(No Model.)

# A. BRADFORD.

## AUTOMATIC SAMPLING APPARATUS.

No. 384,420. Patented June 12, 1888.

Fig. 2.

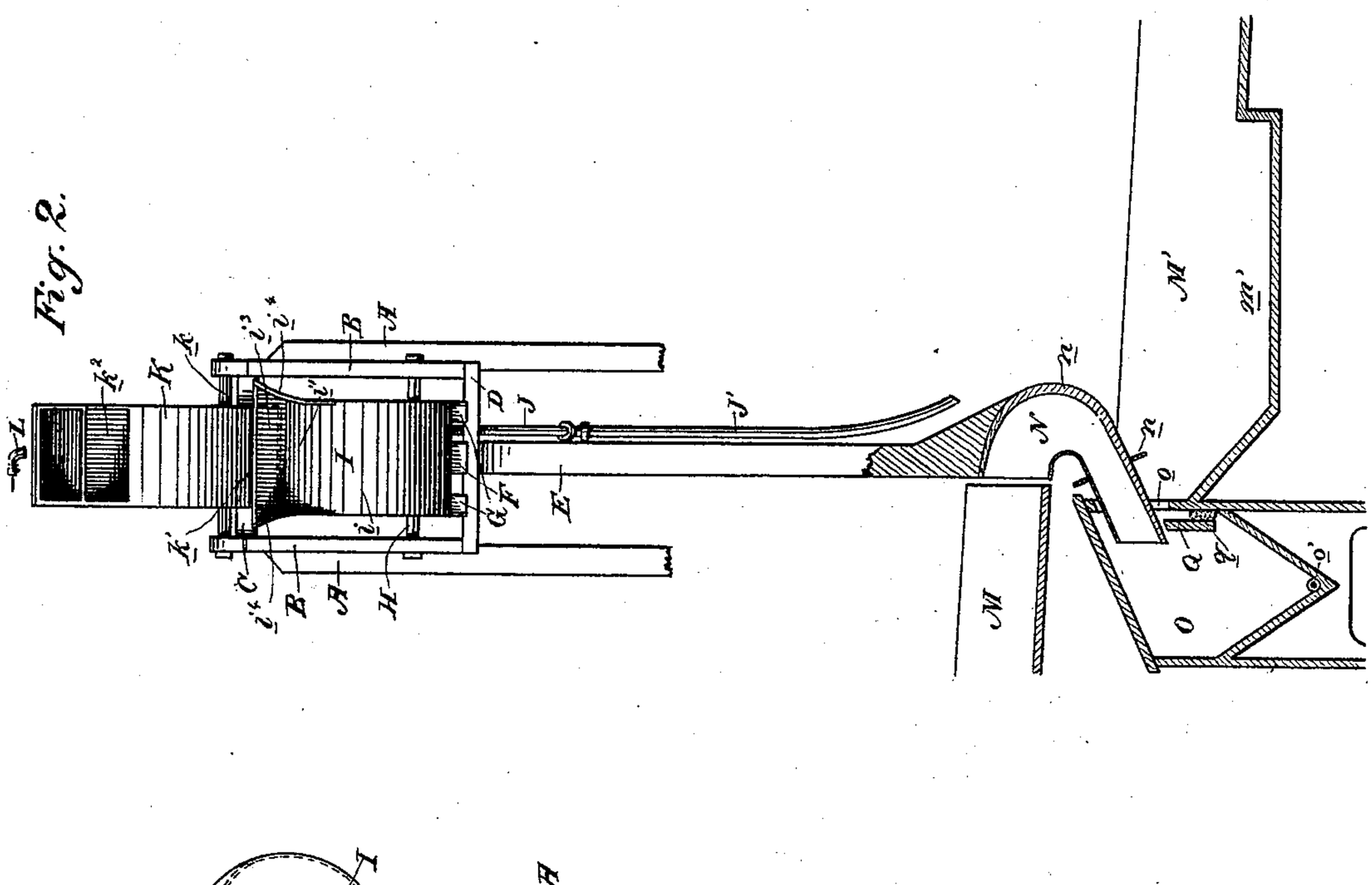
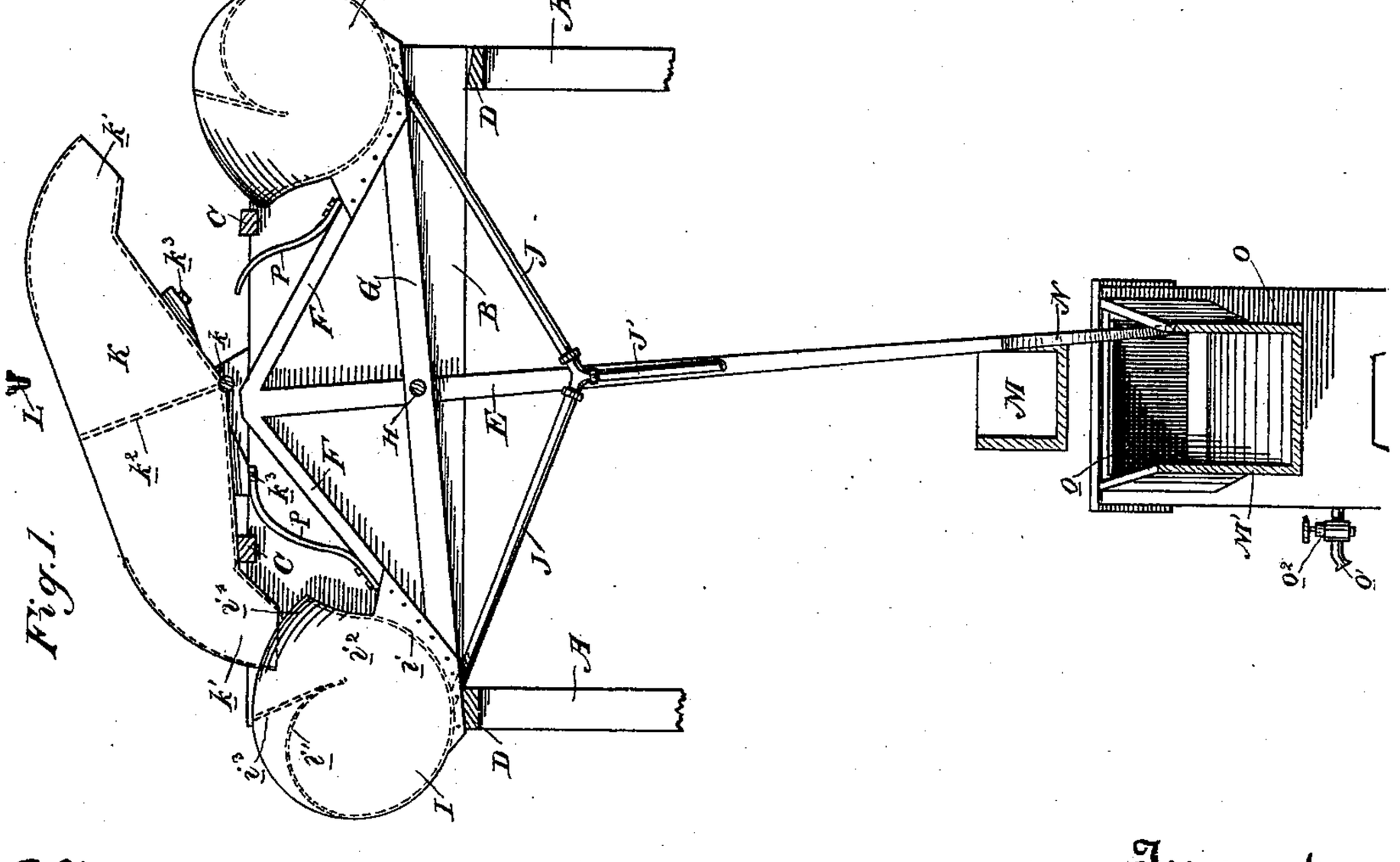


