No. 644,289. Patented Feb. 27, 1900.

G. GATES.

CONCENTRATOR.

(Application filed Jan. 13, 1899.)

(No Model.)

Fig. 1.

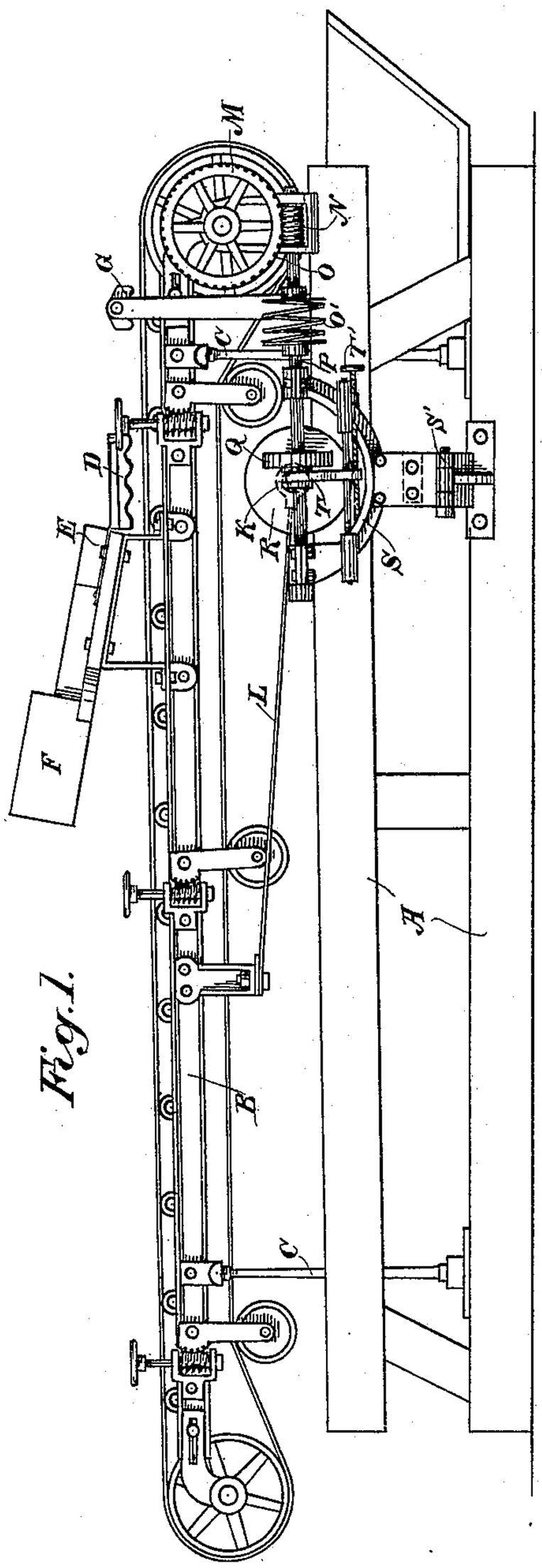

Fig. 2.

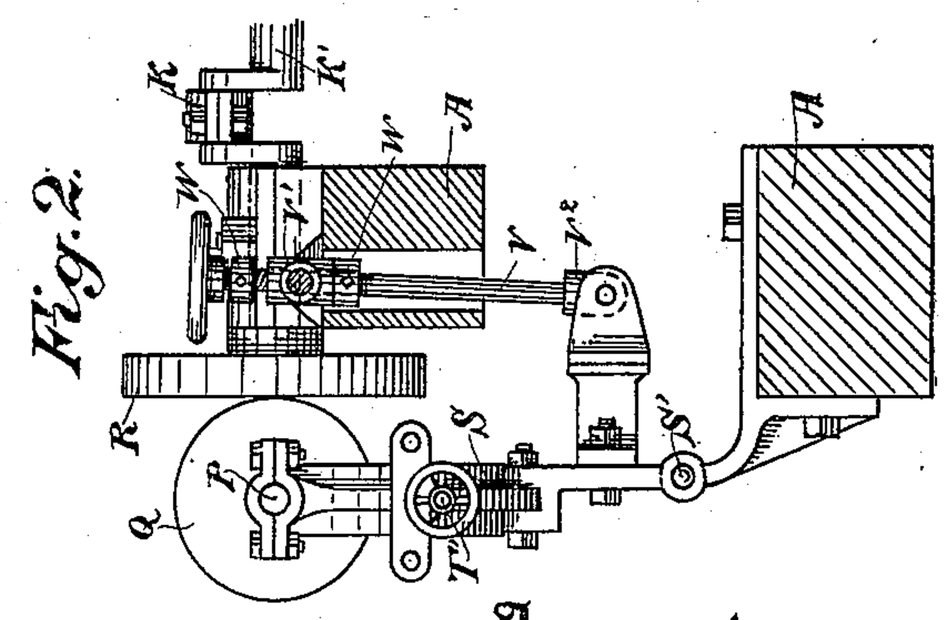

Fig. 3.

