No. 754,911. PATENTED MAR. 15, 1904.

C. ALLEN.

AUTOMATIC ORE AND SLIME SEPARATOR.

APPLICATION FILED JAN. 27, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

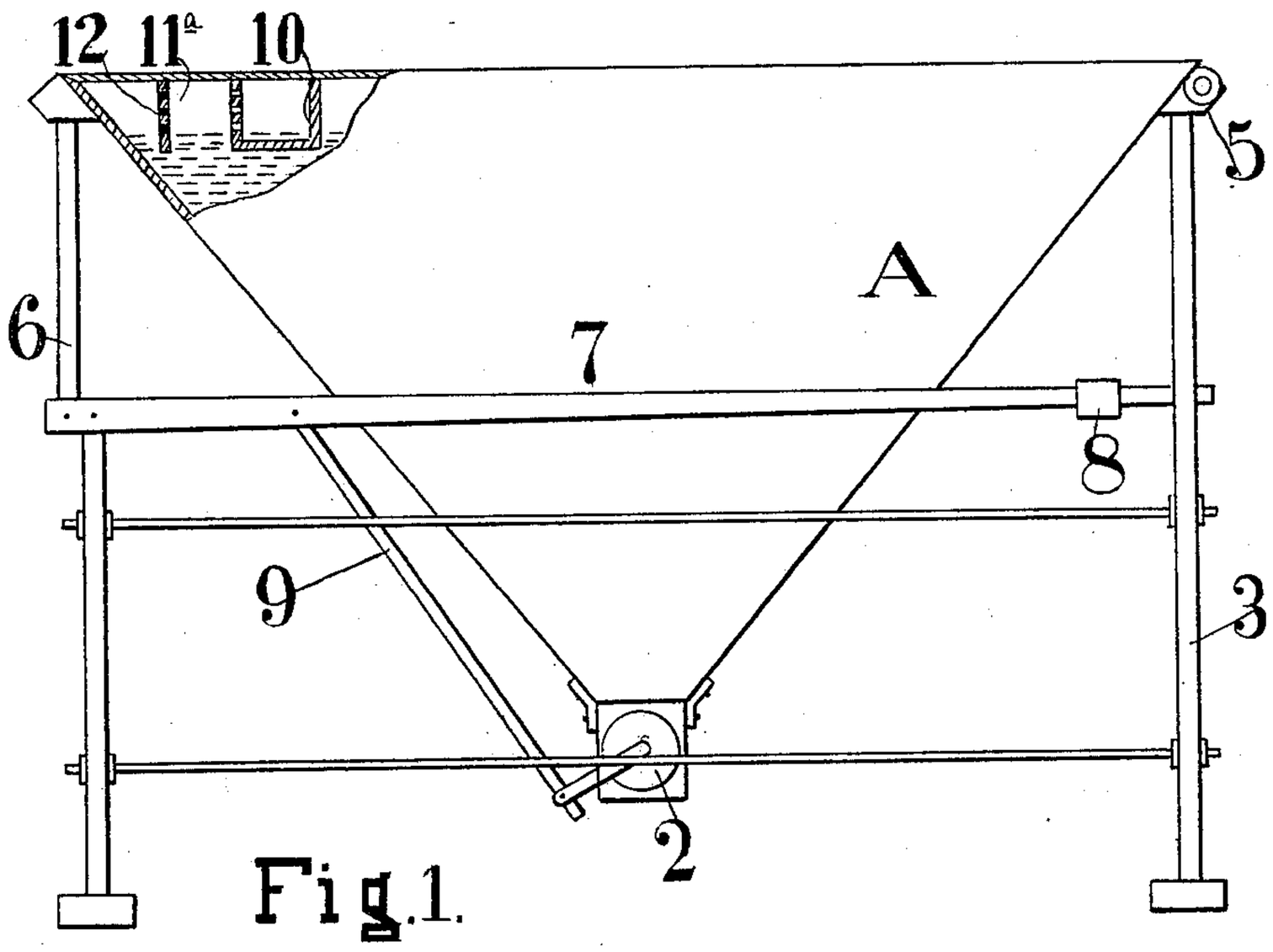

Fig. 1.