Fig. 1.



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# UNITED STATES PATENT OFFICE.

ALLEN BRADFORD, OF WARDNER, IDAHO TERRITORY, ASSIGNOR OF ONE-HALF TO VICTOR M. CLEMENT, OF SAME PLACE.

## AUTOMATIC SAMPLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 384,420, dated June 12, 1888.

Application filed February 23, 1888. Serial No. 265,035. (No model.)

*To all whom it may concern:*

Be it known that I, ALLEN BRADFORD, of Wardner, Shoshone county, Territory of Idaho, have invented an improvement in an Automatic Sampling Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of apparatus for sampling material, and especially for the purpose of sampling the pulp or tailings of quartz-mills.

My invention consists in the improved vibrating sampling-cup arranged to traverse the stream of pulp or tailings, whereby a portion of said stream is directed away from its general course into a suitable receptacle.

My invention further consists in a pivoted swinging frame which carries the sampling-cup, and having a cross-head, on each end of which is a self-discharging vessel for water, and in a tilting tank adapted to receive water in each end alternately and to discharge it into the vessels of the swinging frame, whereby the movement of the frame is rendered automatic, and in various details of construction and arrangement, all of which I shall hereinafter fully describe.

The object of my invention is to provide an automatically-operating and thoroughly effective apparatus for sampling the pulp or tailings of quartz-mills.

Referring to the accompanying drawings, Figure 1 is a front elevation of the working parts and a vertical section of the main frame. Fig. 2 is an end elevation of the upper portion and a vertical section of the lower portion.

The main frame-work of the apparatus consists of posts A, cross-planks B at the top, stop-bars C C above, and stop-bars D D a little below and at the outer edges of the frame. The vibrating frame consists of an upright piece or arm, E, having at its top the inclined braces F, which are in the same vertical plane, and the cross-bars G—one on each side of the upright piece—said bars forming a cross-head, the whole frame being pivoted on a center shaft or pin, H, and adapted to swing on said center as far as the stop-bars D D will allow. On each end of the head of the swinging frame is secured a water-tight vessel, I, from which discharge-pipes J lead out, without valve or other hindrance, to a common discharge-pipe, J′, which leads down and is adapted to discharge into the trough below.

K is a tank, which is pivoted at the center of its base at the point *k*, and has each of its ends formed into a spout, *k′*, for the delivery of water, the bottom of said tank inclining oppositely from the center. The tank is divided centrally by the vertical partition $k^2$, and above the vertical center of the tank when said tank is at the center of its movement is a stationary bib or cock, L, which is connected with some suitable and reliable source of water.

It will be seen from the description thus far given that the operation is as follows: The water from the cock L, gradually accumulating in one side or end of the tilting tank K, finally overcomes the inertia of said tank, so that it tilts on its pivoted center and discharges its water into the water-tight vessel I on that end of the vibrating frame, whereby that end or side of said frame, being thus weighted, moves downward and swings its upright portion or arm E through an arc of a circle. The water which enters the vessel I immediately begins to discharge through the outlet-pipe J, while at the same time more water from the bib or cock L is entering the other end of the tilting tank K until said tank, becoming unstable, tilts to the other side and discharges its water into the other vessel I of the vibrating frame, thus causing said tank to vibrate in the other direction, the stop-bars D D being so placed as to define the limit of the vibration of the frame.

M is the sluice, through which the stream of pulp or tailings passes and discharges from its end into the trough M′, which is set a little below it. The sluice and trough are arranged in such a way that the stream, passing from the one to the other, traverses the path of vibration of the swinging frame. Secured upon the upright piece or arm E of said frame is a sampling-cup, N, which is made of an approximately ⊃ shape, one of its open ends being in position to receive the stream of pulp or tailings as it crosses said stream, while the other end enters and moves in a slot, *o*, in a settling-tank, O, said tank having a hopper-shaped bottom with a discharge at *o′* controlled by a cock, $o^2$. It will thus be seen that

as the sample-cup passes through the stream of pulp or tailings it receives a charge which it directs back into the settling-tank O.

The stop-bars C C above are for the purpose of limiting the motion of the tilting tank. In order to retain the swinging frame and its water-tight vessels I in position until it is time for them to move, I have the spring-catches P P secured to the braces F of the swinging frame, and having their free ends adapted to engage suitably with lugs $k^3$ on the bottom of the tilting tank K and on each side of its center of motion. The engagement of these spring-catches takes place alternately as the tilting tank moves from one side to the other, and is not broken until the tank becomes overbalanced; but while it continues it is obvious that the tank and the tilting frame, moving about different centers, are held effectually by the spring-catches until the time comes when the engagement is broken by the overbalancing of the tank, whereupon the swinging frame is free to receive its water on the other side and accomplish its vibration.

