

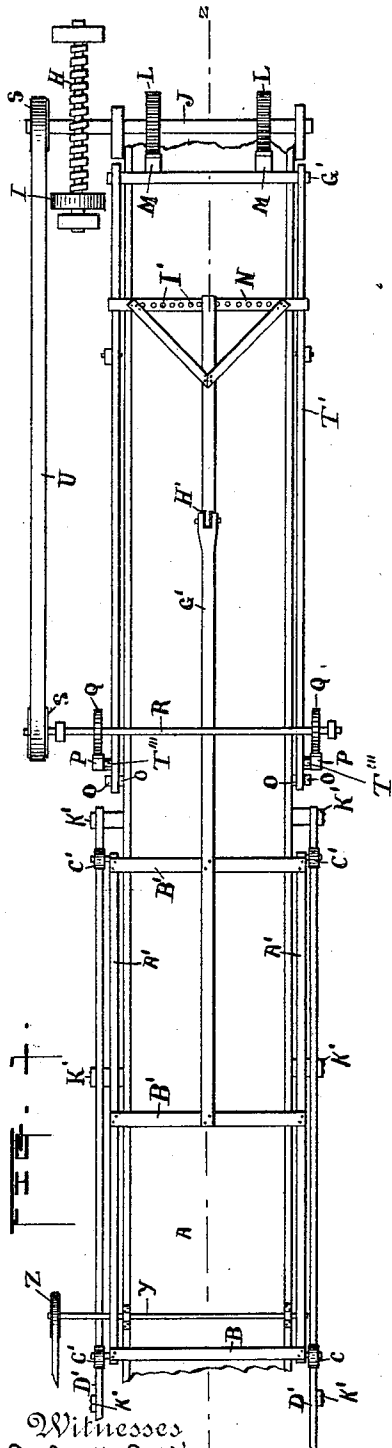
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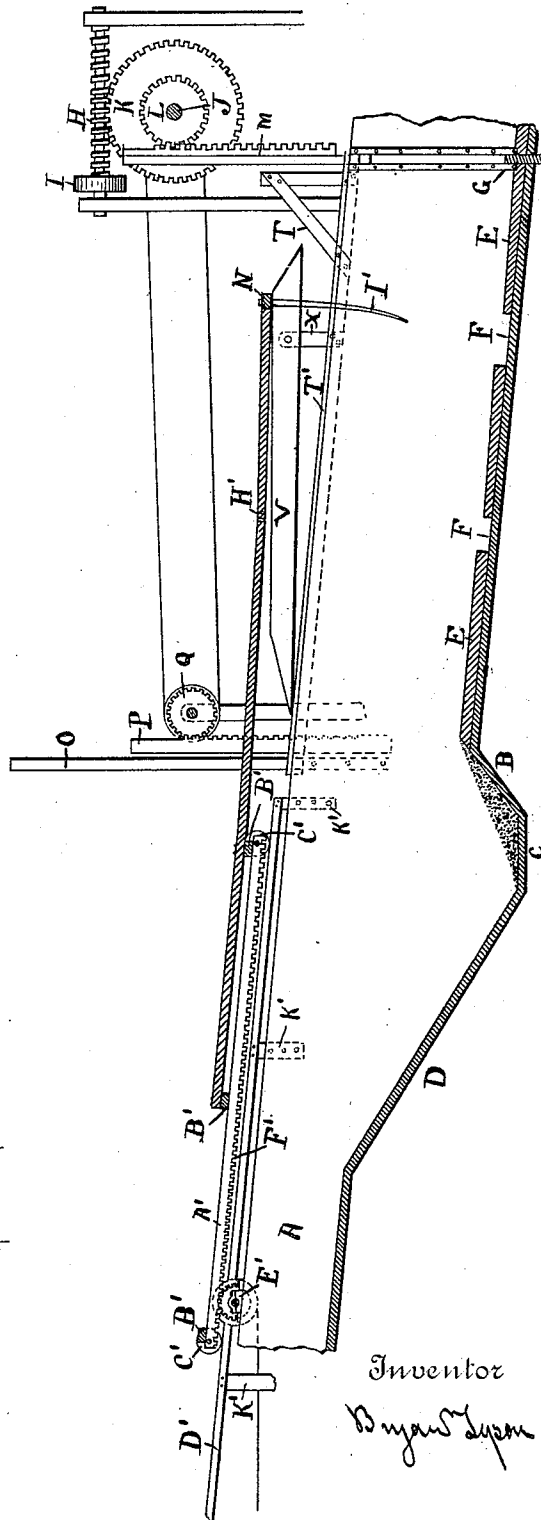
B. TYSON.
CONCENTRATOR.

