(No Model.) 2 Sheets—Sheet 1.

F. W. HARLOW.

COMBINED ORE CONCENTRATOR AND SLIMER.

No. 606,138. Patented June 21, 1898.

Fig. 1.

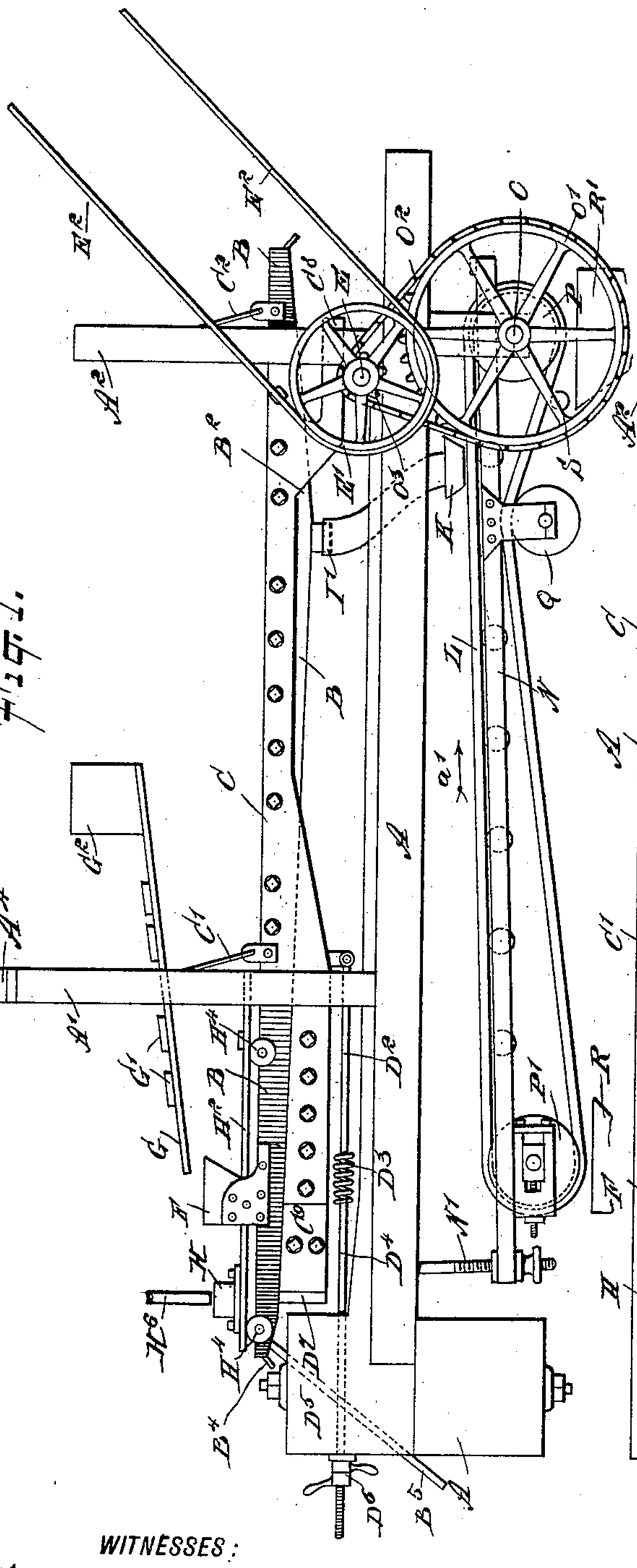
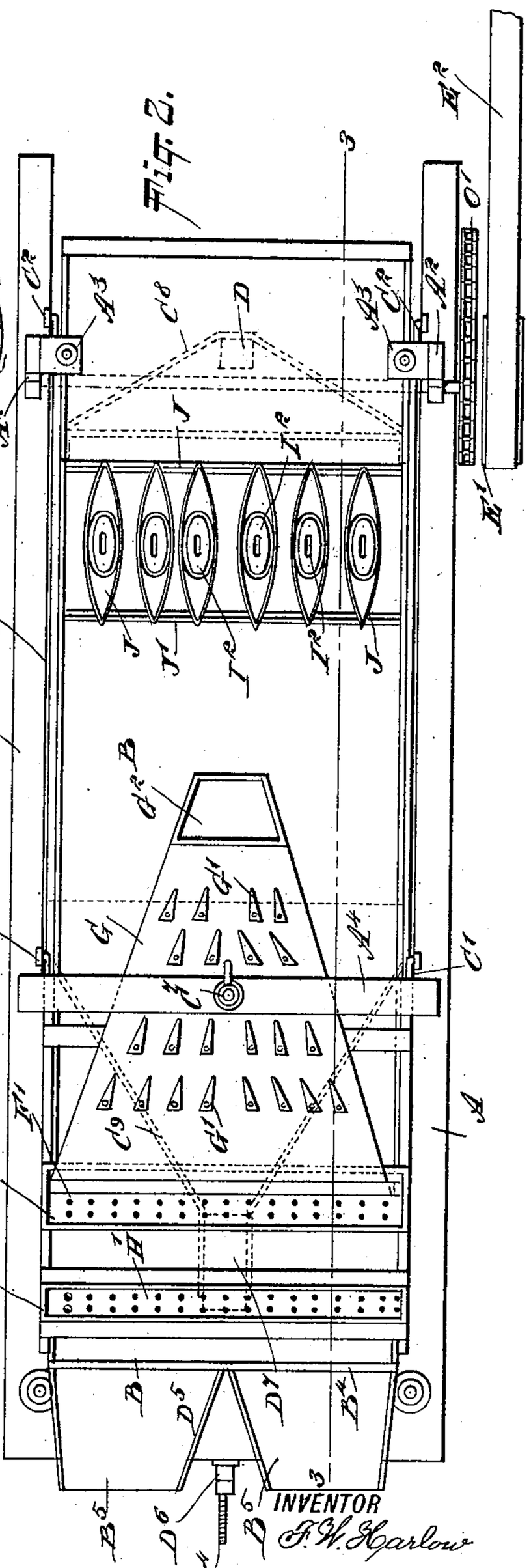