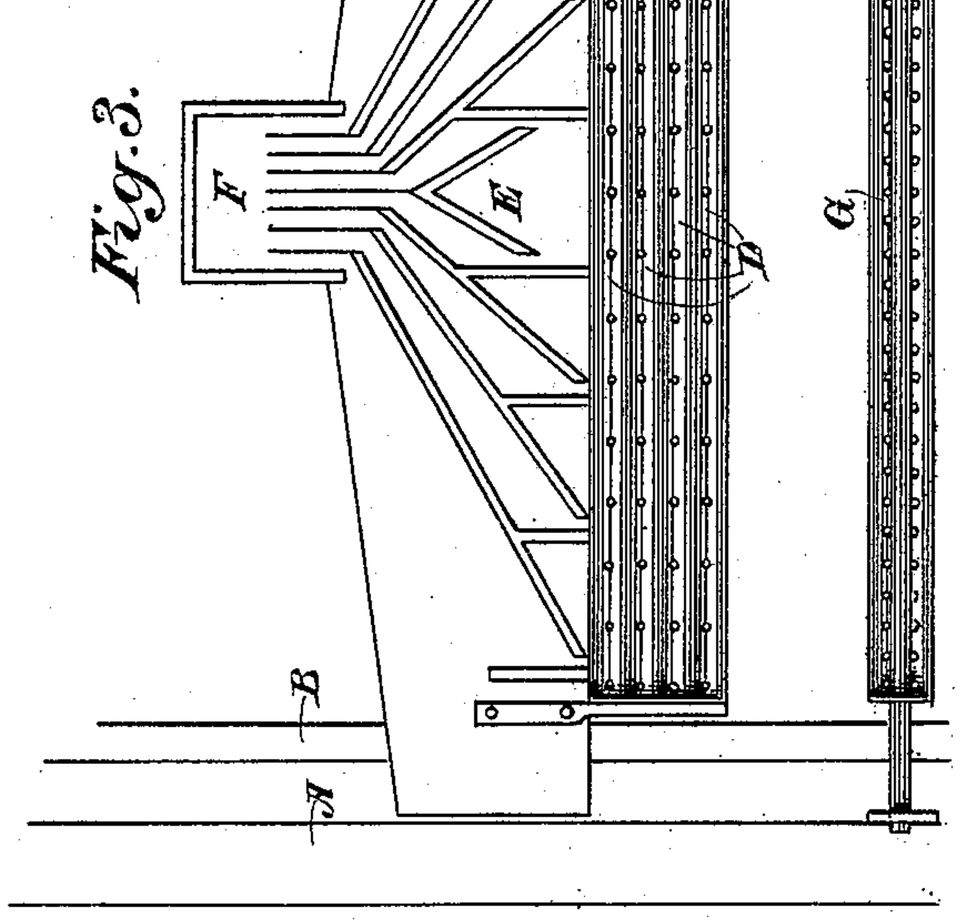

Fig. 4.

Fig. 5.

Witnesses,
P. Stowe
H. F. Ascheck

Inventor,
George Gates
By Dewey Strong & Co.
Atty

UNITED STATES PATENT OFFICE.

GEORGE GATES, OF JACKSON, CALIFORNIA.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 644,289, dated February 27, 1900.

Application filed January 13, 1899. Serial No. 702,041. (No model.)

To all whom it may concern:

Be it known that I, GEORGE GATES, a citizen of the United States, residing at Jackson, county of Amador, State of California, have invented an Improvement in Concentrators; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in endless-traveling-belt concentrators, in which the belt passes over drums at opposite ends of the frame, so that its upper surface stands at an incline from one drum to the other, with means by which the belt is caused to move slowly from the lower toward the upper end, having devices by which the pulp mixed with water is delivered upon the belt, so that the lighter and valueless portions will be carried downward and over the lower part of the belt, while the heavier and valuable material will be concentrated and gradually carried up over the upper end of the belt, to be washed off and collected at a point adjacent to the upper drum.