No. 461,692.

Patented Oct. 20, 1891.



Witnesses
Arch. M. Catlin
Emma M. Gillett



Inventor
Bryan Tyson

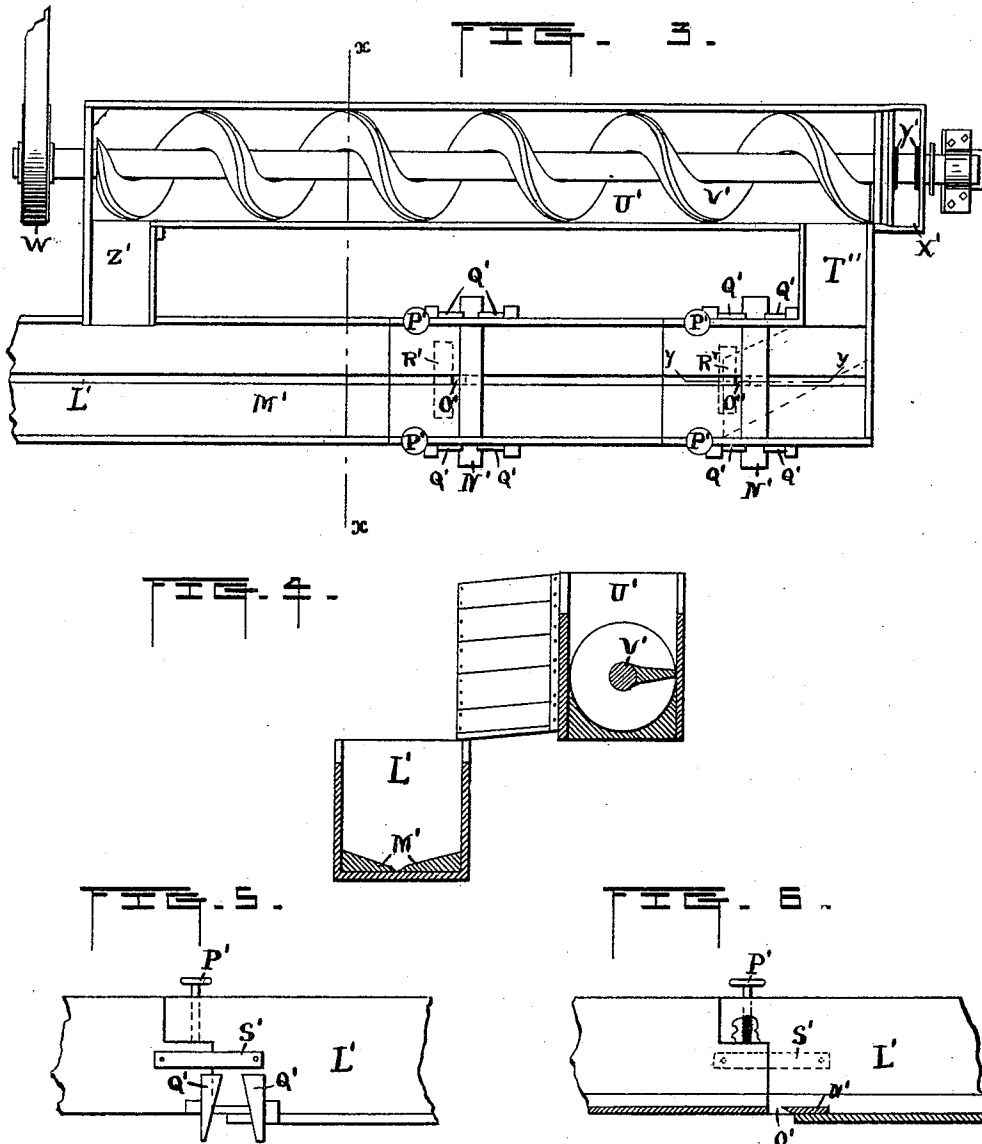
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