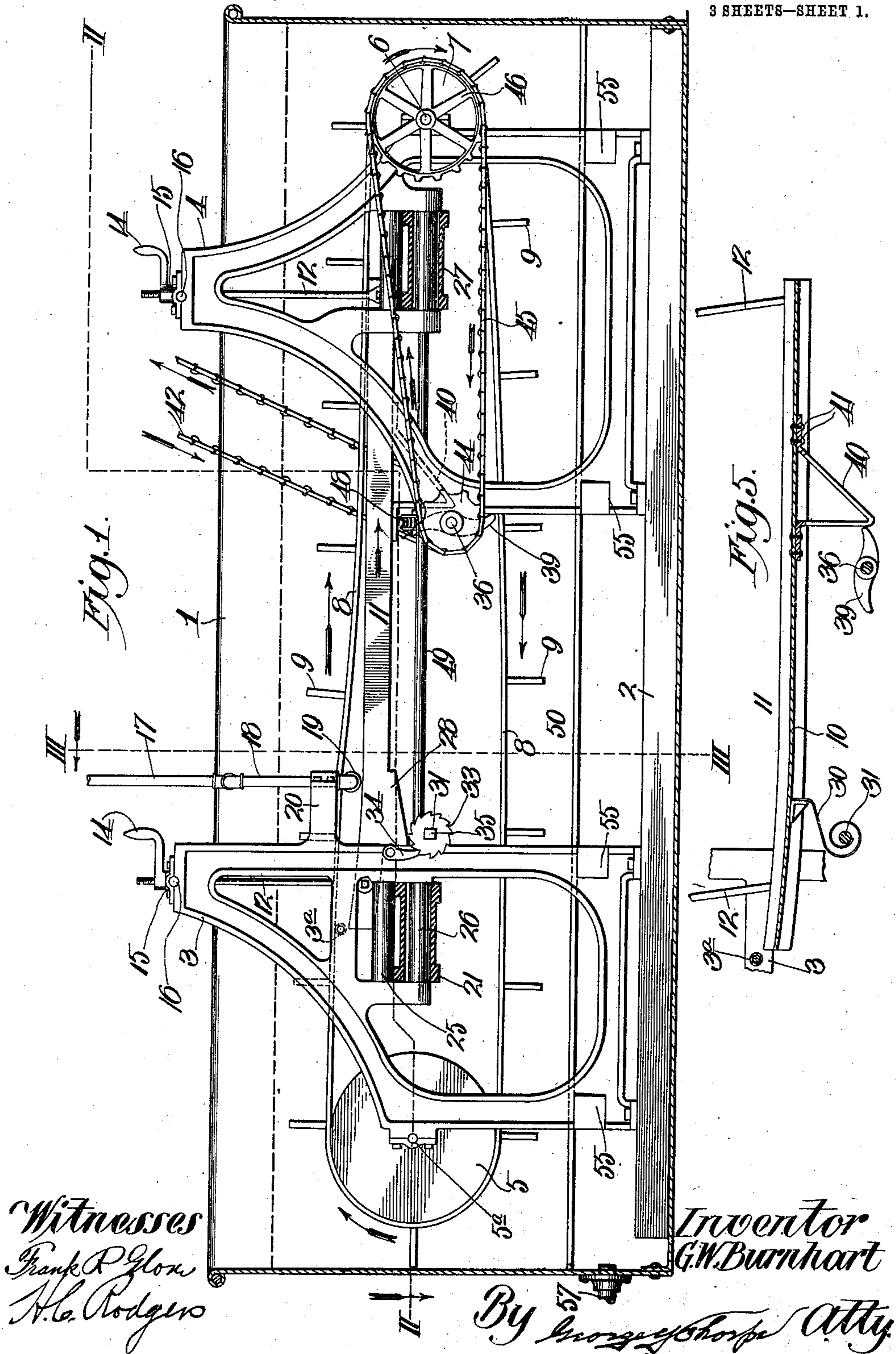


G. W. BURNHART.
ORE CONCENTRATOR.
APPLICATION FILED APR. 8, 1909.

966,521.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 1.



