Dec. 16, 1930. T. A. DICKSON 1,785,302

ORE CLASSIFIER

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Fig. 1.

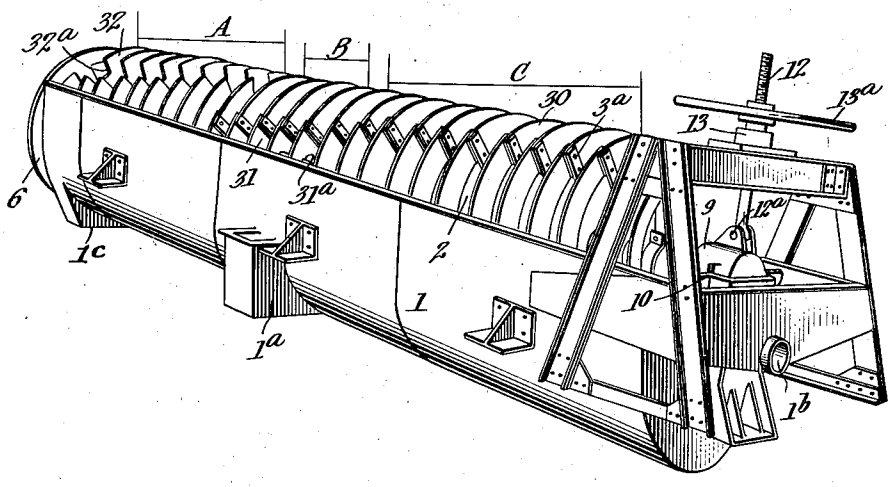
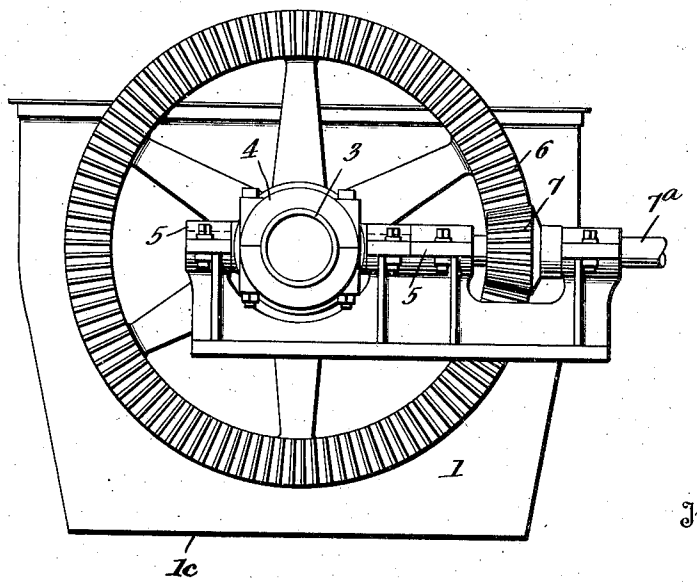


Fig. 2.



Inventor:

Thomas A. Dickson,

By Spear Middleton Donaldson & Hall

Attorneys.

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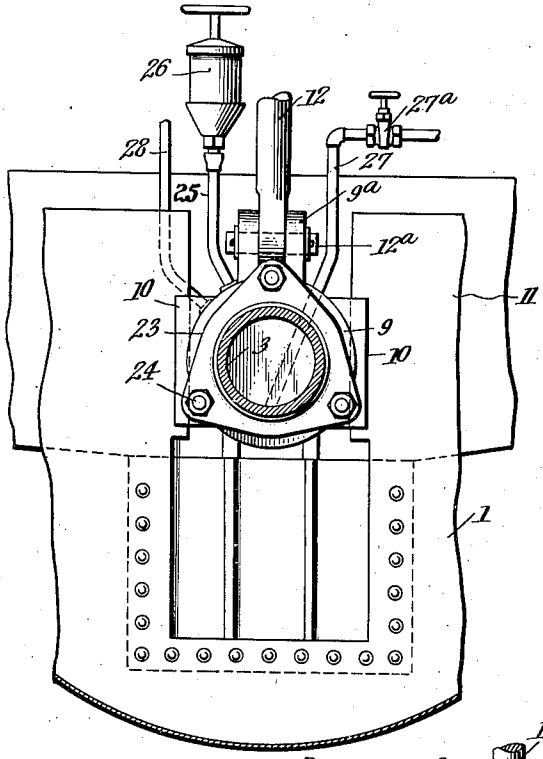


Fig. 3.