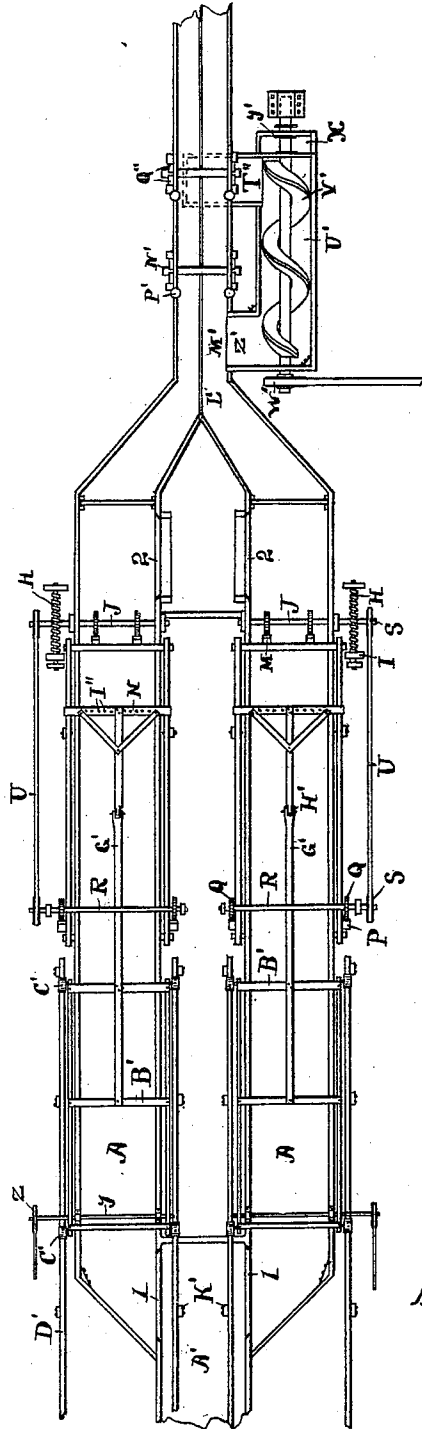
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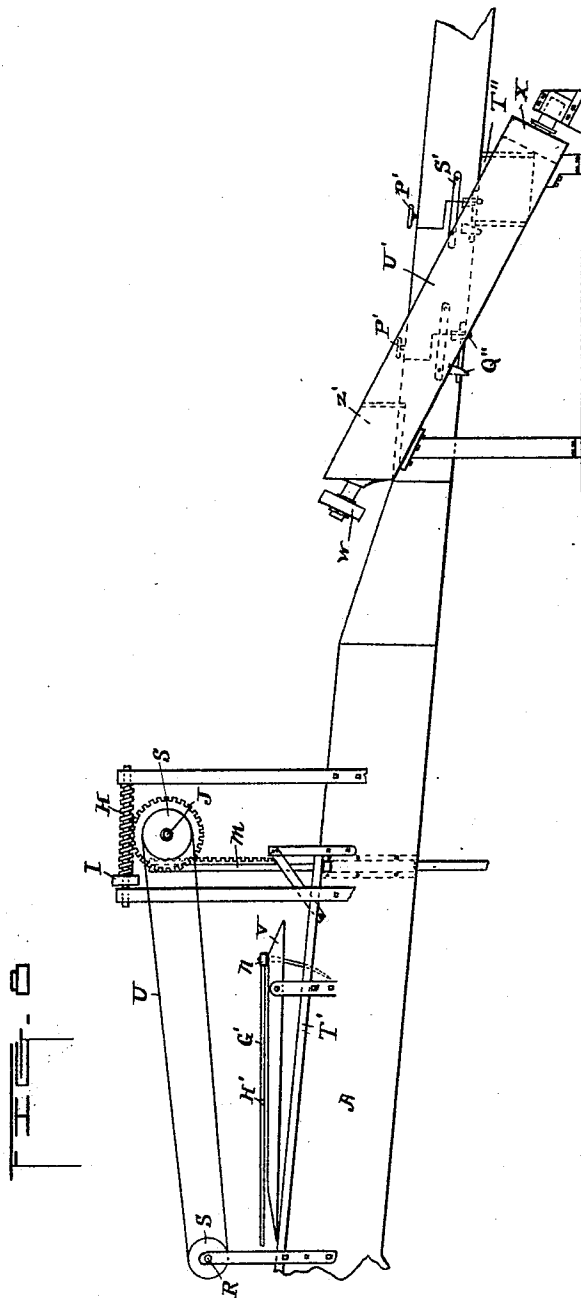
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WITNESSES