My present invention comprises improvements in the method of distribution of the pulp and water upon the belt and certain improvements in the mechanism for regulating the speed of travel of the belt or stopping it altogether at will.

Referring to the accompanying drawings, Figure 1 is a side elevation. Fig. 2 shows the means for operating the speed-wheel. Fig. 3 is a plan of the feeding device. Fig. 4 is a cross-section through the pulp-troughs. Fig. 5 is a similar section through the clear-water trough.

In the operation of this class of belts it is common to discharge the pulp upon the belt at a suitable point by means of variously-constructed distributers and to supply jets of clear water above the point where the pulp reaches the belt, so that it may be washed and the light material separated from the heavy, this process being assisted by either a longitudinal or side shaking motion.

My present invention is an improvement upon the distribution and other features of such apparatus.

A is the main frame, fixed at any suitable point.

B is a supplemental belt-carrying frame, which in the present case is shown supported upon upwardly-extending arms C, these arms being sufficiently flexible to allow the supplemental frame to be oscillated. Various equivalent supporting devices may be employed, and this frame may be oscillated either longitudinally or transversely in various ways which are well known in the state of the art. It has been customary to discharge the pulp mixed with water upon the belt at some point intermediate between the lower and the upper end and to supply clear water above this point of delivery, so that the water flowing down will further thin out and separate the worthless and valuable heavier portions. The pulp, however, is not of an equal gravity or fineness, and when it is all discharged at approximately one point on the belt it is so massed that the separation is not as perfect as it should be.

My invention is designed to mechanically classify and separate the pulp by its varying gravity and fineness, so that the different grades will fall upon the belt at points and in lines more or less separated, and to thus make a preliminary separation, which greatly assists the action of the water in completing the operation upon the belt. This is effected by the use of a series of troughs D, which extend transversely across from side to side of the belt and which are supplied with material by means of the diverging sluices E, which are supplied from a head-box F. These sluices are constructed, as shown, so as to subdivide and separate the material to the full width of the belt, and from the discharge ends of these sluices, which are suitably inclined, as shown, the material falls into the first of the troughs D. These troughs have holes or perforations made along the bottom, and the holes in each trough are in line longitudinally with the belt, there being as many of these lines of holes as is found necessary or desirable to properly deliver the pulp upon the belt, and the object is to cause the pulp falling from the first and the following holes of each line to reach the belt in approximately the same lines longitudinally, thus leaving intermediate spaces between these lines of deposit for a purpose to be hereinafter described. The troughs may be made of any suitable or

desired shape and of any suitable material and may be as many in number as is found desirable for the proper subdivision of the pulp. They are here shown connected in parallel series, with the intervening ridges or elevations of such height that after the first trough is filled the overflow passes to the next, and so on till all are filled. The holes in the troughs are not sufficiently large to allow the pulp to flow through in one or two sets, but are so designed in proportion to the supply reaching them from the sluices E that, all the material being received into the first of the troughs D, the heavier and coarser will sink to the bottom and will gradually pass through the holes of this trough and fall upon the belt. The remainder of the material flows over the elevation between the first and the second trough, and the next heavier material will in like manner reach the bottom and pass through the holes in this trough, and so on until the very lightest of the material reaches the final transverse trough and is distributed through the holes in the bottom of this trough. The material will thus be separated or graded before it falls upon the belt, and each grade will reach the belt at a little distance from that falling from the previous trough. The heaviest material is delivered farthest from the head of the belt and the lightest nearest to the head. A certain separation has thus been effected, so that the clear water flowing down the belt from above can act upon each of these independent bodies of material with greater facility than it could if the material were all discharged upon the belt together. At a point nearer to the head of the belt than these distributing-troughs is situated the clear-water troughs G, which also extend across the belt at a point sufficiently above it, as shown. This clear-water device consists of two or more parallel troughs, with a source of supply which delivers water into the troughs, and it passes from one to the other and is discharged through holes in the bottom to fall upon the belt in the line of the material which has been deposited below.

