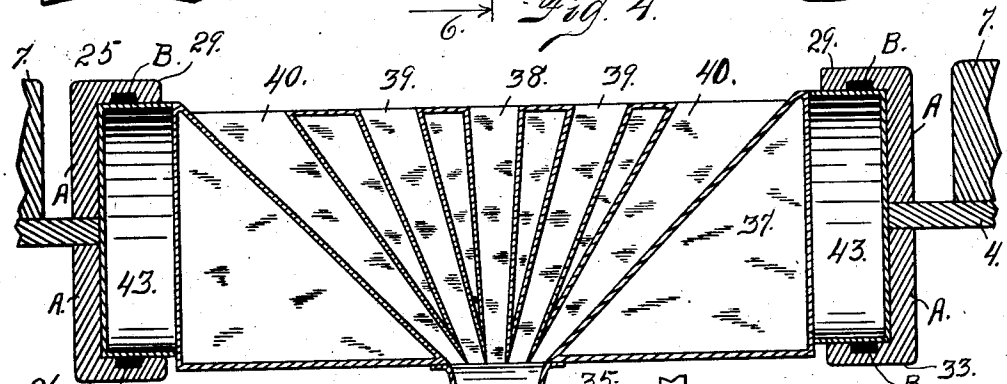

Fig. 5.

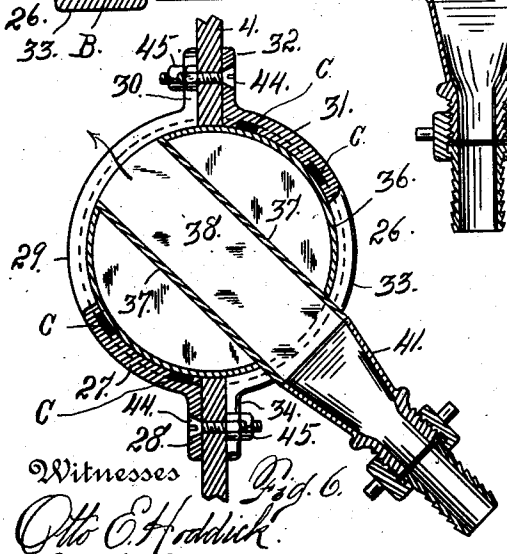

Fig. 6.

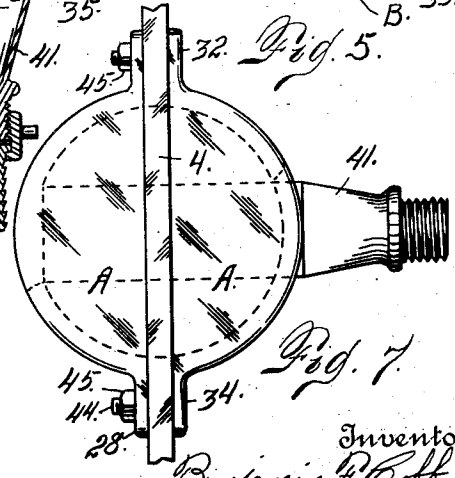

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

BENJAMIN FRANKLIN COBB, OF DENVER, COLORADO.

CONCENTRATOR.

1,010,348. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed August 16, 1910. Serial No. 577,453.

To all whom it may concern:

Be it known that I, BENJAMIN FRANKLIN COBB, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in 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 letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in concentrators whose function is the separation of the precious metal values from the gangue or waste material, either from placer material or pulverized rock.

My improved apparatus relates to that class of concentrators in which an upwardly directed current of liquid is employed to act upon the material falling through the body of water in which the current is produced, whereby the upward current separates the gangue or worthless material from the heavier mineral values, the latter passing downwardly and settling in the bottom of the tank, while the gangue is carried upwardly with the current and caused to overflow at a predetermined level.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a vertical longitudinal section taken through my improved apparatus showing the various compartments into which the main tank or receptacle is divided. Fig. 2 is a top plan view of the same. Fig. 3 is a cross section taken on the line 3—3 Fig. 2. Fig. 4 is an enlarged fragmentary elevation of a portion of the wall of the concentrating compartment, where one of my improved adjustable nozzles is located. Fig. 5 is a horizontal section taken on the line 5—5 Fig. 4. In both of these views the nozzle is adjusted to introduce the water jets into the ore compartment in a horizontal direction. Fig. 6 is a section taken on the line 6—6 Fig. 4, the nozzle, however, in this view being inclined at an angle of about 45 degrees, while in Fig. 4 it occupies a horizontal position as heretofore stated. Fig. 7 is an end view of the nozzle mechanism, one of the end bearings in which the nozzle is journaled being shown.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the main receptacle or tank considered in its entirety and provided interiorly with partitions 6 and 7 which divide the tank into three compartments designated 8, 9 and 10 respectively. The compartments 8 and 9 are in communication with each other at the bottom, since the partition 6 is interrupted at a considerable distance above the bottom of the tank. Both of these compartments are also in communication with the ore compartment 10 through an opening 12, the partition 7 being interrupted at the bottom for this purpose.