Fig. 2.



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(No Model.)

2 Sheets—Sheet 2.

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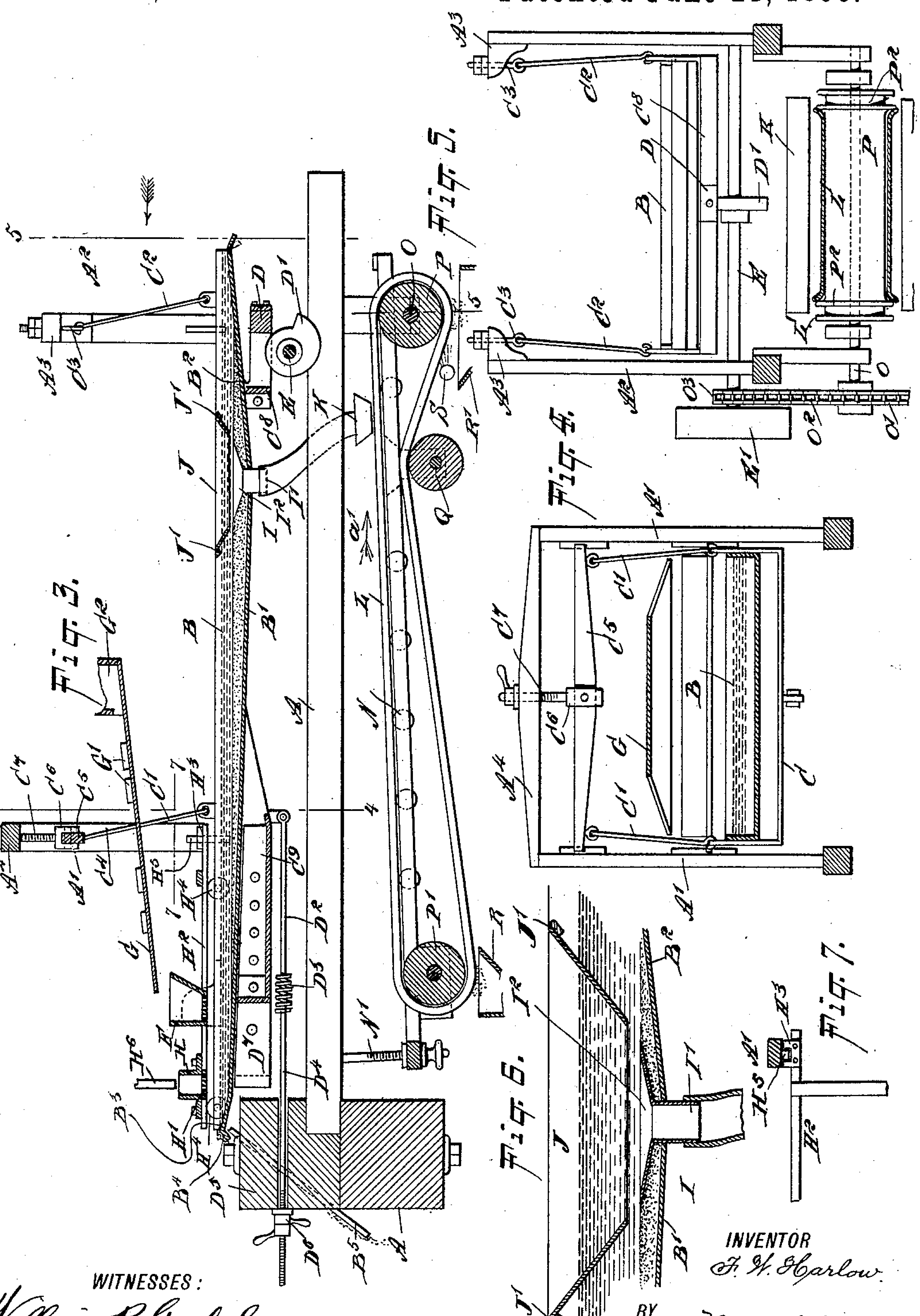

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FRANKLIN W. HARLOW, OF EUREKA, COLORADO.

COMBINED ORE CONCENTRATOR AND SLIMER.

SPECIFICATION forming part of Letters Patent No. 606,138, dated June 21, 1898.

Application filed March 11, 1897. Serial No. 627,005. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN WINFIELD HARLOW, of Eureka, in the county of San Juan and State of Colorado, have invented a new and Improved Combined Ore Concentrator and Slimer, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved combined ore concentrator and slimer arranged to readily separate the tailings from the ore in a very simple manner and without causing a heavy running expense.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a plan view of the same. Fig. 3 is a sectional side elevation of the same on the line 3 3 of Fig. 2. Fig. 4 is a transverse section of the same on the line 4 4 of Fig. 3. Fig. 5 is a rear end elevation of the improvement, with parts in section, on the line 5 5 of Fig. 3. Fig. 6 is an enlarged sectional side elevation of part of the bed and showing the funnel, and Fig. 7 is a sectional plan view on the line 7 7 of Fig. 3 and showing part of the roller-frame for carrying the water-supply.