Witnesses
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Inventor
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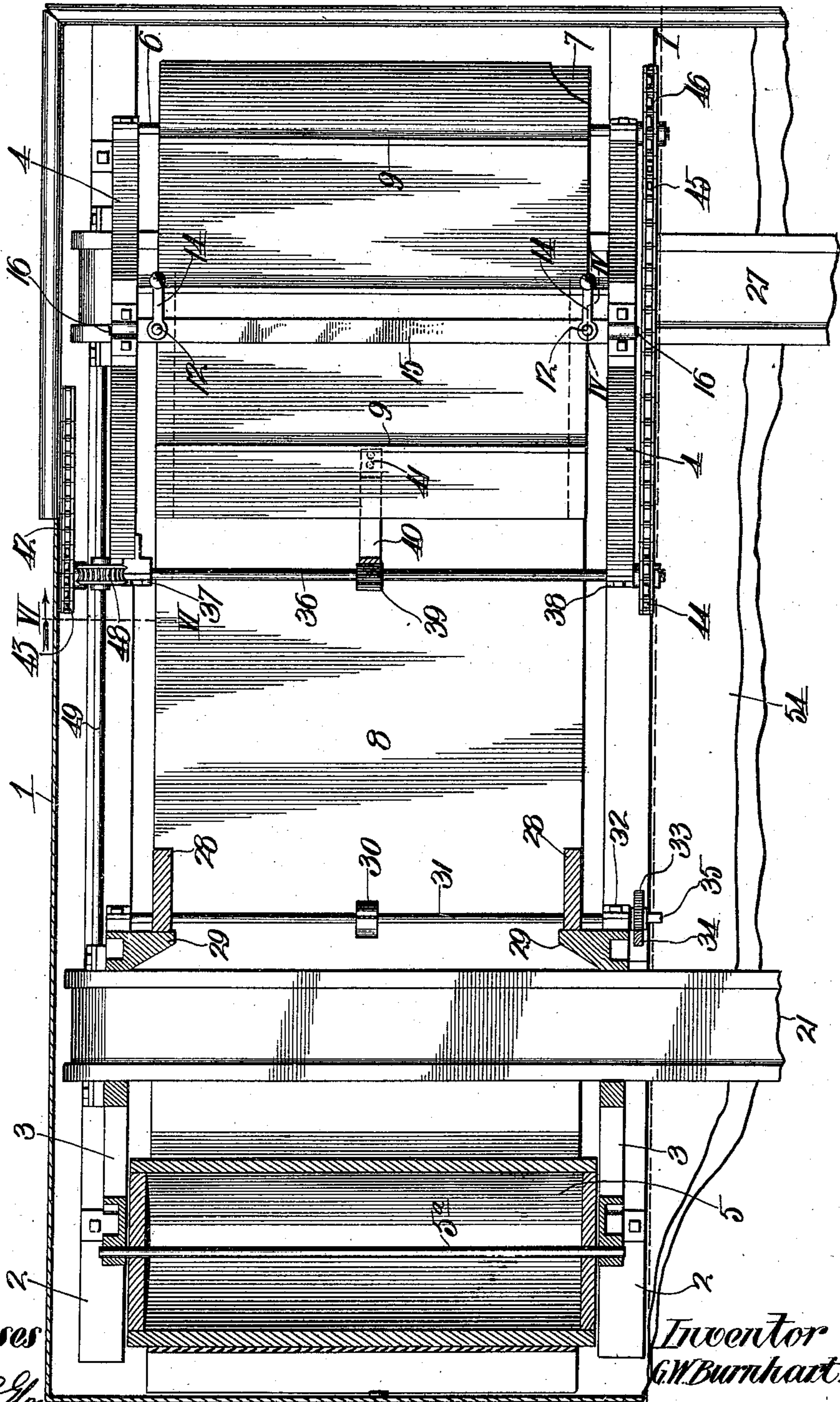
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3 SHEETS—SHEET 2.