The ore compartment 10 is provided with a cone-shaped mesh bottom 13 having a discharge pipe 14 at the bottom, the upper extremity of this pipe being controlled by a valve 15 with which a rod 16 is connected. This rod extends upwardly through the center of the compartment, its upper extremity being pivotally connected as shown at 16^A with a lever 17 fulcrumed at 18 on a support 19 extending upwardly from one end of the tank, being that where the ore compartment is located. The opposite extremity of this lever is pivotally connected as shown at 20 with the stem 21 of a float 22 located in the compartment 8. The stem 21 is provided with a series of perforations 23, whereby the lever 17 is adjustably connected with the stem and may occupy a higher or lower position thereon as may be desired.

The four walls of the ore compartment 10 which is square in cross section, are each provided with an opening 24 for the introduction of water. At the opposite ends of each of these openings bearings for the extremities of the nozzle structure are formed, the said bearings consisting of inner and outer brackets 25 and 26, the inner bracket consisting of a curved plate 27 having a depending flange 28 engaging a frame plate 4 below the nozzle opening, the extremities of the curved plate 27 consisting of upwardly projecting curved arms 29 terminating in flat lugs 30 also engaging the frame plate 4 on the inside; while the bracket 26 consists of a curved plate 31 located at the

top and extending entirely across the nozzle opening, its upper edge terminating in a flat flange 32 engaging the frame plate 4 on the outside. The opposite ends of these brackets are provided with downwardly extending curved arms 33 terminating at their lower extremities in flat lugs 34 engaging the frame plate 4 on the outside. Between the arms 29 of the inner bracket and the arms 33 of the outer bracket, openings are formed to permit the adjustment of the nozzle as hereinafter explained. In addition to the features of these brackets heretofore described, each bracket is provided at its opposite ends with a semi-circular disk A, the edges of the disk abutting against the frame plate 4 on opposite sides and constituting with the edges of the frame plate adjacent the opening, completely closed end bearings, the arms 29 and 33 of these bearings being circumferentially grooved to receive gaskets B.

Let the numeral 35 designate each of the nozzles employed for the introduction of wash water through the openings in the walls of the ore compartment. Each of these nozzles consists of a cylindrical casing 36 through which are passed flat parallel walls 37 between which is formed a chamber which is divided by a series of partitions into a number of passages 38 39 and 40, through which water issues in jets being supplied through an inlet nipple 41 which is in communication with a supply conduit 42.

As illustrated in the drawing the passage 38 of the nozzle is centrally located, while the passages 39 and 40 are located on opposite sides thereof, there being two passages 39 and two passages 40. These passages 39 and 40 diverge from the passage 38 and from each other as they extend upwardly from the supply nipple 41 with which they all communicate as heretofore indicated. The extremities of the cylinder 36, are equipped with hollow cylindrical journals 43 which are fitted into the end bearings formed by the brackets 25 and 26 heretofore explained in detail, water-tight joints being formed by the aid of the gaskets B. The brackets 25 and 26 forming the bearings for the nozzle as heretofore explained, are secured to the opposite faces of the frame plate 4 by means of screws 44, to the opposite extremities of which nuts 45 are applied.

Attention is called to the fact that each nozzle structure is inserted in an opening formed in a rectangular frame plate 4 which surrounds each nozzle opening 24 in the wall of the concentrating compartment 10. These frame plates are secured to the exterior surfaces of the walls of the compartment and as these walls are relatively thick, the inner portion of the cylindrical nozzle structure is practically concealed within the wall opening so that the screen bottom of the ore compartment may, if desired, be detached from the walls of the compartment and moved upwardly through the compartment without interference or obstruction which the nozzle mechanism otherwise might present. The frame plates 4 as illustrated in the drawing are secured to the walls of the ore compartment 10 by the use of suitable fastening devices, as bolts 46.