The improved machine is mounted on a suitably-constructed main frame A, provided with standards A′ and A^2, between which is mounted to swing longitudinally the scoop-shaped bed or pan B, preferably made of sheet metal, with its bottom formed of the two inclined parts B′ and B^2, and the sides and ends sufficiently high to retain a large quantity of concentrates, water, and tailings, as indicated in Figs. 3 and 6. The bed or pan B is secured in a suitably-constructed bed-frame C, connected at its sides with links C′ and C^2, of which the links C^2 are hung on bolts C^3, vertically adjustable in brackets A^3, attached to the upper ends of the standards A^2. The forward links C′ are hung on the ends of cross-beams C^5, pivoted at the middle on a center C^6, supported on the lower end of a screw-rod C^7, held vertically adjustable in the cross-beam A^4, connecting the two front standards A′ with each other, as plainly illustrated in Fig. 4.

Now by the arrangement described the frame C, with the bed B attached thereto, can readily swing longitudinally between the standards and the bed, and the frame can be readily adjusted at the rear ends by adjusting the bolts C^3 to bring the bed to the proper level, the front end finding its own level, owing to the beam C^5 being pivoted at its middle on the bolt C^7.

The front and rear ends of the bed and frame are raised or lowered by adjusting the bolts C^7 and C^3, respectively, to give the desired inclination to the bed, according to the grade of the material under treatment.

In order to impart a rearward swinging motion to the bed and its frame C, I provide the latter at its rear end with a bracket C^8, carrying at its middle a block D, engaged by the cam D′, secured on a transversely-extending shaft E, journaled in suitable bearings in the main frame A and carrying at one end a pulley E′, connected by a belt E^2 with other suitable machinery for imparting a rotary motion to the said shaft E and its cam D′. The latter by its action on the block D draws the frame C and the bed B in a rearward direction, and the said cam finally releases or drops off the block D, so as to permit the frame and bed to be swung suddenly and quickly forward to cause a bumping of the bed and the contents contained therein to insure proper concentration of the material, as hereinafter more fully described. In order to insure a forcible return movement of the frame C and bed B, I provide the said frame, near its forward end, with a rod D^2, pivotally connected with a bracket C^9, attached to the under side of the frame C. The forward end of the rod D^2 is connected with a spring D^3, connected with a rod D^4, passing through the bumper-block D^5 and engaged by nuts D^6 to permit adjusting the tension of the spring D^3, as desired. The bumper-block D^5 is adapted to be engaged by the bumper D^7, secured to the under side of the frame C near the forward end thereof. Now it is evident that when the cam D′ releases the block D the spring D^3, which was stretched during the rearward

swinging of the frame C, causes a return swinging of the bed until the bumper D^7 strikes the bumper-block D^5, so that a strong concussion takes place to gradually agitate the material contained in the bed B, and as hereinafter more fully described.

Near the front end of the frame C is secured a feed-hopper F, transversely extending over the bed B and frame C and having apertures F′ in its bottom to allow the material to be treated to pass in well-distributed quantities into the upper end of the bed B. The hopper F receives the material over a feed-board G, provided on its top with triangular-shaped blocks G′, forming spreaders to divide the material in its downflow over the feed-board, so as to cause the material to fall into the hopper F in a well-distributed state. The upper end of the feed-board G is provided with the usual pulp-receiving hopper G^2, deriving the pulp from the stamp-mill or other machine.

In front of the hopper F is arranged a transversely-extending water-supply H in the form of a box having a perforated bottom H′, the said box being connected by a pipe with a suitable water-supply. The box H is secured in a frame H^2, formed at its rear end with apertured plates H^3, engaging vertical guideways H^5, secured to the inside of the standards A′. The frame H^2 rests loosely on friction-rollers H^4, journaled in the sides of the frame C, so that the rearward and forward swinging of the said frame, as previously described, does not affect the said frame H^2, and consequently the latter is held stationary, together with the box H, while the hopper F moves with the frame and discharges its material into the bed B always at the same place, and the water passes into the bed at different places during the forward and backward travel of the bed to insure a proper washing of the pulp passed into the bed from the hopper F.

