

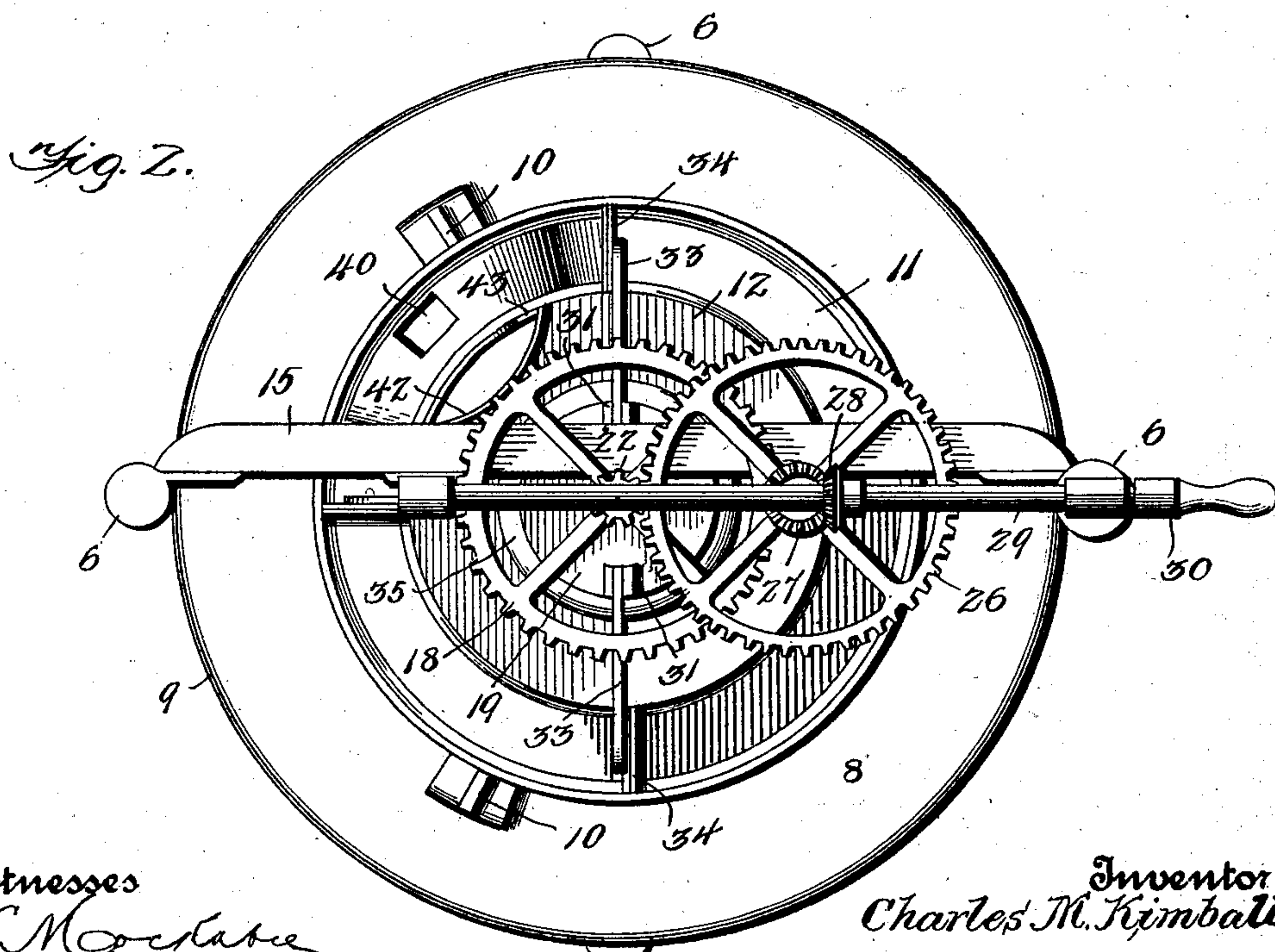
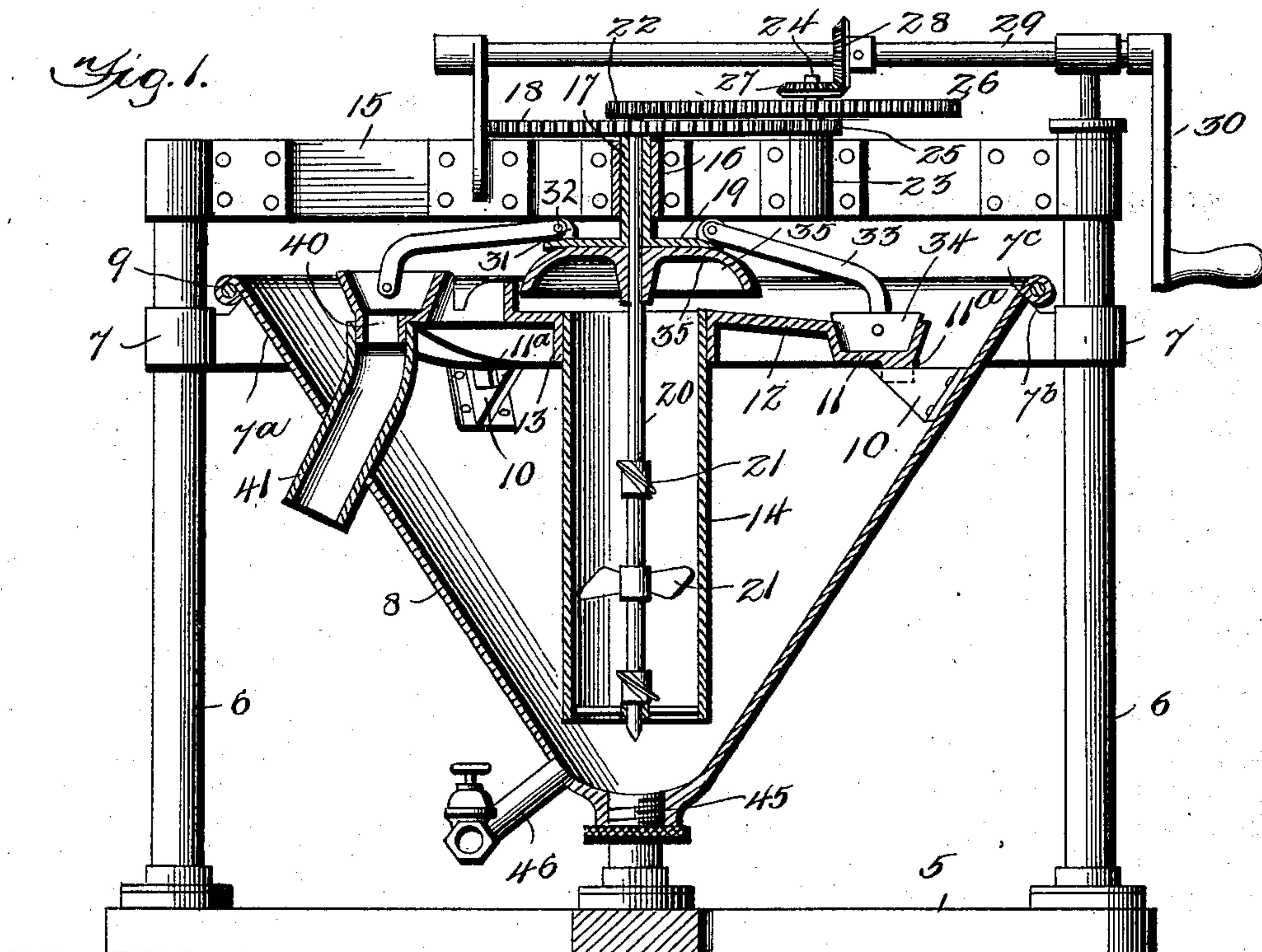
**No. 698,293.**

**Patented Apr. 22, 1902.**

**C. M. KIMBALL.**  
**ORE CONCENTRATOR.**

Application filed Dec. 16, 1901.)