The position of the pulp-distributing troughs D is such that the finer material is deposited nearer the upper end of the belt and the coarser toward the lower end with relation to the finer, so that the water flowing down the belt first acts upon the finer material and carries away the very lightest pulp, leaving the very finest and lightest sulfurets upon the belt, and it acts successively upon each deposit in like manner. In order to furnish a sufficient supply of water, but in quantities too small to produce such a current as will entirely wash away the light sulfurets, I have employed these parallel troughs, each of which has the small holes made in the bottom, so that small streams of water are delivered and the proper supply thus furnished, instead of supplying the full amount of water by means of larger holes or openings in a single supply pipe or trough.

The parallel water-troughs or supply devices may be as many in number as desired. A convenient arrangement is shown in the present drawings, in which three of the troughs are formed by corrugating the metal, the central trough having no openings in the bottom and the troughs on each side of it having perforations, as previously described. (Shown at *g*.) Above the central unperforated channel is a water-supply pipe H, having slots or holes *h* made in the bottom, through which water is delivered into the central trough in quantity sufficient to overflow the elevations upon each side of it into the two exterior troughs, and the water thus divided and received into these troughs passes through the holes *g* and falls upon the belt. From the point where the water falls upon the belt it spreads out, diverging from the points of supply and spreading out in the manner that the tail of a comet spreads from the nucleus outwardly. This supply of water thus constantly becoming thinner and wider the water from each of the longitudinal lines of holes eventually meets that from the next adjacent line, so that a supply of water will flow down the whole of the lower part of the belt and the intervals between the lines of deposit of the pulp and form open spaces, through which the lighter material is more easily separated from the heavier and carried away down the incline of the belt. The troughs which receive the pulp also serve a valuable purpose in distributing the pulp thoroughly from one end to the other, this action taking place by reason of the shaking motion of the troughs, which are supported upon the belt-carrying frame B and partake of its oscillations.

The means for oscillating the belt-carrying frame, as shown in the present invention, consists of an eccentric K, mounted upon a shaft K′, which is journaled transversely across the main frame and to which power is applied from any convenient or desired source. The eccentric is connected by a rod L with the belt-carrying-frame, and by the rotation of the shaft a reciprocating motion is transmitted to the frame.

In order to move the belt up the slight incline at which the frame B stands, the upper drum-shaft has upon its end a gear-wheel which engages with a worm N, this worm being carried by a shaft O, which is journaled and movable with the frame B, by which these parts are carried.

P is a shaft through which power is transmitted to the shaft O to rotate the worm-gear N by means of a spiral elastic connecting-spring O′, interposed axially between the ends of the shafts P and O, so that when the shaft P is turned it will turn the spring O′ and the shaft O and will thus transmit motion through the worm-gear to advance the belt. At the same time the alternate elongation and compression of the spring O′ allows the oscillating motion of the belt-carrying frame, while

the shaft P simply rotates in its boxes without any of this longitudinal motion. The shaft P is journaled upon a yoke or segment S and has fixed upon it a wheel Q. This shaft P is journaled transversely across the line of the shaft K′ and at right angles with the face of a disk R, which is fixed upon and rotates with the shaft K′. The wheel Q is slidable upon a feather upon the wheel P, and by means of a clutch T and a screw T′, by which the clutch is movable, the wheel Q may be moved along the shaft P, so as to stand at any point between the center of the wheel R and its periphery, and when the wheel Q is brought into contact with the wheel R motion will be transmitted from R to Q and the belt-driving mechanism set in motion.

By the adjustment of the wheel Q along the shaft P and moving it into contact with the face of the wheel R at different points between the center and the periphery the rate of travel of the belt is regulated by the increase or decrease of the speed of rotation of the wheel Q, the shaft P, and the worm-gear N.

In order to throw the wheel Q out of contact with the wheel or disk R, and thus entirely stop the advance of the belt without interfering with the shaking motion, I have shown the yoke S as fulcrumed to a stationary part of the frame A, the fulcrum-pin being shown at S′. This fulcrum-pin is parallel with the shaft P and allows the yoke S and the shaft to be moved away from or toward the wheel or disk R. This movement is effected by means of a screw V, turnable in a swiveled nut V′ and having its lower end connecting with a swivel V^2, which is journaled to an arm projecting from the yoke or segment S or some connected portion, so that when the screw is turned in one direction it will tilt the mechanism which carries the shaft P and will move the wheel Q away from the face of the wheel R and stop the rotation of the wheel Q. When the screw is turned in the other direction, it throws the wheel Q into contact with the face of R and causes it to again revolve.