Arch. M. Catlin.
Charles Clough

INVENTOR

Bryan Tyson
by
Benj. R. Catlin
Atty

UNITED STATES PATENT OFFICE.

BRYAN TYSON, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF
ONE-TENTH TO CHARLES A. METCALF, OF SAME PLACE.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 461,692, dated October 20, 1891.

Application filed October 14, 1890. Serial No. 368,083. (No model.)

To all whom it may concern:

Be it known that I, BRYAN TYSON, of Washington, District of Columbia, have invented certain Improvements in Concentrators for the
5 More Effectual and Economical Working of Gold, Silver, and other Ores, of which the following is a specification.

The object of my invention is to provide devices suitable for concentrating ores of low
10 grade and obtaining concentrates to be subsequently further treated for the separation of the precious metal; and it consists in the matters hereinafter described and pointed out in the claims.

15 In the drawings, Figure 1 is a plan view of a portion of my device. Fig. 2 is a longitudinal sectional view of same on line *z z*, Fig. 1. Fig. 3 is a plan view of other portions of the device. Fig. 4 is a transverse sectional view of
20 same on line *x x*, Fig. 3. Fig. 5 is a side view of certain parts of Fig. 3. Fig. 6 is a longitudinal sectional view of certain parts of Fig. 3 on line *y y*, and Fig. 7 is a plan showing relation of sluice-boxes. Fig. 8 is a partial side
25 elevation of the sluice-boxes.

A, Figs. 1 and 2, is a sluice-box of proper construction and grade for the flow of the pulp containing the precious metals to be extracted. It is preferably constructed with a
30 chamber B C D, which serves to break the force of the water and pulp after passing down the incline D. The bottom of the sluice-box for a proper distance below said chamber is preferably provided with boards E E, of
35 proper width and thickness, with spaces F F intervening. They fit snugly between the side walls of the sluice-box and are properly secured to the bottom thereof. The downstream edges are preferably constructed about
40 one-half of an inch thicker than the upstream edges, thus giving the water and pulp a suitable fall.

G is a sliding gate that works in a groove at either side of the sluice-box and through a
45 slot of proper size in the bottom of the box, below which it extends for a suitable distance. The construction should be such as to prevent material leakage and cause the water and pulp at all times to flow over the
50 top of the gate.

H is a screw working in a proper journal at either end.

I is a pulley secured to the screw and adapted to be driven by a belt connecting it with a driving-pulley, (not shown;) but any other
55 convenient mode of applying power may be employed.

J is an axle working in proper bearings. K is a gear-wheel secured to said axle and meshes with the screw H.

L L are other gear-wheels secured to the axle J.

M M are bars secured to the sliding gate G. At or near their upper ends they are provided with gear-teeth that mesh with the
60 wheels L L.

The gate G at its top has lateral extensions G'', which are adapted to rest on the top of the sluice-box and also to support guideways,
70 to be described.