(No Model.)



Witnesses

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# UNITED STATES PATENT OFFICE.

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## ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 698,293, dated April 22, 1902.

Application filed December 16, 1901. Serial No. 86,042. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES M. KIMBALL, of Port Huron, in the county of St. Clair and State of Michigan, have invented new and  
5 useful Improvements in Ore-Concentrators; and I do hereby declare the following to be a full, clear, and exact description of said invention, reference being had to the accompanying drawings, and to the figures of reference  
10 marked thereon, which form a part of this specification.

The invention relates to ore-separators of that type in which the gold or other heavy material is concentrated at one point of the  
15 apparatus, while the lighter material, the sand, pebbles, &c., constituting the tailings or the mining debris, is washed therefrom.

As is well known, there are many places in the United States, Canada, and other coun-  
20 tries where gold and other precious metals exist in more or less quantities in sandy and pebbly soil which, however, is inaccessible to water in large quantities. In such locations it has frequently been found impossible  
25 to obtain gold in paying quantities owing to the lack of sufficient water, although water in somewhat limited quantities is obtainable.

The particular object of my invention is the production of an ore-separator which shall be  
30 simple in construction and easy to operate and which will enable a relatively small quantity of water to be used over and over with but slight and occasional additions of water to replace that which adheres to the dis-  
35 charged tailings or mining debris.

To this end my invention consists in the construction and combination of parts, substantially as hereinafter described and  
40 claimed.

In the accompanying drawings, Figure 1 represents a vertical sectional view of a machine embodying my invention. Fig. 2 represents a plan view of the machine.

Similar reference characters indicate similar parts in both figures of the drawings.

Rising from a suitable base 5 are standards 6, having brackets 7, which are preferably formed, as represented in Fig. 1, with inclined end faces or edges 7<sup>a</sup> and short rearwardly-  
50 inclined faces 7<sup>b</sup>, forming at their apex a top or point 7<sup>c</sup>.

A tank 8, which is preferably the shape of

an inverted cone, is formed with a wired edge or rim 9, whereby the tops 7<sup>c</sup> of the brackets 7 will engage under the rim, so as to firmly  
55 hold and support the tank in position to be readily removed by lifting from between the standards or brackets. The inner wall of the tank is provided with brackets (preferably three) on which there is removably supported  
60 what I may term an "overflow" disk or plate, which has a trough at its outer edge. Said trough is indicated at 11, and the under side of the trough is provided with inverted-U-  
65 shaped brackets or guides 11<sup>a</sup>, which rest upon the brackets 10, and therefore support the trough and prevent any tendency to rotate. The trough 11 is connected to or formed  
70 integral with the outer edge of the overflow plate or disk 12, which latter is preferably slightly inclined downward from its center to the trough. The center of the disk 12 is provided with an opening and with a downwardly-  
75 extending circular flange 13, to which is connected the central vertical pipe or cylinder or flume 14, the lower end of which is open and terminates a short distance above the bottom  
80 of the tank. It will be seen that the flume or cylinder 14, the disk 12, and the trough 11 are all removably supported upon the brackets 10. A cross-bar 15 connects two of the standards  
85 6, which project or rise somewhat above the upper edge of the tank for this purpose. At substantially the center of the cross-bar 15 is a vertical bearing 16 for a sleeve 17, having  
90 a gear 18 at its upper end and a plate 19 at its lower end, the purpose of which latter will be hereinafter described. Mounted to rotate in the sleeve 17 is a shaft 20, which extends  
95 down to substantially the lower end of the vertical cylinder 14 and is provided with several series of angular blades, (preferably three series, as shown,) each of which series of blades, as shown, is similar to a screw-propeller. These blades serve to elevate the wa-  
100 ter and mining debris through the central vertical cylinder or flume, although I do not limit myself to this particular means of causing the circulation, which will be hereinafter described. The upper end of the shaft 20 is provided with a pinion 22.