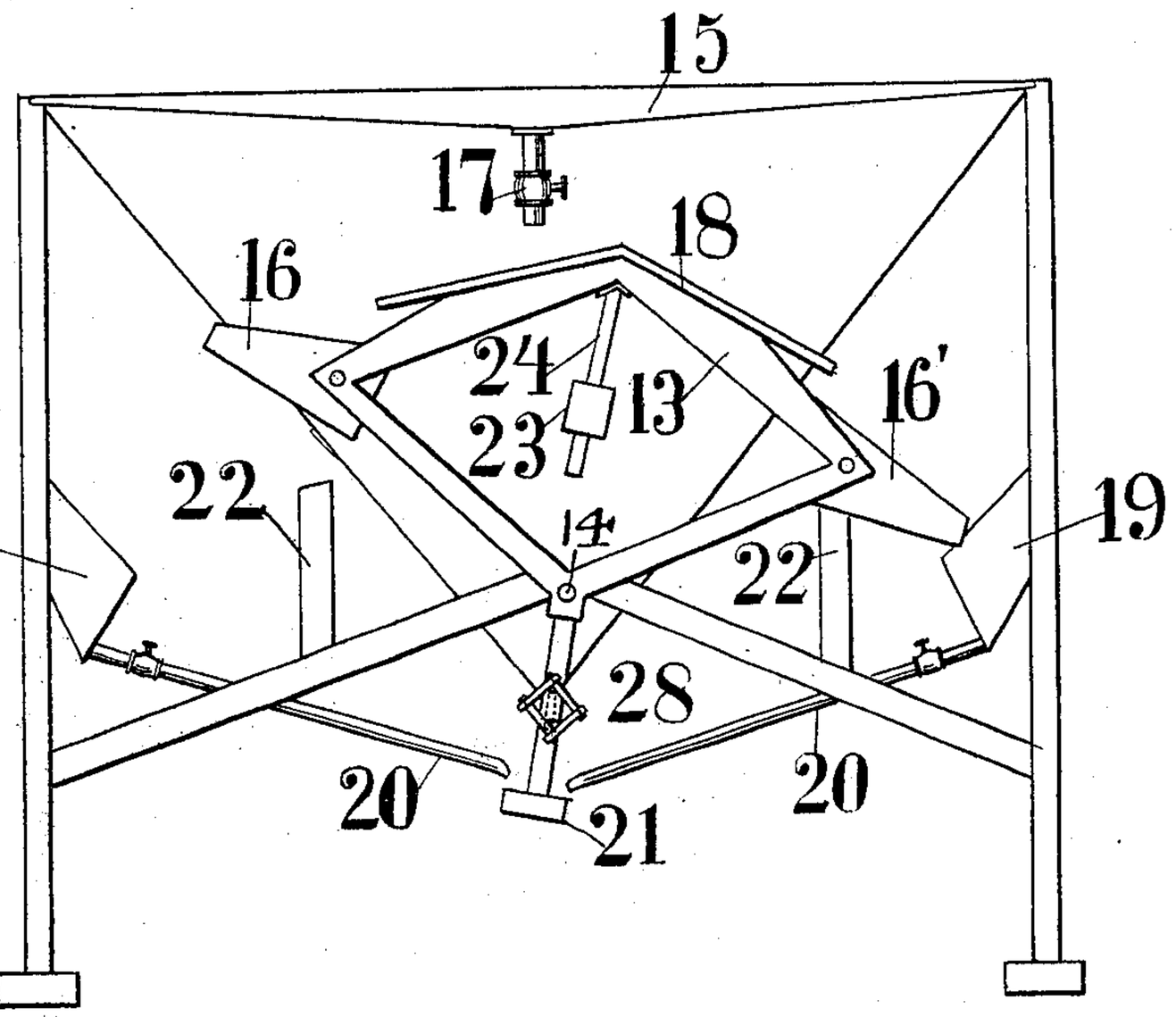

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 2.