In order to cause the pulp that is collected and held by the sliding gate to be regularly and satisfactorily discharged therefrom, I employ a rake N, constructed as follows:

O O are uprights, that are preferably secured in pairs to the sides of the sluice-box,
75 a proper space intervening between them to receive the longitudinal bars T' T', one pair on either side of the sluice-box. These bars T' T' rest at one end upon the lateral extensions G'' of the gate and at the other upon
80 studs T'', fast on the rack-bars P.

P P are rack-bars that are provided with studs T'', upon which rest the bars T, and that mesh with the gear-wheels Q Q. Said
85 gear-wheels are secured to the axle R, which works in proper bearings.

S S are pulleys of the same size, one of which is secured to the axle R and the other to the axle J.

U is a belt that connects the two pulleys and serves to revolve the axle R. The downstream ends of the bars T' T' rest upon the projection G'' of the sliding gate G. Said
90 bars support the rake N at either end, upon which it slides during the upstream movement. The sliding gate G, the sliding bars P P, and the longitudinal bars T' T' will have a common movement, all being raised
100 or lowered at the same time.

V V are bars of proper construction, the upstream ends of which are supported by the bars T' T'. The downstream ends are properly secured to standards X X, which in turn are secured to the bars T' T', thus adapting these bars to be moved together by means of the gears and racks above described.

Y is an axle provided with proper bearings, and Z is a pulley secured thereto and operates it; but any other convenient mode for propelling may be employed.

A' A' are longitudinal bars of a sliding frame, preferably constructed on a level, and B' B' are cross-bars of same. Said sliding frame is provided with rollers C' C', secured thereto, which are supported by the sills D' D'.

E' E' are gear-wheels secured to the axle Y and mesh with gear-bars F' F', that are secured to the bars A' A', one on either side of the sluice-box. The sills D' D' are held in position by standards K' K', that may be secured to either side of the sluice-box.

G' is a bar secured to the cross-bars B' B', and connects with the stem of the rake N at H' by a flexible joint. The rake is provided with a suitable number of teeth I' I' of proper construction.

Commencing a suitable distance above the chamber B C D and ending a suitable distance below the sliding gate G, it will be necessary to construct the sluice-box A with all the appurtenances thereunto pertaining, as above described, in duplicate. (See Fig. 7.)

While the sliding gate of one box is rising and the portion of the sluice-box intervening between the sliding gate and the chamber B C D is being filled with the heavier substances of value the gate in the other box will be going down, and a similar collection there will be in process of being washed out and will flow thence to devices for effecting a further concentration. The teeth of racks M on gate G and of racks P P stop short of the ends of said gate and racks, respectively, as indicated, whereby their upward and downward movements are limited.

When one of the sluice-boxes A has been filled to a desired height, the pulley S will be reversed, which will cause the sliding gate G and the gear bars or racks P P, that support the rake, to descend slowly, during which time the rake will keep the surface of the pulp well broken, and will thus prevent it from being washed out in channels, while other portions thereof are left standing in bars or ridges. After the rake has descended a proper distance the gear-wheels L L and Q Q cease to mesh with their respective bars, the upper teeth of the bars passing below the center of the gear-wheels. Proper supports are provided to receive the sliding gate and the bars P P after said gear-wheels have ceased to mesh therewith, which will prevent the rake-teeth I' I' from coming into contact with the boards E E. Said teeth, when at their lowest depth, should not come nearer than about a half-inch to the boards. The pulp will hold

the gate in its elevated position. It is supported in its lower position by any suitable means, and will be raised, so that the gears will engage the racks, by any convenient means.

