

Jan. 25, 1955

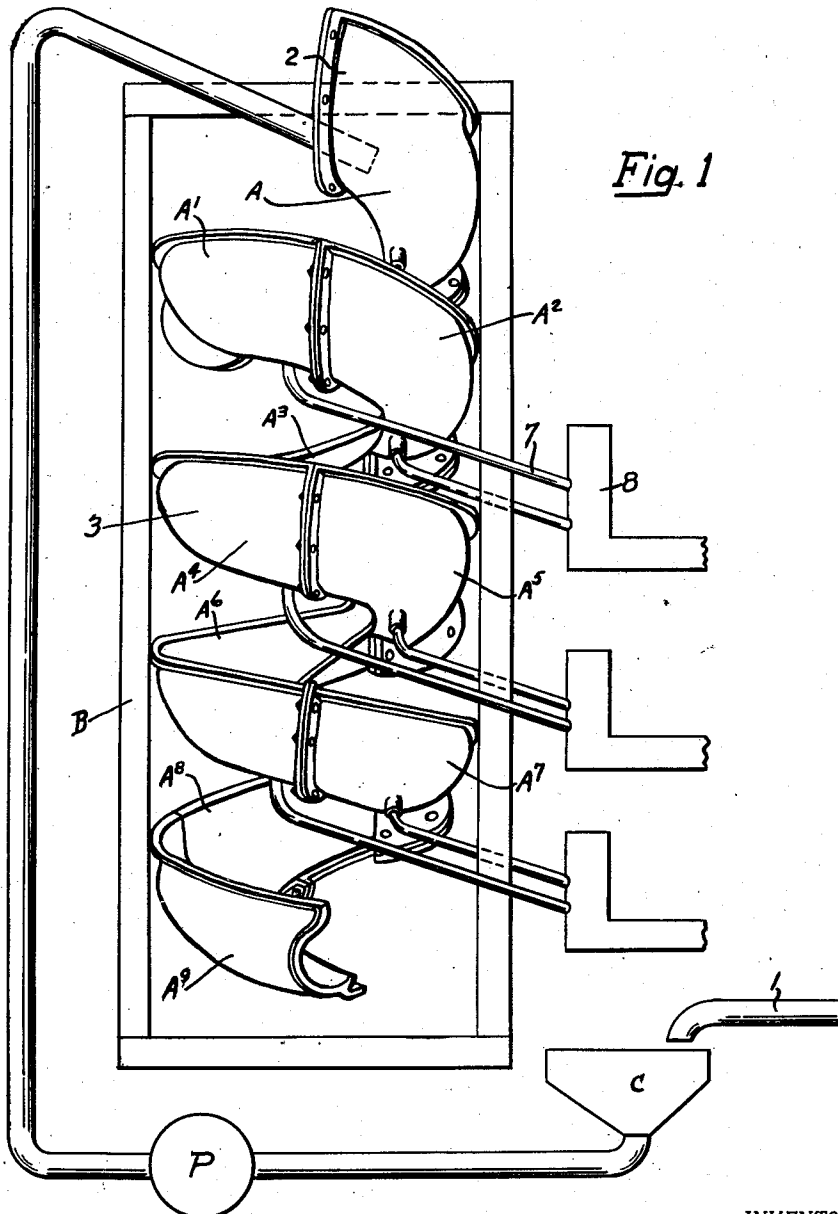
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2,700,469

WASH WATER PICKUP FOR SPIRAL CONCENTRATOR

Filed July 14, 1952

2 Sheets-Sheet 1



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WASH WATER PICKUP FOR SPIRAL CONCENTRATOR

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Application July 14, 1952, Serial No. 298,714

4 Claims. (Cl. 209—211)

This invention relates to an ore concentrator but more particularly and specifically to a wash water pickup for a helical chute type of concentrator such as that disclosed in my United States Patents 2,431,559 and 2,431,560, dated November 25, 1947, and has as a primary object the provision of a wash water pickup built into and forming a part of the helical chute to replace the wash water pickup arrangements disclosed in said patents.

