(No Model.) 2 Sheets—Sheet 1.

H. SCOVELL.

ORE CONCENTRATOR.

No. 452,393. Patented May 19, 1891.

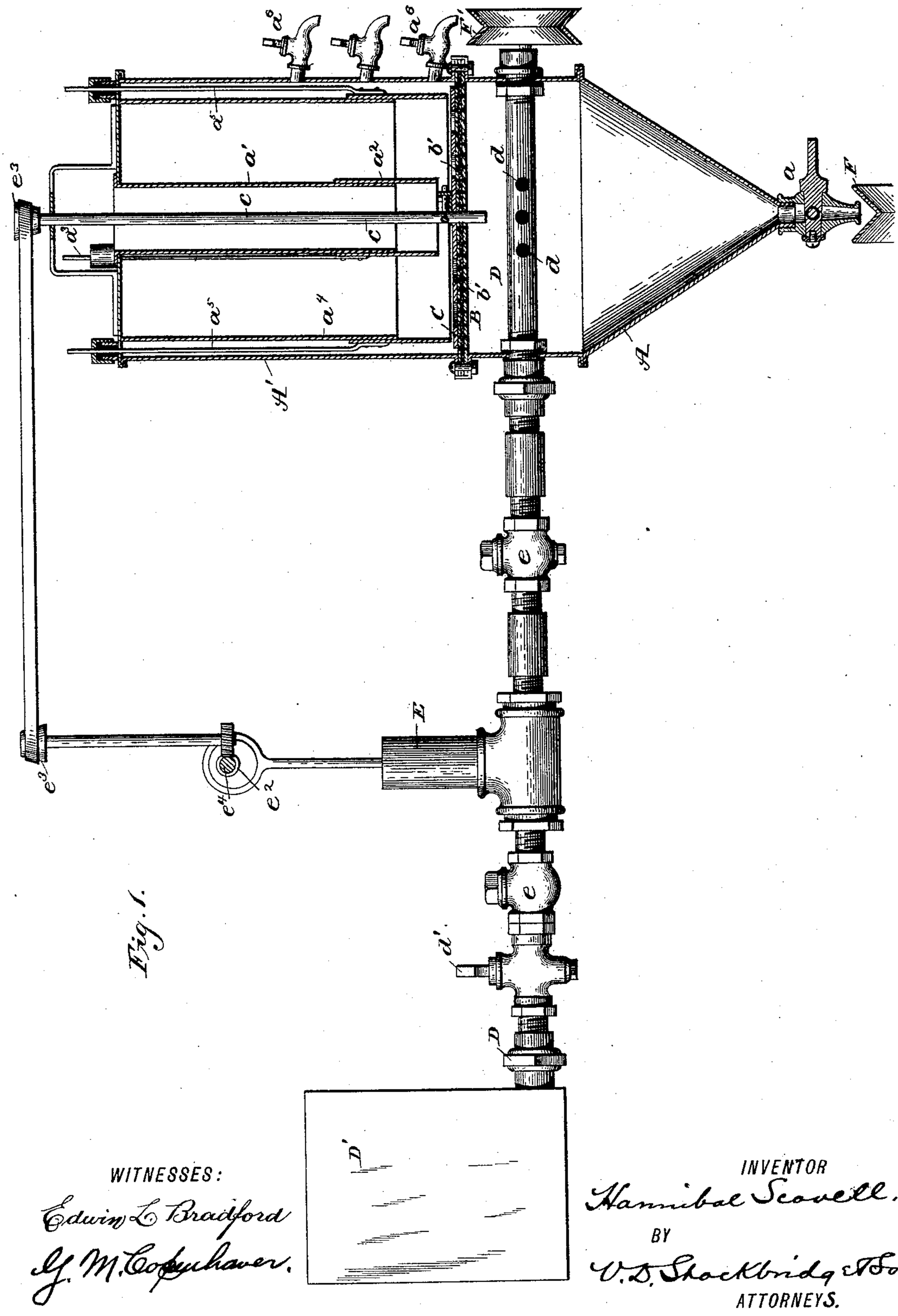

Fig. 1.

WITNESSES:

Edwin L. Bradford

G. M. Coffenhaver.

INVENTOR

Hannibal Scovell.