At one side of the bearing 16 is secured a bearing 23 for a short vertical shaft 24, carrying the gear 26, meshing with the pinion



22 of the shaft 20, and a pinion 25, meshing with the gear 18 on the sleeve 17. The relative sizes of these pinions and gears are such that the rotation of the shaft 20 will be several times greater than the rotation of the sleeve 17. The shaft 24 also has at its upper end the bevel-pinion 27, meshing with the bevel-pinion 28 on a horizontal shaft 29, mounted in suitable bearings carried by the cross-bar. This power-shaft 29 may be operated by a suitable engine or by manual power by means of a crank or handle 30.

The plate 19 has a series of pairs of lugs 31. A pin 32 connects each pair of lugs. To the pins 32 are pivoted the inner ends of arms 33, the outer ends of which extend downward into the trough and carry scraper-blades 34, which are preferably pivoted to the outer ends of the arms.

I preferably employ a deflector under the plate 19. A suitable deflector is represented at 35 and consists of a concavo-convex casting secured under the plate 19, so as to deflect onto the disk 12 the water and mining debris rising from the central cylinder or flume.

It will now be readily understood that the rotation of the shaft 29 and the circulating-blades at the requisite speed and in the proper direction will cause such a rapid circulation of water in the tank (said circulation being downward outside of the central cylinder and under the lower edge thereof) as to cause the water to carry with it up through the flume all but the heaviest particles which are in the material being mined. The heavy particles, as the gold, will settle at the bottom of the inverted-cone-shaped tank, while the sand, pebbles, &c., will be carried up through the flume or central cylinder and out over the disk 12 and will lodge in the trough, while the water flows over the trough back into the tank.

To continuously dispose of the sand or mining debris, I provide the following construction: At one point of the circumference of the disk 12 the trough 11 is raised, preferably, so that at this point its bottom will be slightly above the upper surface of the disk 12. This raised portion of the trough is provided with an opening 40, which communicates with a spout 41, leading out through the side of the tank, the outer end of said spout being adapted to discharge into any suitable chute or tube. The scrapers, which are moved along the trough at a comparatively slow speed, carry before them the mining debris which lodges in the trough, and as each scraper approaches the raised portion of the trough it rides up the inclined surface thereof (the arms 23 being pivoted, as hereinbefore described, for this purpose) and pushes the debris along until it passes out through the opening 40 and spout 41. The opening 40 is narrower than the width of the scraper-blades 34, so that the latter will ride over the opening and down the other inclined plane of the trough to continue their journey around the disk 12.

To avoid as far as possible the loss of any material quantity of water through the opening 40, I provide an opening in the disk 12 near its edge, said opening having a vertical flange 42. At one end of this flange 42 the inner wall of the trough is cut away to form a lateral outflow for the water, this lateral outflow being represented at 43.

During the operation of the machine any water that is being pushed up the incline toward the opening 40 by a blade 34 escapes through the outflow 43 back into the tank, leaving only the moist sand to be discharged through the opening 40. Such sand or debris as escapes from the trough with the water through the outflow or passage 43 is eventually removed from the tank by the continued operation of the machine.

The operation of the machine, as hereinbefore described, results in leaving the gold at the bottom of the tank and carrying all mining debris away therefrom, said operation being continuous for as long as the operator desires. The material is supplied over the open edge of the tank in any suitable way, by hand or otherwise. For some little time after the last of the material has been placed in the tank operation of the circulating-shaft and the debris-removing arms and scrapers will be continued until nothing remains in the tank but water and the gold at the bottom. It will be of course understood that during such operation sufficient water will be supplied to the tank in small quantities to replace that carried out by the moist debris, the level of the water being preferably kept at or just below the upper edge of the trough. No such power is required to operate the machine as would be the case if water and debris had to be lifted from a level at the lower end of the vertical cylinder to the upper end thereof, for the reason that only such power is required as is necessary to overcome the difference in the level of the water surrounding the vertical cylinder and the upper end of said cylinder. The lower end of the tank is provided with an opening with any suitable closure, such as a plug 45. Before removing the gold through this opening the water will be drawn off, as by means of a pipe 46, this pipe communicating with the tank at a point a little at one side of and above the bottom of the tank, so that the gold will not be carried out when the water is being drawn off.