A further object of the invention is the provision of a wash water pickup for a concentrator of the type referred to which is simple of construction and highly efficient in operation.

A still further object of the invention is the provision of a wash water pickup for a concentrator of the character referred to in which the velocity and direction of flow of the wash water is controlled to give to the concentrator a maximum efficiency.

Another and still further object of the invention is the provision of a wash water pickup the operation of which is automatic and does not need manual setting or attention as is the case of the wash water pickups in my referred to patents.

Other objects, advantages, improvements, and novel features of construction of the invention will appear from the following description when read in the light of the accompanying drawings and will be understood and recognized by those skilled in the art.

In the drawings:

Fig. 1 is a side view of a helical chute concentrator embodying the present improved wash water pickup.

Fig. 2 is a transverse sectional view through the helical chute, the section being taken through one of the concentrator draw-off holes.

Fig. 3 is an end elevation view of the end of one of the sections comprising the helical chute.

In the present apparatus, the differences in the specific gravities, or the differences in the effective specific gravities, of the particles is taken advantage of in effecting a separation. It is common practice in the art of concentration, when the specific gravities of different ores or particles are the same, or very closely similar, to pretreat one species of the particles to impart to them a different effective specific gravity. This can be done in several ways. One manner is to treat the particles with a reagent, while another manner is to agglomerate the particles. With treatments of this kind a different effective specific gravity over the actual specific gravity of the ore or particles thereof is obtained.

In view of the foregoing it is to be understood that where hereinafter, either in the specification or claims, particles having different specific gravities are referred to it includes particles which have a natural or inherent like or similar specific gravity but one species thereof is pretreated to give to them a different effective specific gravity.

The concentrator illustrated in Fig. 1 of the drawings is a duplicate of that illustrated in my referred to patents and as a reference to these patents will make an understanding of the operation of the concentrator clear a detailed description of the operation of the concentrator in the present application is unnecessary. The referred to patents contain both method and apparatus claims and a general description of the method of concentration practiced by the concentrator is sufficient to an understanding of the purpose and desirability of the provision of wash water to the main concentrating chute or trough.

Broadly the concentrator comprises a helical chute

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preferably made up of a plurality of sections each of which is substantially identical of construction and are designated as an entirety by A, A1, A2, A3, A4, A5, A6, A7, A8, and A9. The number of sections used in the concentrator is dependent upon the number of turns necessary to effect a concentration of the particular ore to be operated upon. The helical chute making up the plural turn concentrator is suitably supported in a supporting frame B.

In operation the material, that is the mass of comminuted particles containing the particles of ore to be concentrated, is mixed in any suitable or convenient manner with a liquid, usually water, and this liquid with the particles of ore therein is conveyed from a hopper C, to which water or other liquid is delivered by a pipe 1, to the upper open end 2 of the helical chute by a suitable pump P.

As the liquid carrying the particles travels down the main trough 3 comprising the chute the concentration takes place. The particles in the travelling liquid stream stratify in accordance with their specific gravities, and assume by reason of their speed and direction of travel positions such that particles of like specific gravities are in side by side zones extending longitudinally of the stream. Those particles having the greatest specific gravities are in a zone at the inner edge of the stream, that is at the inner side of the chute which side is defined by the chute edge 4, with the remaining zones in a direction towards the outer side of the stream being of progressively decreasing specific gravity.

The outer side of the stream is of course that flowing nearest the outer edge or lip 5 of the chute. The particles constituting each of these longitudinally extending zones in the stream are all discharged through take-off holes 6 which are disposed adjacent the inner edge of the chute in spaced relationship along the length thereof. The particles having the greatest specific gravity, being the first in the inner edge of the stream, are the first to be drawn off and the other zones of concentrate are progressively drawn off down the length of the chute.

Each draw-off hole is provided with a pipe or conduit 7 which conveys the concentrates to periodically arranged larger conduits 8 which convey the concentrates to a collection point. Each draw-off hole is preferably provided with some type of control such as a cutting vane which is designated as an entirety by 9. The specific construction of these draw-off controls and cutting vanes can vary as will be evident by examination of my referred to earlier issued patents.