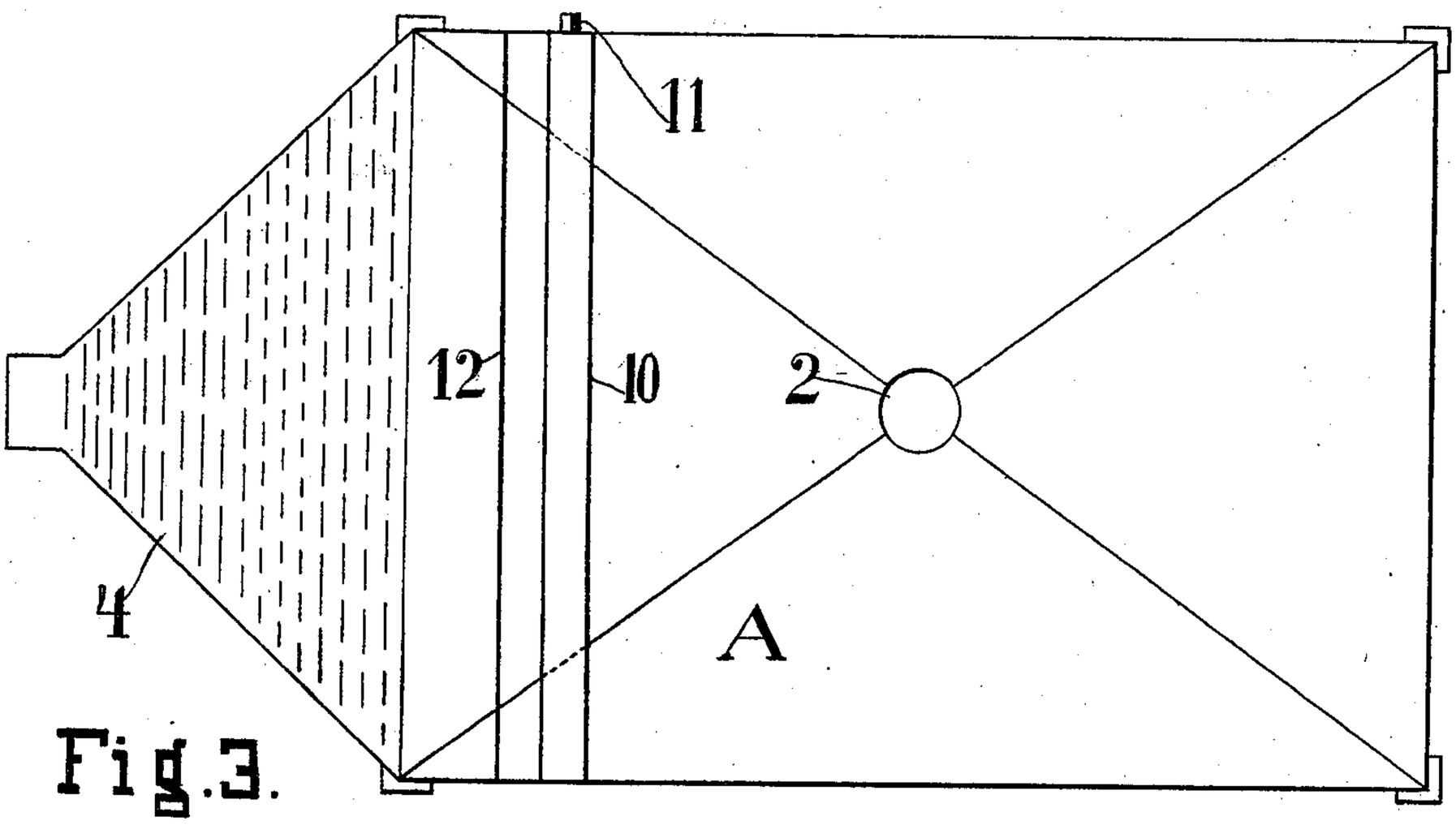

Fig. 3.