The bottoms B′ and B^2 of the bed B extend oppositely in an upward direction, as plainly shown in Fig. 3, and at the joint of the said bottoms or at the lowest point of the bed B are arranged a series of transversely-extending funnels I, each having its nozzle I′ passing through the bottom of the bed, while the inner end of the nozzle extends a short distance above the bottom to bring the funnel-body I^2 a suitable distance upward within the bed B. The funnel-body I^2 is preferably in the form of an oval, as plainly indicated in Fig. 2, with the long axis extending in a longitudinal direction.

Directly above each funnel I is arranged a caisson J, open at the top and bottom, with the lower end extending into the water contained in the bed B, while the upper end is flush with the top of the bed and is secured to the sides thereof by transversely-extending bars J′, as plainly indicated in Figs. 2 and 6. The lower end of each caisson J extends a short distance above the top of the funnel-body I^2, and the said lower end is larger than the top of the funnel-body, with the forward and rear ends of the caisson pointed or formed with sharp edges and inclined downward and inwardly, as plainly indicated in Fig. 6.

The bed B is supplied with a sufficient quantity of water to keep the level thereof a suitable distance above the funnel-body I^2, so that the lower portion of each of the caissons J extends at all times into the water, as plainly indicated in Fig. 6. The water and tailings discharged through the nozzles I′ of the several funnels pass by flexible tubes to a hopper K and are discharged upon the upper run of an endless apron or belt L, arranged in the lower portion of the frame A and extending longitudinally, the upper run of the said belt passing over a table N. The latter is mounted to swing at its rear end on a shaft O, journaled in suitable bearings in the frame A, while the forward or free end of the said table can be raised or lowered by a suitable screw N′, which supports the said free end of the table and permits of adjusting the same, as before mentioned.

The shaft O is provided with a sprocket-wheel O′, connected by a sprocket-chain O^2 with a sprocket-pulley O^3, secured on the main driving-shaft E, so that when the latter is rotated a slow rotary motion is given to the said shaft O by the pulley O^3, chain O^2, and wheel O′. On the shaft O is secured a drum or pulley P, over which passes the rear end of the apron or belt L, and a similar drum or pulley P′ is journaled in longitudinally-adjustable bearings held on the forward or free end of the table N. The lower run of the apron or belt L passes over a tightening-pulley Q, mounted on a shaft journaled in suitable bearings attached to the said table N.

Now by the arrangement described the rotary motion transmitted to the shaft O causes the pulley P to impart a traveling motion to the belt L in the direction of the arrow a', and the tension of the said belt can be increased or diminished by adjusting the bearings for the drum P′ in a longitudinal direction. The sides of the belt L extend up on flanges P^2, formed on the pulleys P P′, so as to prevent the material and water on the belt from running laterally off the same.

The operation is as follows: When the several parts are in the position illustrated in the drawings, then the bed B is supplied with the necessary quantity of water from the box H and the pulp is fed in regular quantities to the said bed by the hopper F, and a swinging and bumping motion is given to the said bed, as previously explained. When the concussion of the bed or pan takes place, it causes the concentrates to gradually move up the bottom B′ of the pan B to be finally discharged over the bent-up end B^3 and the downwardly-turned lip B^4 onto fixed chutes B^5, which deliver the concentrates on the floor or into a suitable receptacle. The middlings, sand, and the finer mesh and lighter