I claim as my invention—

1. An ore-separator comprising in its construction an open tank having a settling-trough with a generally imperforate bottom located within its upper portion, means also within the tank for circulating water and tailings from the lower part of the tank to said trough, and means for moving the tailings which lodge in said trough along the bottom thereof, a tailings-outlet from the trough extending through the outer side of the tank, whereby gold or other heavy material will remain at the bottom of the tank while the tail-



ings will be elevated into the trough, and automatically and continuously removed therefrom while the water overflows from the trough into the tank, as set forth.

5 2. An ore-separator comprising in its construction a tank having a vertical flume or cylinder located therein and open at the top and bottom, a circular settling-trough surrounding the upper end of the flume below  
10 the upper edge of the tank and adapted to receive water and tailings discharged at the upper end of the flume and to return water to the tank by overflow, means for elevating water through said flume, the said trough being  
15 provided with a debris-opening, and means for moving debris around the trough to the opening.

3. An ore-separator comprising in its construction an inverted-cone-shaped tank having  
20 a vertical flume or cylinder located therein and open at the top and bottom, a circular settling-trough surrounding the upper end of the flume below the upper edge of the tank and adapted to receive water and tailings discharged at the upper end of the flume and to  
25 return water to the tank by overflow, means for elevating water through said flume, the said trough being provided with a debris-opening, and means for moving debris around  
30 the trough to said opening, means being provided for removing gold from the bottom of the tank.

4. An ore-separator comprising an inverted-cone-shaped tank having brackets 10 projecting inwardly therefrom, a circular settling-trough resting on said brackets, a vertical cylinder or flume located centrally and having  
35 a circular plate or disk connecting its upper end with the trough, means for elevating water within the flume, and scraper-blades movable in said trough, said trough having provision for the discharge of mining debris therefrom and for returning the water to the  
40 tank by overflow.

45 5. An ore-separator comprising an inverted-cone-shaped tank having brackets 10 projecting inwardly therefrom, a circular trough

resting on said brackets, a vertical cylinder or flume located centrally and having a circular plate or disk connecting its upper end  
50 with the trough, means for elevating water within the flume, scraper-blades movable in said trough, said trough being raised at one portion and having an opening in its bottom, and a chute or spout leading from said opening  
55 outside of the tank.

6. An ore-separator comprising an inverted-cone-shaped tank having brackets 10 projecting inwardly therefrom, a circular trough resting on said brackets, a vertical cylinder  
60 or flume located centrally and having a circular plate or disk connecting its upper end with the trough, means for elevating water within the flume, a rotatable disk or plate above the flume and means for rotating it, outwardly-  
65 projecting arms pivoted to said disk and having scraping-blades pivoted to their outer ends, said trough being raised at one portion and having an opening in its bottom, and a  
70 chute or spout leading from said opening outside of the tank.

7. An ore-separator comprising in its construction a tank, a vertical flume or passage mounted centrally in the tank and having a  
75 circular trough within the upper portion of the tank and below the upper edge thereof, said trough surrounding and communicating with the upper end of the flume, a shaft having spiral blades mounted in said vertical  
80 flume, a disk surrounding said shaft and having arms provided with blades fitting and movable in said trough, said trough being provided with an outlet for tailings, means  
85 for rotating the shaft and the scraper-carrying disk, and gearing whereby the shaft rotates at a higher speed than that of the scraper-carrying disk.

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

CHARLES M. KIMBALL.

Witnesses:

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