The water-tight vessels I are so made that the strip *i*, which forms the rim-piece and incloses the circumference, is made to conform to the side pieces part of the way around, but near the top it takes an eccentric course inwardly, as shown at $i'$, with continually shortening radii for the purpose of leaving an opening at $i^2$ for the entrance of the spout $k'$ of the tilting tank, and for the further purpose of so directing the water which enters suddenly and in a body that its force may be expended without splashing. The rim-piece also has an extension, as shown at $i^3$, extending upwardly, which, together with the sides of the vessel, which are made flaring, as shown at $i^4$, Fig. 2, form a kind of hopper to receive the spill of the water when the tank is in the act of tilting. The capacity of the discharge-pipes J from the vessels is such that they drain either vessel in less time than the bib L can deliver the same quantity of water.

The sample cup N should be made of galvanized sheet-iron or other suitable sheet metal, presenting thin edges and a narrow face to the stream of pulp or tailings flowing from the sluice M. It is made water tight and has on its lower arm a narrow collar, *n*, secured in an inclined position, and which prevents the water which may spatter on it from following its edges into the settling-tank. The back of the sample-cup is re-enforced by a cast-iron shoe, $n'$, to protect it from the wear of the pulp or tailings which impinge upon it as the cup passes through the stream and is thrown backward by its curved form into the settling-tank.

The settling-tank O has a hinged top, and also a narrow partition, Q, extending its whole length just under the end of the sample-cup, and with its top edge higher than the bottom of the slot in the tank. This forms a small compartment, *q*, between the partition and the wall of the tank, which compartment is provided with a filter bottom composed of any suitable material, but preferably of fine-grained sponges set close together, through which the overflow from the settling-tank into the wide end of the trough M′ is filtered. This trough has sufficient width at its upper end to allow the sample-cup to swing clear of the stream flowing from the sluice above. At either side its bottom is depressed, as shown at $m'$, where the stream falls to allow sediment to accumulate and receive the wear of the falling stream.

The general operation of the entire apparatus is as follows: The bib L is opened sufficiently to allow a very small stream of water to flow into the tilting tank. When sufficient water has accumulated on one side of the partition in said tank to overbalance the other end, it will tip to the other side, so as to empty its water into the vessel I of the swinging frame on that side, the weight and momentum of the water suddenly dropped into the vessel causing the swinging frame to move on its center and carry the sample-cup N quickly through the stream of pulp or tailings, as the case may be, taking a small sample through the whole depth and breadth of the stream and depositing the same in the settling-tank O, and leaving the sample-cup stationary and clear of the stream until the continuous stream of water from the bib L has filled the other part of the tilting tank sufficiently to again tip it and reverse the operation and deposit another sample in tank O. When said tank O becomes sufficiently full, the surface-water rises through the filter-compartment *q* and overflows the side of said tank into the discharge-trough M′. The frequency with which the samples are taken depends upon the size of the stream flowing from the bib L, which is regulated to move the parts as often as may be desired. The accumulated samples may be removed from the tank O as often as desired by placing a pail or other vessel under the end of the discharge-pipe $o'$ and opening the valve $o^2$. If clogged too thick to run, the valve, being a straightway gate-valve, admits of passing a small rod through to stir the stream. When the contents are nearly all removed, the cover of the settling-tank is lifted and all the slums which adhere to the bottom and sides are washed down.

This apparatus, it will be seen, is therefore complete in itself and automatic in all its workings, being absolutely accurate in the sample taken, and capable of being regulated to any degree of speed, so as to obtain any size of sample, the sample being ready, complete for the assayer, at any desired period of the run. It is, moreover, simple and complete in construction, no delicate parts to get out of repair and wear out, and it requires no oil and no attention. It is adapted to any class of pulp, and can be placed in any part of the mill where a periodical sample is desired.

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

1. In a sampling apparatus, a centrally-piv-

oted swinging frame having a curved open-ended sampling-cup secured to its lower end and arranged to pass through the stream of material, whereby it receives a sample in one end and delivers it backwardly from the other end, substantially as herein described.