BY

V. D. Shackbridge & Son

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

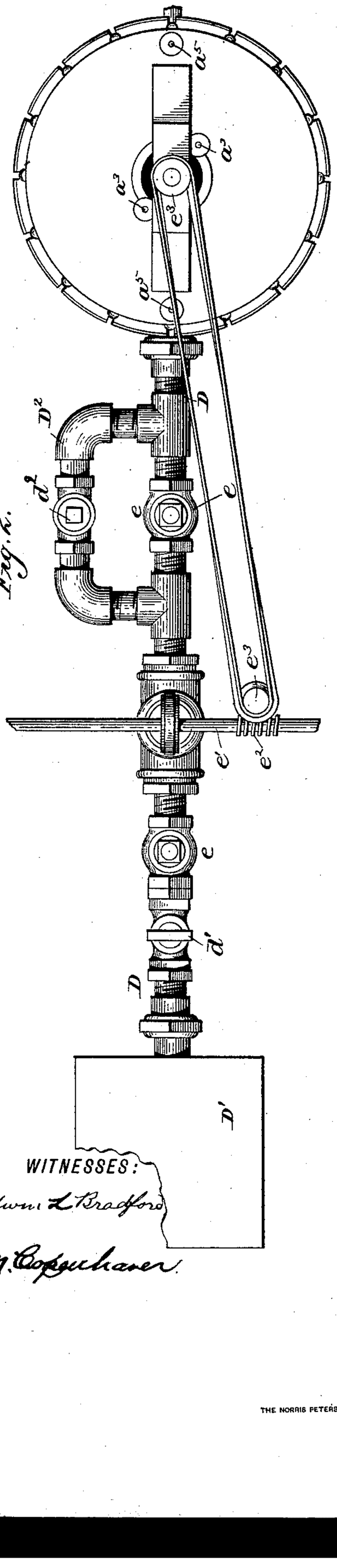


Fig. 3.

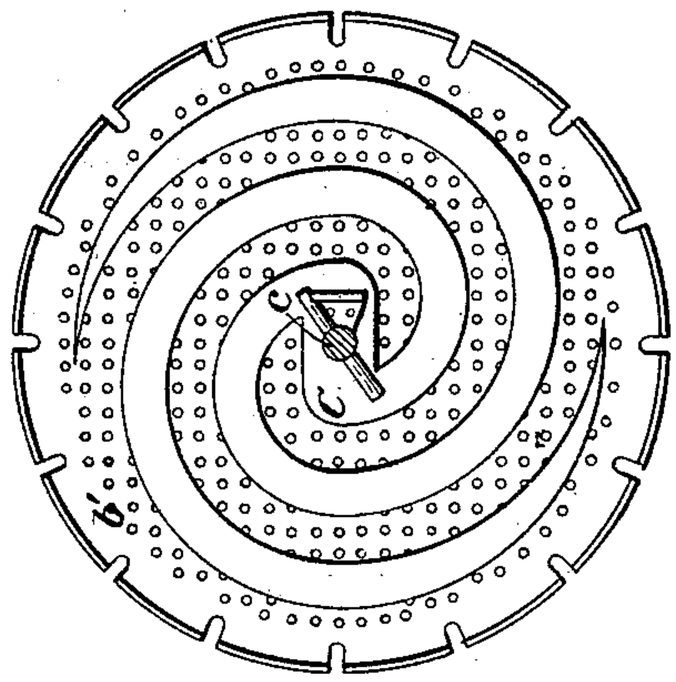
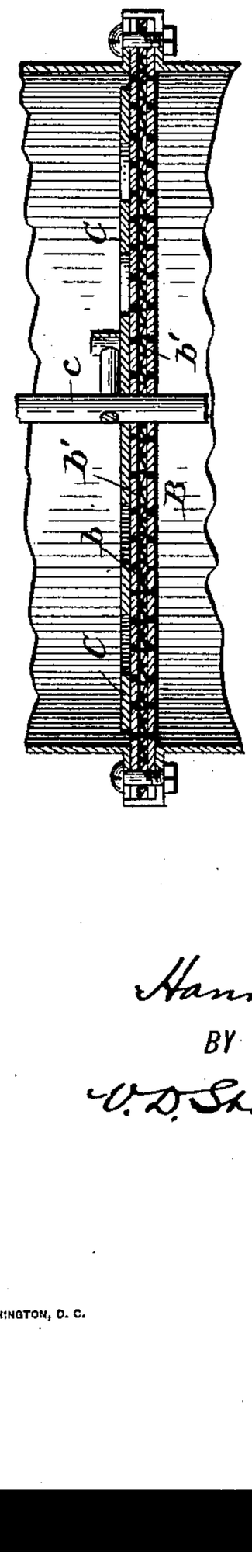


Fig. 4.