In order to limit the movement of the wheel Q, a collar W is fixed upon the shank of the screw V below the swivel-nut V′, and by contacting with said nut it limits the upward movement of the screw. A similar collar carried by the screw or by the hand-wheel by which the screw is turned above the nut will contact with the upper end when the screw is turned down and limit its motion in that direction.

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

1. In a concentrator, the combination with a belt and feeding devices, of a trough interposed between the same and constructed with connected channels from which the pulp successively overflows from one channel to the other, said channels provided with bottom discharges whereby the pulp is delivered directly upon the belt, at different points in the length thereof, depending on its gravity, said feeding devices connecting with the initial channel of the series.

2. In an endless-traveling-belt concentrator, the combination with a moving belt of a series of troughs extending transversely above the belt having the edges connected to form a continuous overflow from one to another of said troughs, spaced perforations made in the bottoms of the troughs from end to end, said perforations being also alined transversely of the troughs and in line lengthwise of the belt, and a preliminary distributer consisting of divergent troughs by which the pulp is delivered from a common supply into the first trough simultaneously from one end to the other.

3 The mechanism for distributing and grading pulp and afterward depositing it upon an endless traveling belt for concentration, consisting of a series of troughs having the edges connected continuously, said troughs extending transversely across above the belt having lines of spaced perforations through the bottoms from end to end, said perforations also standing in line lengthwise of the belt, a distributer by which pulp is delivered from end to end of the first of said troughs, so as to fill and successively overflow to the subsequent troughs of the series and be discharged therefrom in lines upon and lengthwise of the belt, and water-supply troughs extending transversely across the belt nearer to its head than the pulp-troughs.

4. The combination with an endless-traveling-belt concentrator of a series of transversely-disposed troughs with continuously-connected edges, a distributing pulp-supply discharging into the first of said troughs to overflow successively to the following ones, perforations made in the bottoms of said troughs from end to end, and in lines lengthwise of the belt, a water-supply device situated nearer to the head of the belt consisting of a central and two exterior troughs supported transversely of the belt, the central trough being unperforated, a perforated supply-pipe extending transversely and in line above said central trough into which it delivers so that water overflows therefrom into each of the exterior troughs, and perforations made in the bottoms of the exterior troughs through which the water is delivered from one side to the other of the belt in small independent quantities.

5. A mechanism for distributing and grading pulp and afterward depositing it upon an endless traveling belt for concentration, consisting of a series of troughs with connecting edges, extending transversely above the surface of the belt, supports therefor from the belt-carrying frame whereby the troughs partake of the movement of said frame, said troughs having perforations extending from end to end and with the perforations in one

trough in line with those of the other troughs to form lines of perforations which are parallel with the travel of the belt.

6. A mechanism for distributing and grading pulp and afterward depositing it in the order of its gradation, upon an endless traveling belt, consisting of a series of parallel troughs with connecting edges, said troughs extending transversely above the belt, having lines of perforations from end to end, said perforations being also directly in line with each other in series transversely of the troughs and lengthwise of the belt, and a means for supplying pulp and water to the first of said troughs.

7. In an endless-belt concentrator of the character described, a distributer whereby the pulp is graded and delivered upon the belt, and a clear-water supply consisting of a plurality of transversely-disposed troughs having discharge-openings in the bottom of each and so disposed with relation to corresponding openings in the other troughs as to form parallel rows of perforations extending parallel with the travel of the belt, substantially as described.

8. In a clear-water supply for traveling concentrator-belts, a means for subdividing the amount of water delivered upon the belt, and discharging the same at separated points whereby the washing away of the finer sulfurets is lessened, consisting of central unperforated and exterior perforated troughs connected along their contiguous edges, a supply-pipe parallel with and above the central trough, with openings through which water is delivered so as to overflow into each of the side troughs.

9. An endless-belt concentrator having an oscillating frame upon which it is carried, means by which the belt is caused to travel slowly from the lower toward the upper end, mechanism for distributing and grading pulp and depositing it upon the belt, consisting of a series of parallel, transverse, perforated troughs having their upper edges connected to form a continuous overflow from one trough to another whereby the pulp is graded according to its gravity and is deposited at different points on the belt, means whereby said frame is oscillated and means for regulating the travel of the belt.

In witness whereof I have hereunto set my hand.

GEORGE GATES.

Witnesses:
S. H. NOURSE,
JESSIE C. BRODIE.