material keep on going down the inclined bottom B′ of the pan B to finally pass into the dead-water around the caissons J, and by the backward swing of the bed it accumulates and fills up the lower part of the bed to finally reach the outlet-funnels I and pass out of the same. Fine minerals that do not at once move ahead to the discharge end of the bed or pan B settle under the upper crust of sand and gradually reach the bottom portion of the bed or pan, and when enough are collected to adhere to the bottom of the pan they will bump ahead, but always under the middlings and tailings, and finally reach the discharge end B^3. The bulk of the mineral will ordinarily get down to the dead-water line, it being understood that the incline of the bed, and the force of the concussion, together with the amount of material to be treated, are regulated according to the nature of the material. The caissons J compel the water to pass under them in order to reach the funnels I, and the water in doing so carries the tailings along and onto the funnels, so that the caissons are of very great service in quickly removing the tailings from the bed. The tailings, with the water, pass down into the hopper K, and upon the upper run of the belt L travel at a slow steady motion in the direction of the arrow a', as before explained. The slimes or muddy water carrying valuable particles of the precious metals flow down the belt to finally drop at the pulley P′ into a sluice-box R, connected at one side with suitable settling-tanks. The tailings that are too heavy to flow down the belt L adhere to the latter and are carried up and finally discharged under the pulley P into a sluice-box R′ by the action of sprays of water issuing through a transverse nozzle or perforated pipe S, connected with a water-supply. The under side of the lower belt-run is thus cleaned of all matter and then passes over the pulley P′ and up over the same, so that the downflowing matter comes in contact only with a clean surface.

By the arrangement described a large body of dead-water is always kept in the bed or pan B to allow fine light ore that does not go ahead at once from the point where it drops into the pan to settle under the upper crust of the same before working back to the outlets. Thus the ore stands in the mixture under the dead-water until it reaches the bottom of the bed B, and when a sufficient quantity is collected on the bottom of the bed to form a thin layer it is evident that it will move ahead past the funnels I and under the working middlings, as before explained.

It will further be seen that any quicksilver passing with the pulp into the bed B collects with the fine ore in the lowest part of the bed B, the slime passing to the apron L is carried by the latter to the settling-tanks, while the water flows off to a suitable place of discharge.

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

1. A device of the class described, provided with a bed or pan, the said bed or pan having a depression or pocket formed in its bottom and outlet-funnels having spouts the outer ends of which extend through the bottom of the bed at the said pocket, the funnel-bodies being held above the bottom of the bed and extending upward to allow the concentrates to settle in the bottom of the bed and to permit the water and tailings to flow down through the funnels and a caisson arranged over each funnel and open at the top and bottom, the lower end of each caisson being located a short distance above the top of the corresponding funnel-body, as and for the purpose set forth.

2. A device of the class described, provided with a bed or pan having its bottom formed of inclined portions extending in opposite directions and forming a pocket at the angle or junction of said inclined portion, and outlet-funnels located at the junction of said inclined portions of the bed and having spouts extending through the bottom of the bed, the funnel-bodies being held above the bottom of the bed and extending upward therein, a caisson located over each funnel-body, the lower end of each caisson being larger than the funnel-body and terminating a short distance above the same, a hopper located below the bed and arranged to receive the material passing through the said funnels, and an endless apron arranged to travel beneath the said hopper and upon which the material is discharged, substantially as described.

3. A device of the class described, comprising a bed or pan provided in its lower portion with outlet-funnels each having a spout extending through the bottom of the bed and a funnel-body extending upward in the bed, a caisson arranged over each funnel and open at the top and bottom, the lower end of each caisson being located a short distance above the top of the funnel-body, and an endless apron arranged to travel and adapted to receive the discharge from the said funnels, substantially as shown and described.

4. In a device of the class described, the combination with a swinging bed or pan, and a hopper carried by the said pan, of a water-box discharging into the said pan, and a frame carrying the said water-box and resting on rollers journaled in the support for the said bed or pan, the said frame being provided with guides engaging fixed guideways, substantially as shown and described.

5. A device of the class described, comprising a fixed frame provided with standards, a frame mounted to swing in said fixed frame and adapted to receive successive concussions, a bed or pan carried by said swinging frame, a feed-hopper secured to said swinging frame near the front end thereof, a water-supply box, and a frame carrying the said water-

supply box and provided with guides engaging guideways on the standards of the fixed frame, the said frame carrying the water-supply box resting loosely on friction-rollers journaled in the sides of the said swinging frame, substantially as shown and described.