The contour of the stream travel within and down the chute is substantially that shown by the dotted line 10 from which it will be seen that the stream is quite deep at the point 11 and climbs well up the outer side of the trough whereas the stream at its inner lower edge feathers out to practically no depth as indicated at 12. The concentrates collect in this shallow portion 12 of the stream. This zone or portion of the stream is comparatively slow moving and due to the fact that it is shallow there is no great amount of pressure exerted upon the particles in this portion of the stream to move them in a direction downwardly through the spiral chute. Consequently, it has been found in the majority of instances the delivery of wash fluid or water to this edge of the stream is essential to the movement of the concentrates downwardly through the spiral for discharge through the concentrate take-off or draw-off outlets 6. Actually, the wash liquid or water also performs another function which will be hereinafter described. The delivery of wash water or liquid to the inner edge of the main chute constitutes the present specific invention and will be specifically described hereinafter.

The wash water or liquid for the chute travels in a trough E which is disposed at and beyond the inner edge 4 of the chute and extends throughout the length of the chute. It has been found desirable to cast this trough integral with the main chute but it could of course be separately formed and separately supported if desired. This trough is below the inner edge 4 of the chute; that is, it lies in a plane below that of the inner edge of the chute. Wash water or liquid can be supplied to this trough at any point throughout its length or should it be

desired at a plurality of points along its length but ordinarily the liquid is supplied to the trough by a suitable conduit (not shown) discharging into the upper end of the trough where it terminates at the upper end of the chute.

The purpose and desirability of using wash liquid is fully discussed in hereinbefore referred to patents. Broadly, this liquid will keep foreign and light subject matter washed off of the concentrates in the shallow, slow moving inner edge of the stream so that they will be clean when withdrawn from the take-offs. Also of importance is the fact that the wash liquid will assist in moving the heavier concentrates in the inner edge of the stream to their points of discharge. In the absence of wash liquid, the movement of the concentrates would be quite slow because they are in the slowest moving zone or portion of the stream and also in the very shallow portion thereof. The wash liquid will prevent any heavy building up of very slow or non-moving concentrates which might tend to disrupt the separation. Non-moving or extremely slow moving concentrates in the inner edge of the stream would tend to form bars or dams which would be undesirable.

The actual delivery of wash liquid from the wash liquid carrying chute 4 is attained by the provision of a plurality of sluiceways F which have their upstream ends 19 merging into the inner lower side 20 of the trough and their downstream ends 21 merge into the inner edge of the chute 3. Each sluiceway is in reality a short trough-like conduit interconnecting the trough E with the spiral chute 3. The number of sluiceways provided in the length of the chute or in each individual section making up the helical chute would be dependent upon the amount of wash liquid it is desired to convey to the main chute just as the number of draw-off holes is optional. The proper amount of liquid delivery by a sluiceway would be predetermined. The downstream discharge end 21 of a sluiceway preferably communicates with the chute at a point about opposite a draw-off outlet 6. Flow of wash liquid from a sluiceway directly toward or into a draw-off 6 may be prevented by providing adjacent each draw-off an upwardly and longitudinally extending rib or wall G with the consequence that the wash liquid delivered by a sluiceway is not for the purpose of moving concentrates into the immediately adjacent take-off but to move those concentrates in the stream edge below a take-off downwardly through the chute for discharge through the next adjacent take-off. These ribs or walls G which extend from a point above and partly around a draw-off outlet assure that the wash liquid is so directed as to remain for a considerable part of its travel in or near the inner edge of the chute as there is a tendency for it to move toward and merge with the main downwardly moving stream in the chute.

It has been found desirable to retard to some degree the speed of travel of the wash liquid in the chute and to tend to diffuse it and, accordingly, the inner edge of the chute at points just below the lower end of the ribs or walls G are provided with a depression H which in the drawings is shown as a circular hole the inner edge 22 of which is preferably elevated. This precise and exact kind of wash liquid retarder and diffuser need not be followed as other constructions and arrangements could be devised for accomplishing the desired result. In any event, some means of retarding and diffusing the wash liquid is a desirable feature.