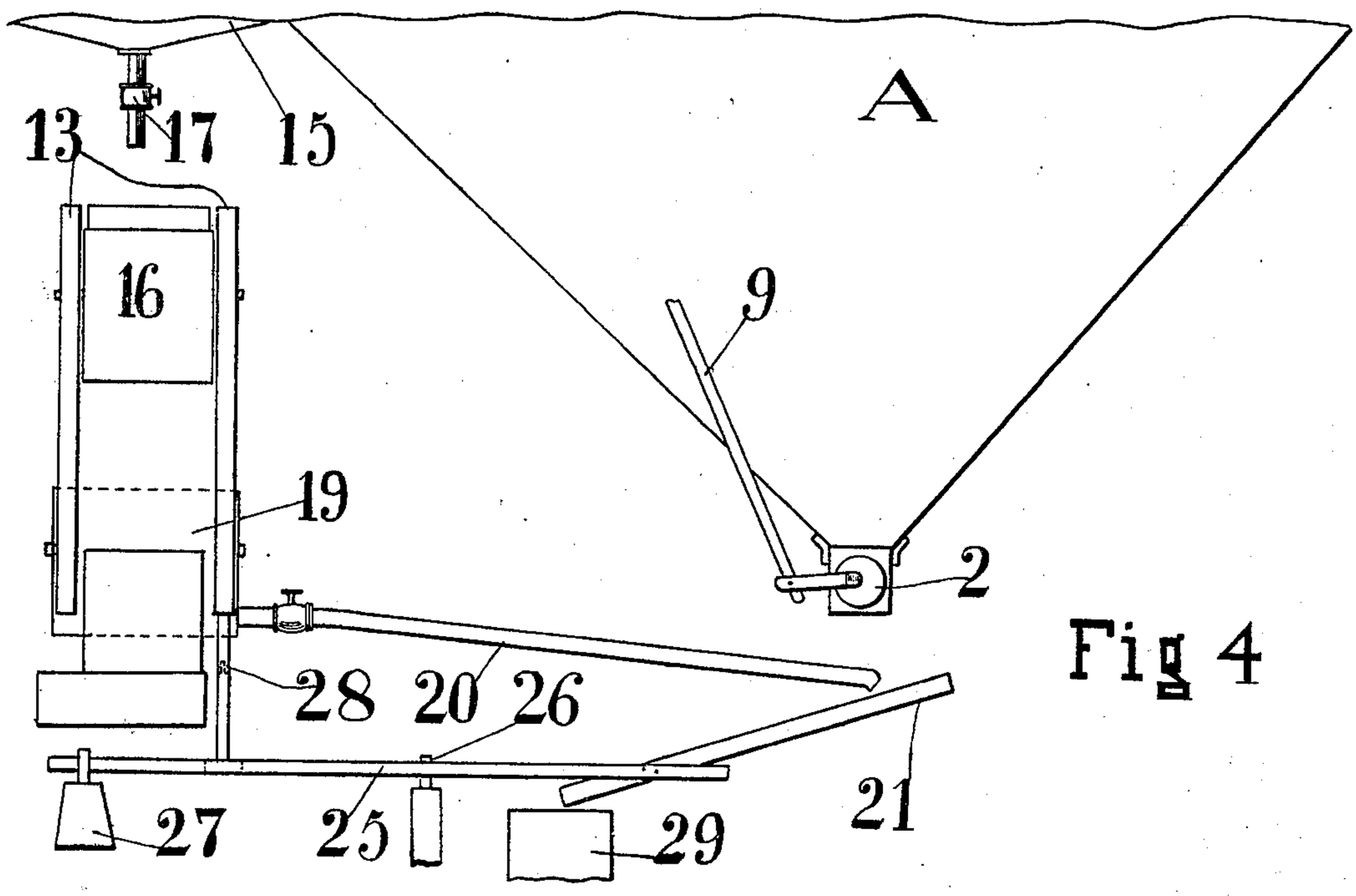

Fig 4

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AUTOMATIC ORE AND SLIME SEPARATOR.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