6. A device of the class described, comprising a bed or pan mounted to swing and adapted to receive successive concussions, a fixed water-supply at the upper end of said bed, a hopper moving with the bed and adapted to discharge the material upon the bed always at the same place, a series of funnels arranged in the lower portion or pocket formed in the bottom of the said bed, each funnel having a spout extending through the bottom of the bed, a funnel-body held above the bottom of the bed and extending upward in the bed, and a caisson arranged over each funnel and open at the top and bottom, the lower end of the caisson being located a short distance above the top of the corresponding funnel-body, substantially as shown and described.

7. A device of the class described, provided with a bed or pan mounted to swing and adapted to receive successive concussions, the said bed being formed in its bottom with a pocket, a series of transversely-arranged funnels held in the said pocket, each provided with a spout extending through the bottom of the bed and a funnel-body held above the bottom and extending up into the pan or bed, and a caisson for each funnel located above the same and fixed to the bed, each caisson being funnel-shaped and open at the top and bottom, the lower end of the caisson being larger than the top of the funnel-body and terminating a short distance above the same, substantially as shown and described.

8. A device of the class described, provided with a bed or pan mounted to swing and adapted to receive successive concussions, the bottom of said bed or pan having inclined portions extending upward in opposite directions forming a pocket at the angle or junction of the inclined portions, a series of transversely-arranged funnels held in the said pocket, each provided with a spout extending through the bottom of the bed, the inner ends of the spouts extending above the bottom of the bed, and a funnel-body held above the bottom of the bed and extending up into the bed, and a caisson for each funnel located above the same and fixed to the bed, each caisson being funnel-shaped with beveled sharp-edged ends, the lower end of the caisson being larger than the top of the funnel-body, and terminating a short distance above the said top of the funnel-body, substantially as described.

9. In a device of the class described, the combination with a bed or pan, a swinging support for said bed or pan, and a hopper adapted to discharge the pulp into the said bed or pan, the said hopper being secured to said swinging support and movable therewith, whereby the material is discharged upon the bed or pan always at the same place, of a fixed water-box discharging into the said bed in front of the said hopper, and a frame supporting the said water-box and resting loosely on rollers journaled in the swinging support for the said bed or pan, substantially as shown and described.

10. In a device of the class described, the combination with a fixed frame, of a swinging frame, a bed or pan carried by said swinging frame, a feed-hopper fixed to said swinging frame and movable therewith, whereby the pulp is deposited upon the bed or pan always at the same place, a water-supply box, a frame carrying the said water-supply box and resting loosely on friction-rollers journaled in the sides of the swinging frame, and guide-plates located at the rear ends of the frame carrying said water-supply box, the said guide-plates engaging vertical guideways on the fixed frame, substantially as shown and described.

11. In a device of the class described, the combination with a frame mounted to swing and adapted to receive successive concussions, a bed or pan carried by said frame, a hopper carried by the frame and adapted to discharge the material into said pan, and an endless traveling apron adapted to receive the discharge from said pan, of a water-supply box discharging into the said bed or pan, a frame carrying the said water-supply box and resting loosely on friction-rollers journaled in the said swinging frame, and means for preventing longitudinal movement of the said frame carrying the water-supply box during the forward and backward travel of the swinging frame, substantially as shown and described.

12. A device of the class described, provided with a bed or pan formed in its lower portion with outlet-funnels each having a spout extending through the bottom of the bed and a funnel-body extending upward in the bed, an endless apron adapted to receive the discharge from the said funnels, an adjustable table under the upper run of the said apron, a shaft journaled in the frame of the device and on which the rear end of said table is mounted, a drum formed with flanges at its ends and secured on said shaft, and a similar drum journaled in adjustable bearings held on the forward or free end of the table, the said apron being arranged to travel over the said drums, and the sides of the apron extending up on the said flanges, substantially as shown and described.

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Witnesses:
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