Attention is called to the fact that the cylindrical journals 43 of the nozzle structure, fit closely within their end bearings, the friction being sufficient to cause the said structure to remain in any desired position of adjustment, whereby the jets of liquid issuing through the various passages of the nozzles may be directed into the ore compartment at any angle to the vertical varying from 90 to 45 degrees, or even a greater range of adjustment may be permitted.

The conduits 42 which lead to the various nozzles extend downwardly from a main supply pipe 47 and two branch pipes 48 and 49, valves 50 being employed to regulate the passage of water through the conduits 42. The lower portions of these conduits 42 are preferably formed of flexible hose pipe while their upper portions, which are directly connected with the supply pipes, are preferably formed of metal as indicated in the drawing, the valves 50 being connected with the metal portions of the conduits.

On each of three sides of the concentrating compartment 10, troughs 51 are located, these troughs being set into openings 52 formed in the walls of the compartment and serving to permit the overflow of the gangue or waste material from the compartment as the said gangue is carried upwardly with the rising current of water resulting from the introduction of liquid into the ore through the agency of the nozzles as heretofore explained. The main tank or receptacle 5 is supplied with water through a depending pipe 53 connected with the main supply pipe 47 and provided with a valve 54.

Before beginning the use of the apparatus, it may be assumed that the tank is supplied with water which rises to the same level in all of the compartments, the said level being that permitted by the overflow troughs 51. Water is then introduced into the ore compartment through the nozzles at a suitable angle, depending upon whether the mineral values of the material to be treated are relatively fine or coarse. If these values are very fine or slimy in character, the jets of water passing through the nozzle may be introduced in a horizontal direction if desired; while if the mineral values are relatively coarse and heavy,

the jets may be directed into the compartment at a considerable angle, say 45 degrees or even greater.

At the beginning of the operation as heretofore indicated, the water level will be the same in the three compartments 8, 9 and 10 of the tank. However, after the operation has continued for some time the mineral values will settle in the cone-shaped bottom of the ore compartment and gradually clog the screen, whereby the passage of water upwardly through the screen bottom will be obstructed causing the water to gradually rise in the compartments 8 and 9 to a level above that in the ore compartment 10, and as this rise of water in the compartments 8 and 9 continues, the float will be carried upwardly sufficiently to act upon the lever 17 and open the valve 15 allowing the concentrates in the bottom of the ore compartment to pass through the outlet or discharge pipe 14. As soon as this discharge is comparatively complete, the screen bottom will be cleared of the obstructing accumulation and the water will again pass freely through the mesh bottom causing the water level to lower in the compartments 8 and 9 to the level of that in the compartment 10 in which event, the float will move downwardly and acting on the lever 17 close the valve 15, when the operation will go on as before until the accumulation of concentrates in the bottom of the ore compartment is again sufficient to obstruct the mesh material of the said bottom, when the operation heretofore described will be repeated.

In order to enable the operator to observe the action of the water upon the material under treatment, the ore compartment is provided on three sides with transparent plates 55 set into openings 56 formed in the walls of the compartment whereby windows are formed, the said plates being of sufficient area for the purpose.

Attention is called to the fact that the plate members 27 and 31 of the brackets 25 and 26 are provided with grooves in which are located gaskets C, in order to form a water-tight joint between the bearing portions of the cylindrical nozzle and the said plate members of the bearing brackets.

Having thus described my invention, what I claim is:

1. The combination with a liquid-containing ore-treating compartment having openings formed in the walls thereof, of a nozzle having cylindrical journals at its opposite extremities, and bearings for the said journals, said bearings being composed of inner and outer brackets applied to the opposite sides of the wall of the compartment, each bracket forming an approximately semicircular bearing for each nozzle journal, substantially as described.

2. The combination with a liquid-containing ore compartment, means for introducing water upwardly through the bottom, the walls of the compartment above the bottom having openings, of cylindrical nozzles for introducing water into the compartment in a direction transverse to the axis of the nozzles, and bearings in which the nozzles are journaled, comprising coöperating brackets whose extremities are curved to form bearings for the nozzle journals, the said bearing members having gaskets, the brackets also having plates curved to conform to the curve of the nozzles, the said plates engaging the nozzles both interiorly and exteriorly, one of said plate members engaging the upper part of the nozzle and the other the lower part of the nozzle, the bracket plates being cut away between their bearing members to permit the adjustment of the nozzles, substantially as described.