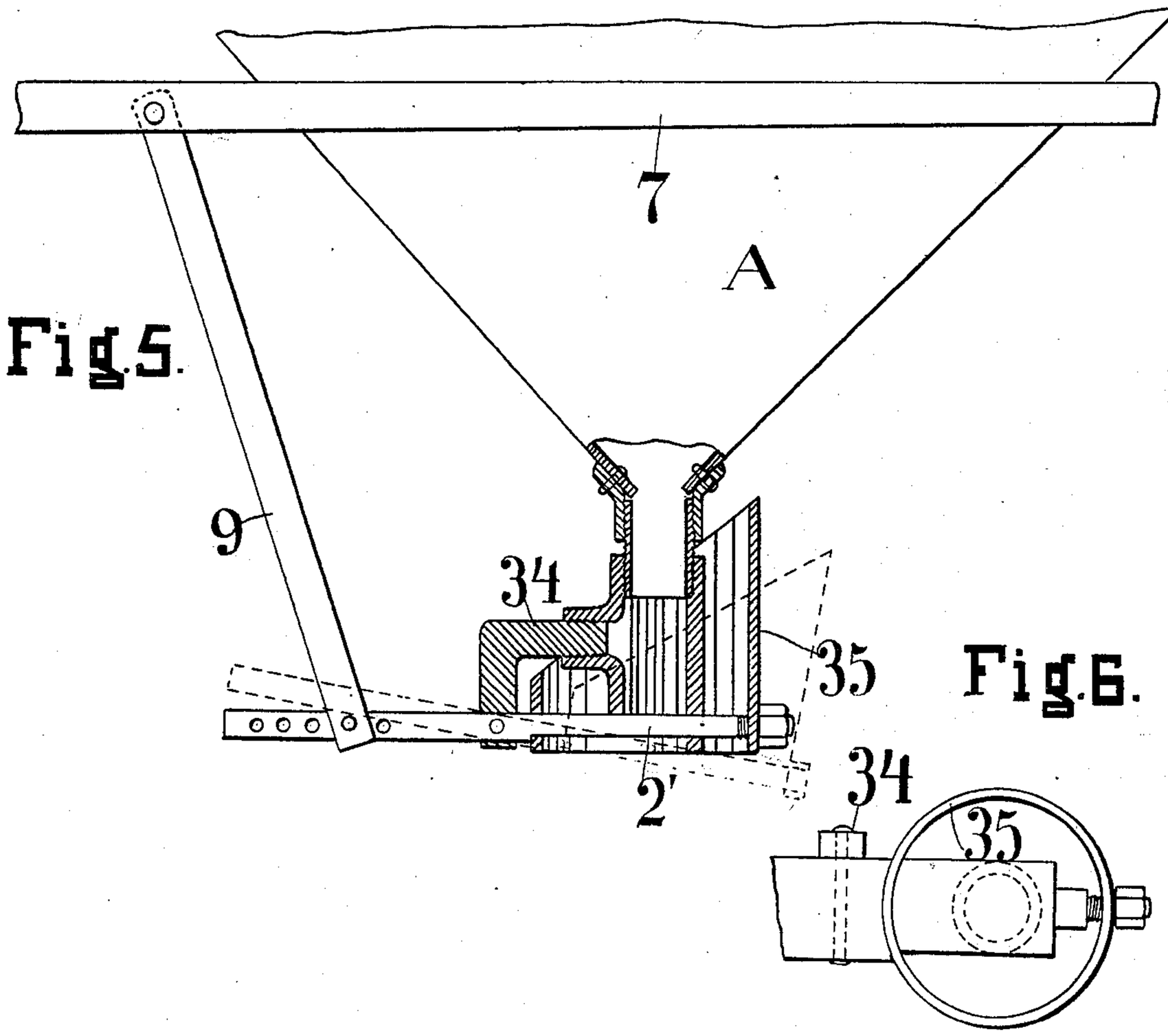

Fig. 6.