2. In a sampling apparatus, a sluice through which the stream of material passes and a trough in a lower plane and into which the stream of material is directed, in combination with a centrally-pivoted automatically-vibrating frame having a curved open-ended cup arranged to traverse the stream, whereby it receives a sample of the material in one end as it passes through and directs said sample backwardly from its other end, and a settling-tank into which the sample is deposited, substantially as herein described.

3. In a sampling apparatus, a sluice through which the stream of material passes and a trough into which the stream is directed, in combination with an automatically-vibrating frame having a ⊃-shaped open-ended cup passing through the stream of material, whereby it receives a sample of the material in one end and delivers it from the other, and a settling-tank provided with a slot in which the delivery end of the cup moves, substantially as herein described.

4. In a sampling apparatus, a pivoted swinging frame carrying a sample-cup arranged to traverse the stream of material whereby it is charged in passing through it, in combination with the means for automatically vibrating the swinging frame, consisting of self-discharging water-vessels upon each side of the frame and a tilting tank above receiving water and alternately discharging it into the water-vessels on each side, substantially as herein described.

5. In a sampling apparatus, a pivoted swinging frame having a cross-head and carrying on its lower end a sampling-cup arranged to traverse the stream of material, as described, in combination with the self-discharging water-vessels on each end of the cross-head of the frame, the pivoted tilting tank above having its ends arranged to discharge water into the vessels of the swinging frame, and a partition in its middle and a stationary water-supply above the central plane of the tilting tank, whereby the water is delivered to it alternately on each side of its partition, substantially as herein described.

6. In a sampling apparatus, a pivoted swinging frame having a sample-cup arranged to traverse the stream of material, as described, and a cross-head with self-discharging water-vessels on each end, in combination with the compartment tilting tank above arranged to discharge water alternately into the vessel at each end, and the stop-bars of the main frame, by which the vibration of the swinging frame is limited and defined, substantially as herein described.

7. In a sampling apparatus, a pivoted swinging frame carrying a sample-cup arranged to traverse the stream of material, as described, said frame having a cross-head with a self-discharging water-vessel at each end, in combination with the tilting compartment tank above, arranged to discharge its water alternately into the vessels of the swinging frame, the stop-bars by which the tilting of the tank is limited and defined, and the stop-bars by which the swinging of the tank is limited and defined, substantially as herein described.

8. In a sampling apparatus having a swinging frame carrying a sampling-cup traversing the stream of material, as described, the water-vessels I, through which the vibration of the frame takes place, said vessels having their rim-pieces eccentric inwardly at their tops, whereby an opening is formed to receive the water delivered to the vessels, substantially as herein described.

9. In a sampling apparatus having a swinging frame carrying a sampling-cup arranged to traverse the stream of material, as described, the water-vessels I on the swinging frame, whereby it is overbalanced and its vibration effected, said vessels having their rim-pieces eccentric at their tops, their side pieces flaring, and extensions $i^3$, whereby a hopper-shaped opening is provided for receiving the charge of water, substantially as herein described.

10. In a sampling apparatus, a pivoted swinging frame having the curved sampling-cup, as described, in combination with the sluice through which the material passes and arranged to direct its stream across the path of the cup, the trough into which the stream is discharged, the settling-tank O, into which the charge from the sample-cup is delivered, and the overflow filter-chamber $q$ in said tank, substantially as herein described.

11. In a sampling apparatus, the sluice through which the material passes and the trough into which it is discharged, in combination with the swinging frame and the sampling-cup secured to said frame and arranged to traverse the stream, said cup having an inclined collar on its lower portion, and the settling-tank into which the cup delivers its sample, substantially as herein described.

12. In a sampling apparatus, a sluice through which the material is directed and the trough for receiving it, in combination with the swinging frame, a curved sampling-cup carried by said frame and adapted to traverse the stream, whereby it receives a charge and directs it backward, said cup having a re-enforcing shoe on its back, and the settling-tank into which the cup delivers its sample, substantially as herein described.

In witness whereof I have hereunto set my hand.

ALLEN BRADFORD.

Witnesses:
JUSTUS LOEBER,
JOHN S. ATCHISIN.