Fig. 2.



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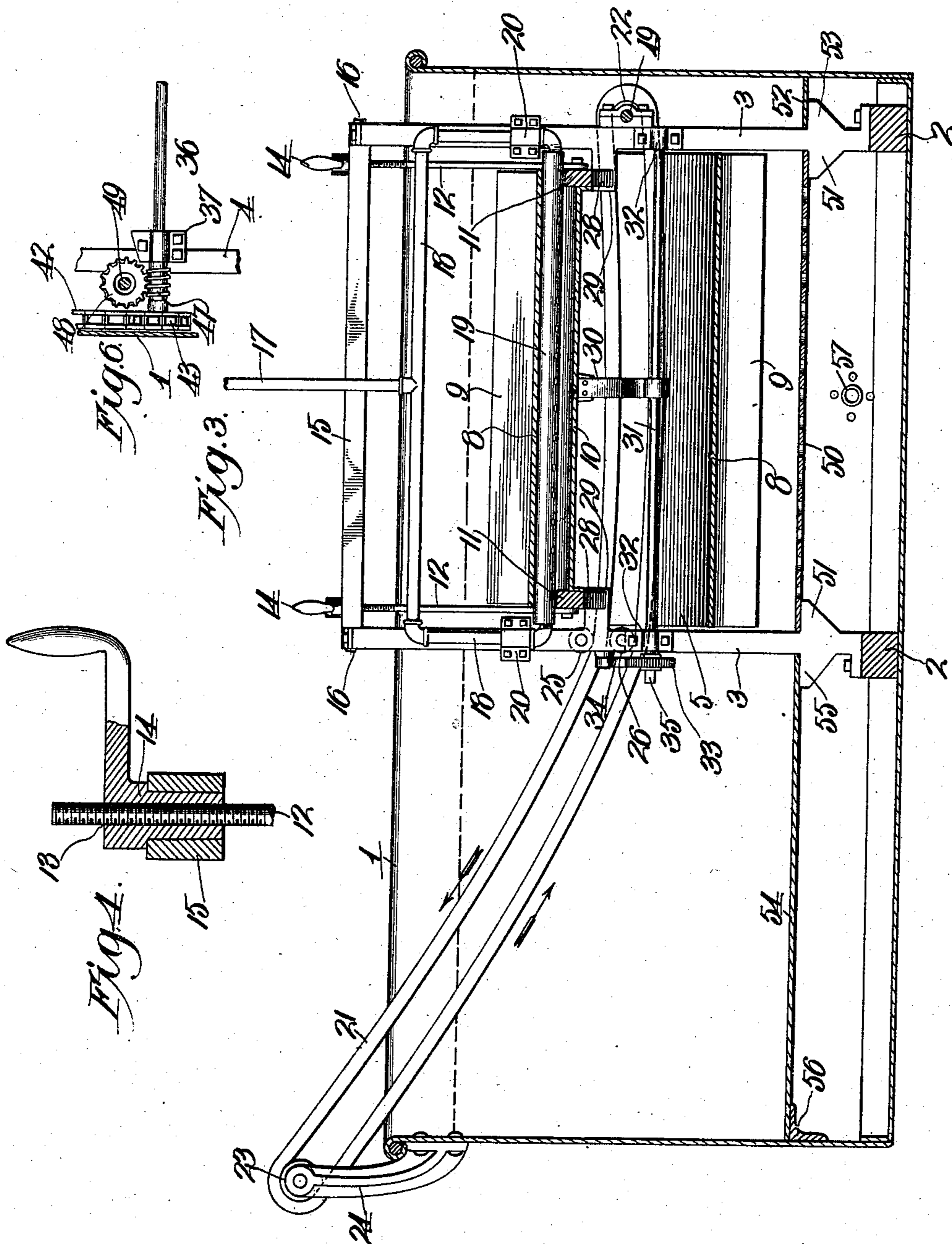
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

GEORGE W. BURNHART, OF WARD, COLORADO.