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No. 754,911. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

CHARLES ALLEN, OF EL PASO, TEXAS.

AUTOMATIC ORE AND SLIME SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 754,911, dated March 15, 1904.

Application filed January 27, 1903. Serial No. 140,735. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ALLEN, a citizen of the United States, residing at El Paso, county of El Paso, State of Texas, have invented an Improved Automatic Ore and Slime Separator; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in mining apparatus, and particularly in that class of apparatus known as "settlers."

Where tailings from wet crushings-mills are to be treated by the cyanid process it is desirable that the material should be delivered into the vats in as dry a condition as possible in order, among other reasons, not to dilute the solution more than is absolutely necessary. It is also desirable to take samples from time to time of the material delivered from the settler in order to determine the value of the ore passing through the mill.

The object of the invention is to provide an apparatus which will, first, effect a separation of the sand and other solid particles from the water, whether these particles sink in the water or are so light as to float on the surface; second, which will automatically adjust itself to the quantity of sand and slime entering with the water, so as always to discharge sand and slime of the same consistency; third, which will furnish clear water for reuse; fourth, which will automatically discharge the material after separation, and, fifth, which will take a sample at intermittent periods of the tailings so discharged without using other power than that furnished by the settler or separator or its contents.

The invention consists of the parts and the construction and combination of parts hereinafter more fully described, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation, partially broken away, of the settler, showing baffles. Fig. 2 is a rear end view of same and sampler. Fig. 3 is a plan view of settler. Fig. 4 is an end view of sampler, showing relation with the settler. Fig. 5 is a detail of the sand-discharge valve. Fig. 6 is a bottom view of same.

A represents a settling-tank having its sides and bottom inclined downwardly and converging to a common discharge-opening controlled by a suitable valve 2. The tank may be of any convenient size and is preferably made of metal. The top may be of any desired shape; but the angle of the sides should be greater than the angle of resistance of the sand or slime, so that the latter will ever gravitate toward the lowest point. The tank is supported on the frame-standards 3 in such manner that the end at which the stream of pulp enters through trough 4 will have a limited up-and-down movement to actuate the valve 2 when sand or other heavy particles in excess of a predetermined quantity have accumulated in the tank. These results may be achieved in a variety of ways. In the present instance I have shown the tank pivoted at one end, as at 5, and the other or feed end supported by connecting-rods 6 upon levers of the first class, as represented at 7, carrying the counterbalance-weights 8. One of the levers connects by a rod 9 with an arm on the valve-stem, whereby the valve will be operated on the oscillations of the tank. As the sand and other heavy particles accumulate in the bottom of the tanks the volume of water is displaced, and whenever the quantity of material so settled is sufficient to overcome the weights 8 the entrance end of the tank is depressed to open valve 2 and allow a quantity of the compacted material to pass out of the tank into a suitable car or conveyer, whereby it may be delivered to the leaching-vats comparatively freed of water. Should the quantity of sand entering the tank or hopper diminish and the gate or valve in the bottom discharge it faster than it is entering the hopper, the entrance side or end of the hopper rises, thereby closing the valve in proportion to its rise. By this action there is always approximately the same quantity of sand over the outlet in the bottom of the hopper, and the depth of this sand regulates the freedom from water of the sand and slime passing through the discharge gate or valve. Should the entrance of sand and slime into the hopper be completely stopped, the entrance end or side of the hopper will rise until the sand-discharge gate or valve is completely closed. The sand and slime remaining in the hopper settling around the closed gate or valve chokes

it water-tight even when the gate is very loose. The hopper remains full of water ready for the entrance of the pulp or tailing stream when the side or end of the hopper is again depressed, and the discharge gate or valve is opened in proportion to the quantity of sand and slime entering the hopper. The amount of sand that the tank may hold before valve 2 will be actuated is determined by adjustment of the counterweights 8 on levers 7. The difference in weight between the ordinary settled material and the displaced water in favor of the former is approximately thirty-seven and one-half pounds per cubic foot. As long as the hopper or tank is full of water the sand will not have opportunity to pack about the valve sufficiently to prevent its opening, owing to the diameter and shortness of the discharge-opening and the pressure of the incumbent body of water.