WITNESSES:

Edwin L. Bradford

J. M. Coppuchaver

INVENTOR

Hannibal Scovell

BY

U. D. Stockbridge & Son.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

HANNIBAL SCOVELL, OF PORTLAND, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 452,393, dated May 19, 1891.

Application filed October 18, 1890. Serial No. 368,591. (No model.)

To all whom it may concern:

Be it known that I, HANNIBAL SCOVELL, a citizen of the United States, residing at Portland, in the county of Ouray and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare that the following is 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.

The invention relates to improvements in ore-concentrators or machines for separating ores and minerals from refuse or waste matter.

The invention consists in the combination of a vessel or tank having a foraminated diaphragm across it and ports or openings for the reception of material to be treated and for discharging the tailings above the diaphragm, a fluid-conduit leading to the vessel below the diaphragm, a source of liquid-supply, and means for imparting an intermittent upwardly-progressive reciprocating or undulatory motion to the fluid.

The invention also consists in the combination, with the above-mentioned instrumentalities, of means for imparting pressure to the surface of the rising column of liquid.

It also consists in other combinations hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation, partly in section, of my improved apparatus. Fig. 2 is a top plan of the same. Fig. 3 is a plan of the diaphragm and a rotary stirrer or spreader, and Fig. 4 is a section, on an enlarged scale, through the diaphragm.

A is a vessel or tank having a hopper-shaped bottom. This vessel is by preference constructed in two parts, the upper part A′ being bolted through flanges to the lower part A. The lower part is provided with a cock or gate a to regulate the discharge of the values from the machine. The upper part has a central well or passage a' extending nearly to a horizontal diaphragm, and this well has a telescopic adjustable extension a^2 for regulating the proximity of the bottom of the well to said diaphragm. This extension is operated by a rod a^3 extending through the stuffing-box at the top. The pulp or other material to be operated upon is fed through the well to the diaphragm. There is also connected with the upper part a vertically-arranged partition or annular diaphragm a^4. This partition has also an adjustable skirt and a rod a^5 for operating it. The top of the upper part outside of the well is hermetically closed, forming air-chambers within the vessel above the liquid. Discharge-nozzles a^6 a^6 are arranged at different elevations along the side of the upper part A′. These openings are provided with cocks, so that any one or more of them may be opened to discharge at one time.

B is a horizontal diaphragm or screen. This is made up of wire fabric b, of any desired mesh, and perforated plates b' b'. The plates serve as armor or guards to protect the wire fabric from undue wear. The diaphragm as a whole is conveniently secured in place by being clamped between the flanges of the two parts of the vessel.

C is a rotary stirrer or spreader to distribute the pulp which enters through the well over the surface of the diaphragm. This spreader is operated by a vertical shaft c, extending upward through the well, as shown.

D is a liquid-conduit leading from reservoir D′ to the lower part of the vessel below the diaphragm, and D^2 is a loop or switch around the forward check-valve. The discharge end of this conduit within the vessel is by preference perforated, as shown at d d.

E is a pump connected with the conduit between the reservoir and the concentrating-vessel. This pump has the usual check-valves e e', and is driven through any suitable gearing, as by an eccentric on the shaft e^4. Between the liquid-reservoir and the pump there is a cock d' for shutting off the water from the pump as occasion may require, and for regulating admission to the pump, and in the loop or switch there is also a cock or gate d^2 to provide for and regulate a backflow to the pump. The stirrer or spreader is driven by suitable gearing connecting with the pump-driving shaft, as shown. The pump should be driven rapidly, and it should have a very short movement or stroke—say about one-

fourth of an inch. The speed of the spreader should be moderate, and a convenient means of regulating and reducing the speed from the pump-driving shaft to the spreader is the worm e^2 and the cone-pulleys e^3 e^3.

F is a trough or V shaped belt conveyer (shown in section on pulleys shown in elevation) for conducting the values from the vessel A to a proper receptacle, and F′ is a similar conveyer for conducting the tailings to place of deposit.