ORE-CONCENTRATOR.

966,521.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed April 8, 1909. Serial No. 488,599.

To all whom it may concern:

Be it known that I, GEORGE W. BURNHART, a citizen of the United States, residing at Ward, in the county of Boulder and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification.

This invention relates to submerged ore concentrators and has for its object to produce a machine of this character which will effectually, thoroughly and expeditiously clean and separate concentrates, tailings and what is known as "slimes."

A further object is to produce a machine of this character which creates and maintains a circulation of the water in which it is submerged for the purpose of effecting the cleansing and separation of the concentrates, tailings and slimes.

A further object is to produce means for separating and collecting the slimes or other matter precipitated from that part of the water actively engaged in the cleaning operation.

With these and other objects in view as hereinafter appear, the invention consists in certain novel and peculiar features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawings, in which:—

Figure 1, is a vertical section of a machine embodying my invention, on the line I—I of Fig. 2. Fig. 2, is a horizontal section on the line II—II of Fig. 1. Fig. 3, is a vertical transverse section on the line III—III of Fig. 1. Fig. 4, is an enlarged vertical section on the line IV—IV of Fig. 2. Fig. 5, is a vertical longitudinal section taken centrally of the swinging table, and also shows a spring for moving the table in one direction and a cam for moving it in the opposite direction, the figure furthermore showing a part of the frame and a roller for preventing the current-producing part from sagging adjacent to the front end of the table. Fig. 6 is a section on the line VI—VI of Fig. 2.

In the said drawings, in which like reference characters identify corresponding parts in all of the figures, 1 indicates a tank, and largely submerged in water contained in said tank, is an ore concentrator constructed as follows:

2 indicates sills extending longitudinally and resting on the bottom of the tank. 3

indicates a pair of opposite frames secured upon the front ends of said sills and 4 a pair of frames upon the rear ends of said sills, the frames 3 and 4 of each sill forming the sides of the frame of the machine.

5 is a transversely-arranged roller having its shaft or spindles 5^a journaled on frames 3, and 6 indicates the shaft or spindles of a similar but preferably smaller transversely-arranged roller 7, said shaft or spindles being journaled on frames 4, and connecting said rollers is an endless belt 8 provided with outwardly-projecting cleats or wings 9 for creating and maintaining a circulation of the water in the direction indicated by the arrows adjacent to said belt.

Arranged between the rollers and just under and substantially parallel with the upper strand of the belt is a table which by preference slopes upward slightly toward its front end from a point contiguous to such end as shown in Fig. 1, and said table consists of a bottom and side walls 11 projecting above the bottom, the frames 3 carrying a transverse rod 3^a above and near the front end of the table to guard against any possibility of the belt 8 sagging at such point sufficiently to interfere with the free discharge of the concentrates from the front end of the table, as hereinafter explained. Pivoted at their lower ends to and near the opposite ends of the walls of the table are threaded rods 12 engaging threaded passages 13 in the vertically-disposed hubs of cranks 14, the hubs of said cranks being journaled in parallel rock-bars 15 extending transversely of the frame of the machine and terminating in spindles 16 journaled in the opposite sides of said frame, the arrangement being such that when pressure is applied on said table tending to move it endwise, it will be caused to describe a slight swinging movement by said rock-bars and the connections between the same and the table, it being also noticed in this connection that the altitude of the table can be varied and it can be caused to assume a perfectly level or a tilting position by a proper adjustment of the cranks 14, as will be readily understood.

17 indicates a pipe leading from the point of supply, not shown, of the crushed ore to be treated, such ore being mixed with water to cause it to flow down through pipe 17 and the branches 18 thereof to the opposite ends of a perforated pipe 19 arranged just

above the table and under the upper strand of the belt adjacent to the point where the table starts to slope upwardly and forwardly, the supply-pipeway described being
 5 secured reliably to frames 3 by caps 20 secured to parts of said frames, as shown clearly in Figs. 1 and 3.