It is to be noted that the downstream ends 21 of the sluiceways terminate in the depressions H and that the discharge or outlet ends of these sluiceways are, as mentioned, in a plane slightly below the inner edges 22 of the depressions.

The number of sluiceways and their particular disposition as well as the inclinations thereof and their widths and the amount of wash liquid delivered to the trough E and the velocity of it downwardly through said trough could be varied in accordance with the particular type of material to be concentrated with the result that there are variables, and, accordingly, the invention is to be limited only within the scope of the hereinafter and following claims.

What I claim is:

1. In an apparatus for concentrating and separately collecting from a comminuted mass composed of particles

having different specific gravities those particles having like specific gravity, a vertically disposed helical shaped chute adapted to carry a stream of liquid having therein the material to be concentrated, draw-off outlets positioned in spaced relationship along the length of the bottom of the chute adjacent but inward of the inner edge thereof for drawing off at spaced points material from the inner edge of the stream, a trough disposed in a plane below and extending along the length of the inner edge of the chute and adapted to carry a stream of wash liquid, said trough being normally out of communication with the chute, a rib extending upwardly from the bottom of the chute and extending longitudinally thereof adjacent but in spaced relation to the inner edge of the chute, the rib extending from a point up-stream from each draw-off outlet to and partly surrounding the draw-off outlet at the edge thereof adjacent the inner edge of the stream, and a sluiceway extending inwardly and upwardly from the wash liquid carrying trough through the inner edge of the chute to terminate therein at a point approximately opposite each draw-off outlet for the delivery of wash liquid to the inner edge of the chute.

2. A construction as defined in claim 1 wherein, the chute at a point beyond the delivery end of each sluiceway is provided with means to cause an eddying and to cause a reduction in the speed of travel of the wash liquid delivered by its associated sluiceway.

3. In an apparatus for concentrating and separately collecting from a comminuted mass composed of particles having different specific gravities those particles having like specific gravity, a vertically disposed helical shaped chute adapted to carry a stream of liquid having therein the material to be concentrated, a wash liquid carrying trough disposed in a plane below and extending along the length of the inner edge of the chute, the inner edge of the chute being upwardly turned and periodically in its length being notched out, a sluiceway formed integral with the chute and trough and having a reception end in the trough and having a portion extending inwardly and upwardly through each notched portion of the chute and having a delivery end terminating in the chute on the bottom thereof for delivering wash liquid to the inner edge of the chute, the bottom of the chute being periodically throughout its length and adjacent its inner edge provided with draw-off outlets, a rib extending upwardly from the bottom of the chute adjacent each draw-off outlet, and said rib extending longitudinally of the chute adjacent but in spaced relation to the inner edge of the chute and having a portion disposed between the draw-off outlet and the delivery end of an adjacent sluiceway.

4. In an apparatus for concentrating and separately collecting from a comminuted mass composed of particles having different specific gravities those particles having like specific gravity, a vertically disposed helical shaped chute adapted to carry a stream of liquid having therein the material to be concentrated, a wash liquid carrying trough disposed in a plane below and extending along the length of the inner edge of the chute, the inner edge of the chute being upwardly turned and periodically in its length being notched out, a sluiceway formed integral with the chute and trough and having a reception end in the trough and having a portion extending inwardly and upwardly through each notched portion of the chute and having a delivery end terminating in the chute on the bottom thereof for delivering wash liquid to the inner edge of the chute, the chute bottom adjacent the delivery end of each sluiceway being provided with a draw-off outlet, a rib associated with each draw-off outlet and extending upwardly from the bottom of the chute and having a portion disposed between the draw-off outlet and the delivery end of the adjacent sluiceway, and means in the chute adjacent the delivery end of each sluiceway for causing a liquid delivered from the sluiceway to eddy and to retard the speed of travel of said liquid, and means comprising a cavity in the bottom of the trough.

References Cited in the file of this patent

UNITED STATES PATENTS

2,431,559	Humphreys	Nov. 25, 1947
2,431,560	Humphreys	Nov. 25, 1947