The rake is principally designed for use while the sliding gate G is descending and the body of the pulp held above is being washed out. Consequently, while the gate is rising and the sluice-box above is being filled the rake can be lifted and laid back on the sliding frame, the flexible joint at H' admitting of this. After the sluice-box has been properly filled the rake should be turned back and the motion of the pulley I reversed. The rake, however, can also be employed while the sluice-box is being filled, if found best in practice. While the deposit in one sluice-box is being washed out the sliding gate in the other will be rising and catching a similar deposit, and thus the sluice-boxes will be alternately filled and the deposit therein washed out, first one and then the other. After one of the sluice-boxes has been properly filled the water and pulp are diverted therefrom at a proper point above the chamber B C D into the other box by opening a gate and closing a similar gate, each controlling communication between a sluice-box and a supplemental box A'' common to the two main boxes, and a suitable stream of water, preferably clear, is turned into the abandoned box at or near the head of said chamber to wash out the pulp. These gates are so beveled at their ends and fitted to openings with corresponding bevells that they are held in place by hydrostatic pressure. The construction is preferably such that when the sliding gate is raised to its greatest height the water and pulp will lack an inch, more or less, of being backed level with the plane of the bottom of the sluice-box situated above the chamber B C D.

The size of the sluice-box A will depend much on the quantity of pulp to be worked; but two feet broad, one and a half feet deep, and eighteen feet between the sliding gate and the chamber B C D are recommended as suitable dimensions for ordinary purposes. The boards E E may be one foot broad, one inch thick on the upstream edge, and one and a half inches thick on the downstream edge, and the spaces F F about four inches.

It may be stated that the sliding gate will have the effect to overcome to a great extent the ordinary laws of gravity, and thus cause the coarser and practically valueless particles of the pulp to be washed into the waste. To be plainer, a lump of ordinary quartz and a particle of gold one-eighth the diameter thereof, both being round, have practically the same specific gravity so far as capacity for settling onto the bottom of a sluice-box is concerned. Consequently the larger particles are disposed to crowd the smaller and more valuable particles, though composed of more dense substances, from the bottom of the sluice-box

into an upper stratum, and thus to a great extent prevent these finer particles from being saved by any ordinary gravity process when worked in connection with the coarser particles; but if a dam be gradually formed by the rising of a sliding gate it is found that the finer, more dense, and more valuable substances are most disposed to bank, while the force of the flowing water overcomes the ordinary gravity of the larger particles, keeps them rolled to the surface of the pulp, and consequently readily washes them into the waste. The substances of value, such as iron pyrites, are usually broken finer than the less valuable portions of the ore. Consequently the collection above the sliding gate will be composed almost exclusively of the finer and more valuable portions of the pulp, and are therefore in a suitable condition to be further concentrated by a simple gravity process.

L', Fig. 3, is a sluice-box, preferably constructed from four to eight inches broad and of proper depth and grade for the flow of the pulp. The sluice-box A, commencing a suitable distance above the mouth, is preferably contracted gradually to a size suitable to connect with the sluice-box L', with which it is joined, as shown in Fig. 7; but any convenient plan for delivering the substances of value held by the sliding gate G to the sluice-box L' can be adopted that may be found best in practice. The construction should be such that the sluice-box L' will only receive the substances of value that are discharged from the sluice-box A while the sliding gate is going down; but while the sliding gate is rising the flow of water and pulp therefrom is diverted into the waste at some convenient point below the sliding gate. B'' indicates gates, which may be raised by hand for this purpose, said gates having beveled ends fitted to the walls of their respective openings as are gates 1.

Commencing at the downstream ends of the sluice-boxes A A, the sluice-box L' is preferably constructed in duplicate, the two converging toward each other at a suitable angle until they are properly united. From the junction down one box only will be necessary. (The contraction of the sluice-box A at its mouth and the branching of the sluice-box L' into two parts near the upper end and the arrangement for throwing the valueless portion of the pulp into the waste, thus diverting it from the sluice-box L', are not shown in the drawings.) The bottom of the sluice-box L' is preferably provided with a couple of pieces M' M', preferably not less than twelve feet long, about three-eighths of an inch thick on the outer edge, (for a four-inch sluice-box, but proportionately thicker if the sluice-box be broader,) and beveled to a sharp point on the inner edge. A space of about one-fourth of an inch should preferably intervene between the two pieces, Fig. 4.

N' N' are blades of proper construction, preferably of some hard metal, and are brought

to a sharp edge in front. Said blades work in slots of suitable size constructed in the sides of the sluice-box and are supported by the bottom of the sluice-box L', which is suitably cut away to form apertures O' O'' of proper dimensions. The sluice-box is cut apart in front of each of said blades to permit their relative adjustment in a vertical plane, the loose connecting bars or strips S' S' being provided to prevent their entire separation. The downstream portions are supported by the ends of the set-screws P' P'.