In order to prevent surface currents in the tank and to collect the floating slimes or values that would otherwise flow over the lower discharge end of the tank and be lost, I provide one or more baffles and collectors adjacent to the outlet of the feed-trough 4. In the present instance a combined baffle and collector or slime-trough 10 is shown extending across the tank, having a valve-controlled discharge-opening 11 at one end through the side of the tank. Trough 10 may be of any desired depth, and the edges of its sides project a couple of inches above the surface of the water. The side adjacent to the feed-trough is perforated, as at 11^a, the size and number of the perforations, slots, or holes depending on the character of the pulp handled. A second baffle 12 or any number of baffles may be disposed intermediate of baffle 10 and the feed-trough 4, projecting above and below the surface of the liquid in the tank and provided with perforations staggering with the perforations in the side of baffle 10. These perforations are so disposed that when the feed end of the tank is in elevated position—*i. e.*, when valve 2 is closed—they will be just above the surface of the water, so that nothing can enter trough 10; but when the tank is depressed to open valve 2 their lowest edges will come below the surface, whereby a thin stream may flow from the tank into the slime-trough 10 and thence out through opening 11. This creates temporarily a surface current to carry off the flotsam. The pulp enters the tank from trough 4 in a thin sheet with no greater velocity than sufficient to carry the sand. The heavier particles of the inflowing pulp immediately settle to the bottom of the tank. The baffles arrest any surface agitation, thereby allowing the finer particles to settle. The floating values are collected as described, and the clear water is decanted from the tank to be stored and used again, if desired.

It is necessary from time to time to take samples of the ore that is passing through the mill for the purpose of assay. I have devised a means in connection with my settler by which a sample of the material discharged from the tank may be taken automatically at intervals through the medium of the settler and its contents.

13 represents a polygonal frame pivoted to a fixed support below its center, as at 14. This frame is disposed beneath a launder 15, receiving the overflow from tank A. At opposite points of the frame, on either side of pivot 14, are pivoted the water boxes or buckets 16 16′, which are adapted to be filled alternately from the launder-trough 15 on the oscillation of the frame. The launder has a small valve-controlled discharge-pipe 17 in its bottom, through which water may trickle or flow in a small stream into one or the other of the oppositely-inclined troughs 18, discharging into the buckets 16 16′. The remaining water may be discharged from the launder by a separate outlet, to be stored and used again, if desired. The frame 13 is in unstable equilibrium, so that normally one bucket or the other will be elevated, and the water from pipe 17 will flow into that bucket. When the weight of water in the bucket is sufficient to tilt the frame, the contents of the buckets will be dumped into a receptacle 19 and delivered thence by a pipe 20 into a spout 21, which has meanwhile received a sample of material passing valve 2. The buckets are each provided with a cross-piece or baffle at the outer end, so that the water will not splash out and be discharged all at once on the buckets striking the stops 22. During discharge the frame is also supported on one or the other of the stops, as shown. The shape of each bucket is such and the bottom is so inclined that the discharge end of the bucket is considerably removed from its pivot, whereby the water exerts an additional leverage to keep the bucket depressed until delivered of all its contents. The amount of water necessary to oscillate frame 13 may be further regulated by shifting the position of weight 23 on stem 24, projecting downwardly from the apex of the troughs 18. During the oscillation of the frame which results from the filling of a bucket the spout or sample-receiver 21, which oscillates at right angles to frame 13, has been moved across the path of the discharging material passing valve 2 by the following means: The spout is secured to a horizontal bar 25, pivoted intermediate of its ends at 26. The spout may be counterbalanced by a movable weight 27. Frame 13 has a telescoping extension 28 below its pivot, which extension is pivoted to bar 25, whereby in the resulting synchronous oscillations of the frame and spout the end of extension 28 will move in a straight line rather than in an arc of a circle. The arc of movement of the spout about pivot 26 is such as to carry the spout into position beneath the end of one or the other of pipes 20. What-