3. The combination with a liquid-containing ore-treating compartment, a wall of the compartment above the bottom having a rectangular opening and nozzle mechanism mounted adjacent said opening and comprising a plate having a rectangular opening conforming to the opening in the wall of the compartment, brackets applied to the opposite sides of the plate and coöperating to form cylindrical bearings at the opposite ends of the plate openings, the brackets between their bearing extremities consisting of plates curved to conform to the shape of the nozzle and occupying positions respectively above and below the water discharge through the nozzle, the nozzle member proper being cylindrical in shape exteriorly and having an opening therethrough, and means for delivering water under pressure to the nozzle, substantially as described.

4. The combination with a liquid-containing, ore-treating compartment, having a valve controlled outlet for concentrates, the walls of the compartment being provided with openings, a series of nozzles journaled in the said openings at their opposite extremities, and provided with a series of transverse passages for delivering water in a corresponding series of convergent jets into the compartment, the said nozzles being adjustable to deliver the series of jets of water at any desired angle to the vertical, and means for supplying water to the nozzles under pressure, substantially as described.

5. The combination with a liquid-containing, ore-treating compartment, of a series of cylindrical nozzles journaled in the walls of the said compartment above the bottom and communicating with the compartment, each of the said nozzles having a centrally located nipple, and a series of separated passages communicating with the said nipple and diverging from each other as they ex-

tend inwardly, and means connected with the nipple for supplying water to the passages, the said nozzles being adjustable and adapted to deliver convergent series of currents of water to the compartment at any desired angle to the vertical, substantially as described.

6. The combination with a liquid-containing ore-treating compartment, a series of nozzles formed in the walls of the said compartment above the bottom and communicating with the compartment, each of the said nozzles having a centrally located nipple, and a number of separated passages communicating with the said nipple and extending transversely through the nozzles, and means connected with the nipple for supplying water to the passages, the said nozzles being adjustable and adapted to deliver convergent series of currents of water to the compartment at any desired angle to the vertical, substantially as described.

7. The combination with a liquid-containing ore-treating compartment, of a series of nozzles located above the bottom of the compartment, each of the nozzles being provided with a nipple, and a number of separated passages communicating with the said nipple and extending transversely through the nozzle, the said nozzles being adjustable to deliver convergent series of currents of water to the compartment at any desired angle to the vertical, and means connected with the nipples for supplying water to the passages, substantially as described.

8. The combination with a liquid-containing ore-treating compartment having an outlet for concentrates, the wall of the compartment being provided with an opening, a nozzle journaled in the said opening and provided with a series of horizontally divergent transverse passages for delivering water in a corresponding series of divergent jets into the compartment, and means connected with the said nozzle for simultaneously supplying water to all of the said passages, the said nozzle being adjustable to deliver the series of jets of water at any desired angle to the vertical, substantially as described.

9. The combination with a liquid-containing ore-treating compartment having an outlet for concentrates, the wall of the compartment being provided with an opening, a nozzle longitudinally and horizontally journaled in the said opening and provided with a series of horizontally divergent transverse passages for delivering water in a corresponding series of jets into the compartment.

10. The combination with a liquid-containing ore-treating compartment having an outlet for concentrates, the wall of the compartment being provided with an opening, a nozzle longitudinally and horizontally journaled in the said opening and provided with a series of transverse horizontally divergent passages for delivering water in a corresponding series of divergent jets into the said compartment, and means connected with the said nozzle for simultaneously supplying water to all of the said passages, the said nozzle being adjustable to deliver said series of jets of water at any desired angle to the vertical, substantially as described.

11. The combination with a liquid-containing ore-treating compartment, the wall of the compartment being provided with an opening, an elongated nozzle horizontally journaled in the said opening and provided with a series of transverse horizontally divergent passages for delivering water in a corresponding series of divergent jets into the compartment, and means connected with the said nozzle for simultaneously supplying water to all of the said passages, for the purpose set forth.

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

BENJAMIN FRANKLIN COBB.

Witnesses:
A. J. O'BRIEN,
F. E. BOWEN.