Q' Q' are keys for adjusting the blades N' N' with reference to the apertures O' O''. By loosening the upstream wedges and tightening the others the blade will be moved up to partially close the opening O', which also by a reverse operation can be made wider.

R' R' are irons of proper width and thickness placed across the sluice-box at right angles thereto. They form the upstream edges of the apertures O' O''.

S' S' are irons of proper construction with a hole in either end and are properly secured to the sides of the box, one at either side of the box where cut apart, and thus prevent the box from parting. By means of the set-screws P' P' the blades N' N' can be adjusted to any desired height, and by means of the keys Q' Q' the dimensions of apertures O' O'' can be regulated to any desired size.

In practice the heavier and more valuable substances will collect in the channel in the center of the sluice-box, and when they reach the first aperture O' they will be caught beneath the sharp edge of the blade N' and will be deflected thence into any suitable receptacle that may be constructed to receive them, from whence they can be taken for future treatment; but in order to take a higher grade of concentrations the upstream blade is preferably so adjusted as to take out a proper percentage of the substances of value, leaving still a portion thereof to be taken out by the lower blade, where a lower grade of concentrations will be caught and deflected into the box T'' in the same way above described. This box is placed on a suitable incline to deliver said product into the box U', which is preferably constructed of cast-iron, the bottom thereof being circular in form. From four to six inches for width and depth is recommended as a suitable size, and the length should conform to that of the sluice-box L'. The box is placed on a proper incline, the upstream end being elevated a suitable distance above the sluice-box L'.

V' is a screw of proper size and construction and works in said box, being provided with proper bearings at either end.

W' is a pulley for propelling the screw.

X' is a chamber of proper size and depth constructed immediately adjacent to the downstream end wall of the box U', said wall being common to both the box and chamber. The axle or nucleus of the screw is prefer-

ably turned down to a proper size for a suitable distance from the end. The inner and outer walls of said chamber are provided with proper apertures, in which said axle works loosely.

Y' Y' are preferably pieces of india-rubber placed about the axle on the inside of said chamber sufficiently tight to prevent material leakage. The chamber X' should be constructed a foot (more or less) higher than the end wall of the box U'. A stream of water sufficient to keep said chamber full should be conducted therein. The pressure of the water in said chamber being outward, the pulp in the box U' cannot interfere with the working of the bearing at the lower end of the axle.

Z' is a box of proper size and length and connects the box U' at its upper end with the sluice-box L'. It is placed on a suitable incline to carry the pulp that is raised by the operation of the screw from the lower end of the box U' to the sluice-box L', which will be washed a second time to the apertures O' O''. The particles that go through the first aperture O' will be saved for future treatment. Those that go through the second aperture O'' will be conveyed to the top of the box U' to be again washed down, and thus the work will be continued. Particles of pulp can only flow to waste by passing both the apertures O' O''. In this way we can procure a high grade of concentrations at small cost and without material loss.

Any other convenient mode for raising the pulp may be employed in lieu of the screw that may be found better in practice, and any other convenient mode for propelling same in lieu of a belt may be employed.

The following is the operation of my device: Water and pulp containing the substances to be concentrated are turned into the sluice-box A, at its head, and necessary power is applied to the belt-pulleys I, Z, and W'. The sliding gate G begins to rise slowly. The spaces F F between the boards E E will break the force of the water and permit the heavier substances to be deposited above the sliding gate. As the deposit increases in depth said spaces will, one by one, commencing first near the sliding gate, be filled, and we will finally have only the chamber B C D to break the force of the water, which will continue to do this until the sluice-box be filled to the desired depth. After the sluice-box has been filled to its greatest depth there should still remain a fall of one inch (more or less) at the upstream end of the incline D. The water and pulp will now be turned from this sluice-box into another of similar construction, and a proper stream of water, preferably clear, will be turned into the box just vacated. The motion of the pulley I will be reversed, which will cause the sliding gate G to start down slowly. The rake N should be brought over onto the pieces V V, the teeth of which dur-