ever material is received into the spout in its passage under the sand-outlet of the tank is washed away by the water from the discharging-bucket and is collected in a suitable receptacle 29. The frequency with which samples are to be taken will be determined by the length of time necessary to fill a bucket.

In Fig. 5 I have shown a sand-discharge valve of special design, which on account of its sensitiveness is particularly adapted for use in the present construction. 2′ represents a valve fulcrumed in the bracket 34 and closable over the end of the sand-outlet. The stem extension of the valve is perforated to afford an adjustable connection for the rod 9, which latter connects with the lever 7. 35 is a hood or ring carried by the valve and for the purpose of preventing splash. When the tank A is depressed, lever 7 is lifted to open the valve and allow the sand to discharge on either side thereof. The sand-valve is a flat plate pivoted in a bracket 34, screwing into a T on the end of the sand-discharge and having an open cylinder-hood portion 35 enveloping the T when the valve is closed and preventing splash when the valve is opened. The sand flows out between the sides of the cylinder-hood 35 and plate 2′ when the latter is tilted, as indicated in dotted lines in Fig. 5.

I do not claim in this application the devices by which samples of the material delivered from the settler may be taken from time to time to determine the value of the ore passing through the mill, as the same forms the claimed subject-matter of a divisional application filed by me September 2, 1903, Serial No. 171,632.

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

1. In a device of the character described, the combination with an intermittently-oscillating tank or hopper hinged at one end and counterbalanced connections with the opposite end said tank or hopper having an inclined bottom and a discharge-passage in said bottom, of a valve in said passage connected with the counterbalanced connections and operable in unison with the oscillations of the tank.

2. In a device of the character described, the combination of a tank hinged at one end and counterbalanced connections whereby the tank is resiliently supported at the opposite end, said tank having a sand-discharge passage in its bottom and a valve in conjunction with said passage automatically operable by the counterbalanced connections during the movement of the tank about its hinges.

3. In a device of the character described, the combination with an intermittently-oscillating tank having a pulp-feed inlet, said tank hinged at one end and counterbalanced connections supporting the opposite end, a sand-outlet in the bottom of the tank and connected with and controlled by the counterbalanced connections, said tank having a surface-water outlet, of means for preventing surface currents, and means for drawing off the floating slimes at intervals corresponding with the oscillations of said tank.

4. In a device of the character described, the combination of a tank hinged at its upper edge at one end, and counterbalanced connections whereby it is resiliently supported at the other, said tank having a pulp-feed inlet and separate sand and water outlets, means connecting the sand-outlet with the counterbalanced connections whereby the latter automatically controls said outlet, and slotted baffles substantially as described disposed adjacent to the feed-inlet.

5. In a device of the character described, the combination of a tank hinged at its upper edge at one end and having its opposite end resiliently supported on counterbalanced levers, a discharge-pipe in the bottom of the tank, a valve in said pipe, and connections between said valve and levers to operate the valve in unison with the oscillations of the tank.

6. In a device of the character described, the combination of a tank hinged at its upper edge at one end and having downwardly-converging sides and bottom and a discharge-outlet in said bottom, a valve in said outlet, counterbalanced levers of the first class resiliently supporting the tank opposite the hinged end thereof, connections between said levers and valve, a pulp-feed trough adjacent to the movable end of the tank, and means upon the tank by which the floating slimes may be collected.

In witness whereof I have hereunto set my hand.

CHARLES ALLEN.

Witnesses:
H. E. RUNKLE,
ALBERT S. EYLAR.