In operation, the cock d' being open and the pump started, pulp or material to be concentrated and graded being fed through the well, and the cock or gate a regulated, liquid is drawn from the source of supply by the upward or forward movement of the pump-piston and driven forward to the vessel A by the downward or reverse movement of said piston. This is continued until the vessel is filled to or above the diaphragm. The cock d^2 is then adjusted to permit the passage backward of a relatively small volume of liquid, when the upward and forward stroke of the pump-piston will draw the liquid forward from the main supply and backward from the vessel, thus producing a backward movement or impulse of the liquid in the vessel, and upon the reverse stroke an amount of liquid equal to the full capacity of the pump is driven forward into the vessel. This operation produces a reciprocating or undulatory motion of the liquid in the vessel; but as there is a greater amount injected by the downward stroke than is withdrawn from the vessel by the upward or forward stroke there will be an intermittent upwardly-progressive reciprocating current or volume of liquid constantly passing through the apparatus. The forward impulses serve to lift the liquid and its suspended contents step by step, and the backward impulses intermittently draw the same downward, thus keeping the contents of the liquid aroused and suspended, but permitting the heavier portions to settle below the lighter, and finally drawing such heavier portions through the screen to the lower part of the vessel, whence they are discharged through the gate a. This operation in a manner scrubs the valuable parts, perfectly cleans the same, and separates the waste from the values. The air within the chambers above the liquid becomes compressed by the inflow of the liquid and serves to press the surface floats into the liquid, and thus prevents the formation of slimes. It also serves as an elastic compress and operates in the nature of a piston, which may be used instead of an air-cushion to accelerate or augment the effect of the backward motion or impulse of the liquid upon the return movement of the pump-piston.

The lower edge of the wall and the skirt of the annular partition are made adjustable to accommodate ores and minerals of different grades of fineness. The ore passes down the well and thence radially outward under its lower end, and is gradually spread over the screen by the spreader, and the waste passes out beneath the skirt of the annular partition and escapes by the ports or waste-cocks a^6.

I do not herein claim the process of treating ores described, the same being made the subject of application, Serial No. 369,736, filed by me October 29, 1890.

Having now described my invention, what I claim is—

1. The combination of a vessel having ports for the reception of material to be treated and for discharging tailings, a foraminated diaphragm or screen athwart the vessel below said ports, a fluid-conduit leading to the vessel below the diaphragm, a source of liquid-supply, and means, consisting of differential fluid injecting and withdrawing mechanism, for imparting an intermittent upwardly-progressive reciprocating or undulatory motion to a volume of fluid within the vessel, as set forth.

2. The combination of a vessel having ports for the reception of pulp and for discharging tailings, a foraminated diaphragm or screen below said ports, a fluid-conduit leading to the vessel below the diaphragm, a source of liquid-supply, a force-pump, and a liquid-switch, substantially as described.

3. The combination of a vessel having ports for the reception of pulp and for discharging tailings, a foraminated diaphragm or screen below said ports, a fluid-conduit leading from the source of supply to the vessel below the diaphragm, means, consisting of differential fluid injecting and withdrawing mechanism, for imparting an intermittent upwardly-progressive reciprocating movement to the liquid, and a piston above the liquid-level, substantially as described.

4. In an upwardly-progressive reciprocating-current ore-concentrator, a piston for accelerating the return or backward movement of the liquid, substantially as described.

5. In an upward-current ore-concentrator, a dome or air-chamber above and within the fluid-level for compressing the surface floats within the liquid and thus preventing the formation of slimes, substantially as described.

6. In an upward-current ore-concentrator, the combination of a vessel, a horizontal screen within said vessel, a dome or air-chamber above the screen, and means, as a rod, for adjusting the sides of the dome with relation to the screen, substantially as described.

7. In an upward-current ore-concentrator, the combination of a vessel, a horizontal screen within said vessel, a dome or air-chamber above the screen, and a well or passage extending through the dome, substantially as described.

8. In an upward-current ore-concentrator, the combination of a vessel, a horizontal screen within said vessel, a dome above the screen, a well or passage through the dome, and means, as a rod, for adjusting the lower

walls of the well with relation to the screen, substantially as described.

9. In an ore-concentrator, the combination of a vessel having ports for the reception of the pulp and for discharging tailings, a screen below said ports, a fluid-conduit leading from a source of liquid-supply to the vessel below the diaphragm, a force-pump, a liquid-switch, and a dome or air-chamber above the screen having an adjustable skirt, substantially as described.

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

HANNIBAL SCOVELL.

Witnesses:
A. J. STILES,
WM. M. STOCKBRIDGE.