ing the upstream stroke will extend a proper distance into the pulp. As the gate goes down the deposit held above will be washed out over the top of the gate. The revolving of the gear-wheels E' E', that mesh with the gear-bars F' F', will cause the rake to be drawn back and forth. When the proper length of stroke has been attained, the motion of said wheels will be reversed by any one of the well-known methods that may be found best in practice, and thus the desired reciprocating motion will be procured. The construction is preferably such that the rake will be drawn over nearly or quite all of the deposit above the sliding gate. During the downstream movement the ends of the rake-stock will be caught by the upstream ends of the pieces V V and raised sufficiently to draw the rake-teeth out of the pulp. When the rake reaches the downstream ends of said pieces, the weight thereof will carry them down onto the guide-pieces T' T', where the rake will then be delivered. Said pieces V V will then resume their normal position, which will permit the rake to pass under them and make the upstream stroke, supported by the guide-pieces T' T'. During the upstream stroke the rake-teeth I' I' descend into the pulp a proper distance. When the rake reaches the upstream ends of the pieces V V, it will raise them and pass out, they immediately dropping down again. At the return stroke the rake will mount said pieces, and thus the reciprocating motion will be continued, the pieces V V serving as supports of the rake during the downstream stroke, and the guide-pieces T T and T' T' will serve as supports during the upstream stroke. As shown in the drawings, the guide-pieces T T and T' T' are down at their lowest depth and the sluice-box washed out clean. Consequently all is ready to throw the rake back onto the sliding frame and commence the operation of filling, as heretofore detailed. The belt-pulleys S S being of the same size, the guide-pieces T T and T' T' will throughout their entire length have the same upward-and-downward motion as the sliding gate G, causing the rake at all times to perform its work with the desired regularity. The rake will be of much service in causing a regular discharge of the pulp. The deposit held by the sliding gate will as discharged therefrom flow to the apertures O' O''. The first O' will take out a concentration to be reduced by any appropriate mode. The second O'' will take out a lower grade of concentrations that will be delivered into the box U'. The revolving of the screw V' in a proper direction will elevate this pulp to a height suitable for delivery into the sluice-box L', from whence it will be again washed over the apertures O' O'', and thus the operation will be continued.

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

1. The combination of the downwardly-inclined sluice-box having in its bottom a receptacle with the long inclined side D, a horizontal bottom C, and a short inclined side B, and the boards E E, with intervening spaces F, located below said receptacle, the sliding gate, and mechanism for raising and lowering the said gate, substantially as set forth.

2. The combination of the sluice-box, the rake hinged as at H, mechanism for moving the rake lengthwise of the box, the sliding gate, a driving-pulley and intermediate gearing for raising the gate, ways or guide-pieces for said rake, and mechanism for raising said ways simultaneously with the gate, substantially as set forth.

3. In combination, a sluice-box, a hinged rake, a sliding gate and ways to support the rake in its operative position, the said gate, and mechanism for simultaneously raising the gate and ways, substantially as set forth.

4. The sluice-box L', having the inclined bottom pieces M' M' and provided with an opening O' in the groove between the two inclines, in combination with the blade N', substantially as set forth.

5. The sluice-box L', having the inclined bottom pieces M' M' and provided with an opening O' in the groove between the two inclines, in combination with the blade N' and with devices for adjusting the blade both vertically and horizontally, substantially as set forth.

6. The sluice-box L', having the inclined bottom pieces and intermediate groove and an opening O' in said groove, and the sluice-box U', provided with an elevating-screw and arranged with one end below and the other above said box L', substantially as set forth.

7. The combination of the sluice-box L', the sluice A', and sluice-boxes A A, each having a waste-outlet and suitable gates, whereby pulp can be let into either of said boxes A at will and partly discharged as waste and partly discharged into box L', substantially as set forth.

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

BRYAN TYSON.

Witnesses:

EMMA M. GILLETT,
WATSON J. NEWTON.