21 indicates an endless marginal flanged or walled conveyer or belt to receive the concentrates discharged from the front end of the table, said conveyer engaging a drive-wheel 22 at one end and a belt-wheel 23 at its opposite end, said wheel 23 being supported above the plane of the tank by a
 10 bracket 24 projecting upward from the tank, and intermediate of said wheels the upper and lower strands of said conveyer pass under and are held depressed by a pair of anti-friction rollers 25 and 26 journaled in
 15 the frame 3, so that the portion of the belt underlying the table shall occupy a substantially horizontal position, the remaining portion of the belt extending upwardly from said anti-friction rollers to said wheel 23.
 20 A similar conveyer or belt is arranged under the opposite or rear end of the table to receive the tailings therefrom, the said conveyer, numbered 27, being supported and guided by parts corresponding in all respects
 25 to those described in connection with the conveyer or belt 21.

For the purpose of limiting the forward swinging movement of the table, it is provided with one or more shoulders 28 to
 30 strike against abutments or stops 29 rigid and preferably cast integral with frames 3, as shown most clearly in Figs. 2 and 3, and to impart such endwise movement to the table, a spring 30 is secured at its outer end
 35 to the bottom of the table (see Figs. 3 and 5) and at its inner end to a transverse shaft 31 journaled in bearings 32 secured to frame 3; said shaft being equipped with a ratchet wheel 33 engaged by a gravity pawl 34 carried by the adjacent frame 3 as shown, the
 40 adjacent end of the shaft being preferably squared as at 35 for convenient engagement by a wrench or its equivalent, by which the shaft may be turned to increase the tension
 45 of spring 30, the tension of such spring being relaxed if desired, by tripping the pawl to permit the shaft to turn backward.

36 indicates a transverse shaft journaled in bearings 37 and 38 carried by frames 4,
 50 and provided centrally with a double-arm cam 39 for alternate engagement with a projection or shoulder 40 depending from the bottom of the table, said projection or shoulder preferably being in the form of a V-shaped frame riveted as at 41 to the bottom
 55 of the table.

42 is a drive-chain engaging the sprocket-wheel 43 secured on one end on shaft 36, said shaft being equipped at its opposite end
 60 with a sprocket wheel 44 connected by a

chain 45 with a sprocket wheel 46 secured on shaft 6 of roller 7.

47 is a worm on shaft 36 meshing with a worm-wheel 48 on a longitudinal shaft 49 carrying the drive-wheel 22 of belt 21 and
 70 the corresponding drive-wheel of belt 27.

50 is a perforated plate or foraminous partition arranged below the belt 8 and supported by preference on lugs 51 cast with frames 3 and 4. Partition 52 and a partition 54 are arranged in the same plane as
 75 partition 50 but at opposite sides of the machine, partition 52 being secured upon lugs 53 of the frame of the machine and partition 54 upon similar lugs 55 and a cleat 56 secured to one of the walls of the tank.
 80 These partitions are employed to provide a chamber in which the water will remain substantially quiet or still and into which the heavier slimes will be precipitated from the water in the upper chamber through the perforated plate 50, it being obvious of course
 85 that plates 52 and 54 may also be perforated if desired.

In practice, motion is imparted through
 90 chain 42 to shaft 36 and from the same through chain 45 to belt 8 and through the worm-gearing to belts 21 and 27. The rotation of shaft 36 causes the arms of the cam to impart endwise movement twice in
 95 each revolution of said shaft to the table in the direction indicated by the arrow thereon (Fig. 1) each of such movements tensioning spring 30; so that the same shall reverse such movement of the table the instant said cam
 100 arms pass out of engagement with the projection or shoulder 40, such reverse or forward movements of the table being arrested by contact of shoulders 28 with abutments 29, it being obvious of course that a jar or
 105 shock is incidental to the arrest of each forward movement of the table, this jar or shock tending to cause the concentrates to in effect climb forward on the table by a series of jumping actions, which movements of the concentrates take place in opposition to the
 110 current of water which flows rearward on the table below the upper strand of the belt, which, it will be apparent, creates a circulation of water in the direction indicated by the arrows adjacent to the belt, as hereinbefore explained. This current is sufficiently
 115 strong to carry the tailings rearward upon the table. The concentrates drop upon the conveyer or belt 21 and the tailings upon the conveyer or belt 27 and are conveyed thereby upwardly through the tank and discharged from the elevated ends of the conveyers into suitable receptacles, not shown.
 120 It will be apparent that the concentrates and tailings are thoroughly washed by the water and that the slimes or parts held in suspension by the water will circulate with the latter, the heavy slimes being precipitated downward and eventually find their way
 125
 130

through the perforated partition into the still water chamber below, where they more readily and more quickly settle upon the bottom of the tank. By thus providing for a separation of the heavier from the lighter slimes the water in the tank can be used for a longer period than if such separation was not effected, and after the operation of the machine is brought to a close those in charge will not have to wait as long a time for the settling or precipitation of the remaining slimes to take place, before drawing off the water and collecting the slimes, which of course are of more or less value according to the character or kind of ore being treated. The slimes may be removed in any suitable manner and access to them can be readily had by removing plate 54, the water being preferably first drained from the tank through drain pipe 57, or it may be otherwise removed, the same pipe being utilized if desired to recharge the tank with fresh water preliminary to a second concentrating action.

From the above description it will be apparent that I have produced a submerged ore concentrating machine embodying the features of advantage enumerated as desirable and which is susceptible of modification in various particulars without departing from the principle and scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters-Patent, is:

1. The combination with a tank of an ore concentrating machine, comprising a suitable frame within the tank, a table therein, means to receive concentrates and tailings discharged from the opposite ends of said table, means to impart endwise vibratory movement to said table, and an endless traveling belt submerged in the water of the tank and adapted to travel from the front toward the rear end of the table and cause the water upon the latter to flow in the same direction.

2. The combination with a tank of an ore concentrating machine, comprising a suitable frame within the tank, a table therein, means to receive concentrates and tailings discharged from opposite ends of said table, means to impart endwise vibratory movement to said table, an endless traveling belt submerged in the water of the tank and adapted to travel from the front toward the rear end of the table and cause the water upon the latter to flow in the same direction, and means to discharge crushed ore upon the table.

3. The combination with a tank of an ore

concentrating machine, comprising a suitable frame within the tank, a table therein, means to receive concentrates and tailings discharged from opposite ends of said table, means to impart endwise vibratory movement to said table, an endless traveling belt submerged in the water of the tank with its upper strand above and adjacent to the table and its lower strand below the table and moving so that its upper strand shall travel from the front toward the rear end of the table to cause the water upon the latter to flow in the same direction, means to discharge crushed ore upon the table and below the upper strand of the belt, and means for abruptly arresting the forward vibratory movements of the table.

4. The combination with a tank of an ore concentrating machine, comprising a suitable frame within the tank, a table suspended from said frame, an endless conveyer arranged within the tank with its upper strand above and its lower strand below the table, means to deposit crushed ore upon the table, means for causing said conveyer to travel so that its upper strand shall move from the front toward the rear end of the table, a rotary cam to impart rearward endwise movement to the table, means for reversing the movement of the table when released by the cam, means to suddenly arrest each forward movement of the table, and means to receive concentrates and tailings discharged from the opposite ends of the table through the vibratory movements thereof.

5. The combination with a tank of an ore concentrating machine, comprising a suitable frame within the tank, a table suspended from said frame, an endless belt arranged within the tank with its upper strand above and its lower strand below the table, means to deposit crushed ore upon the table, means for causing said belt to travel so that its upper strand shall move from the front toward the rear end of the table, a rotary cam to impart rearward endwise movement to the table, a spring for reversing such vibratory movement, means to suddenly arrest such reverse or forward movement of the table, and means to receive concentrates and tailings discharged from the opposite ends of said table through the vibratory movements thereof.

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

GEORGE W. BURNHART.

Witnesses:

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G. Y. THORPE.