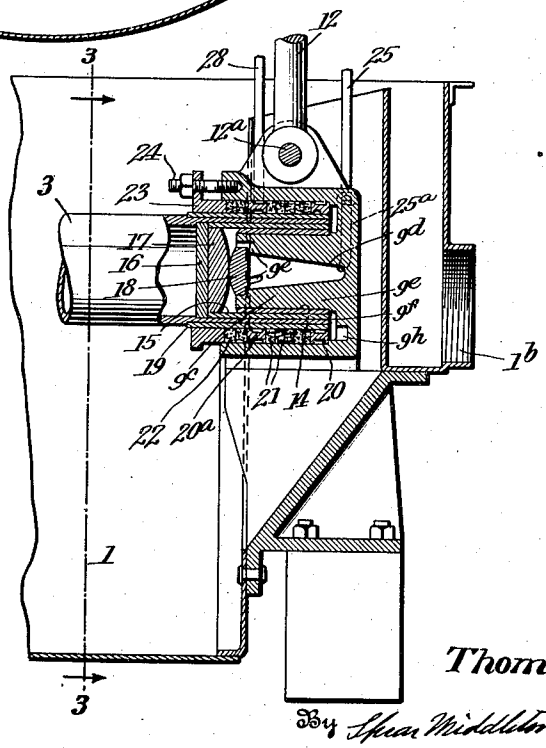


Fig. 4.

Inventor:

Thomas A. Dickson,

By Spear Middleton Donaldson & Hall

Attorneys.

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Fig. 5.

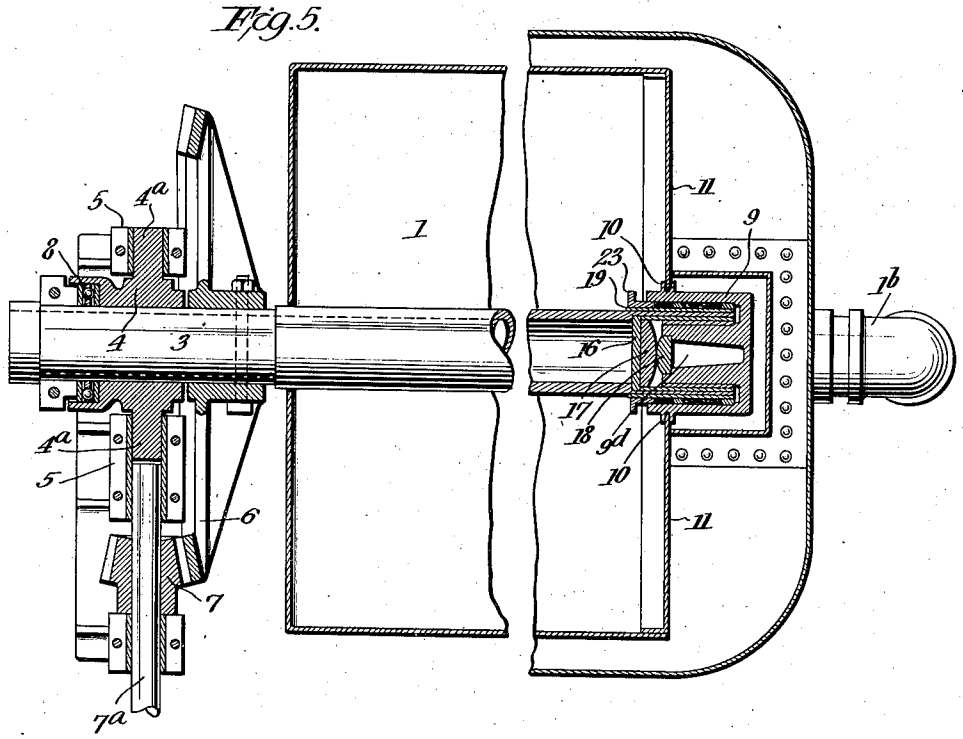


Fig. 6.

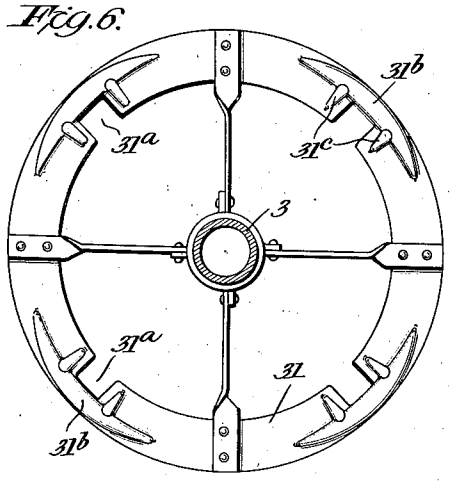
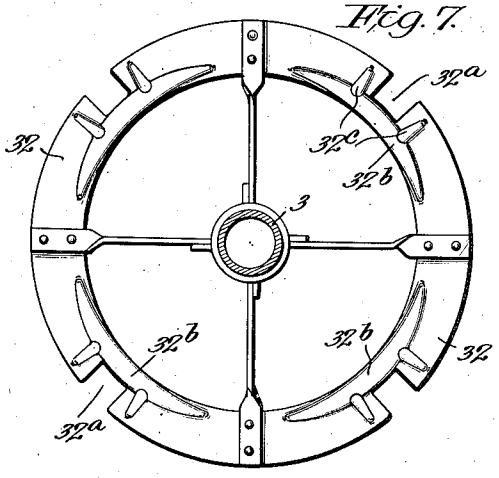


Fig. 7.



Inventor

Thomas A. Dickson,

By Spencer Middleton Donaldson & Hall

Attorneys.

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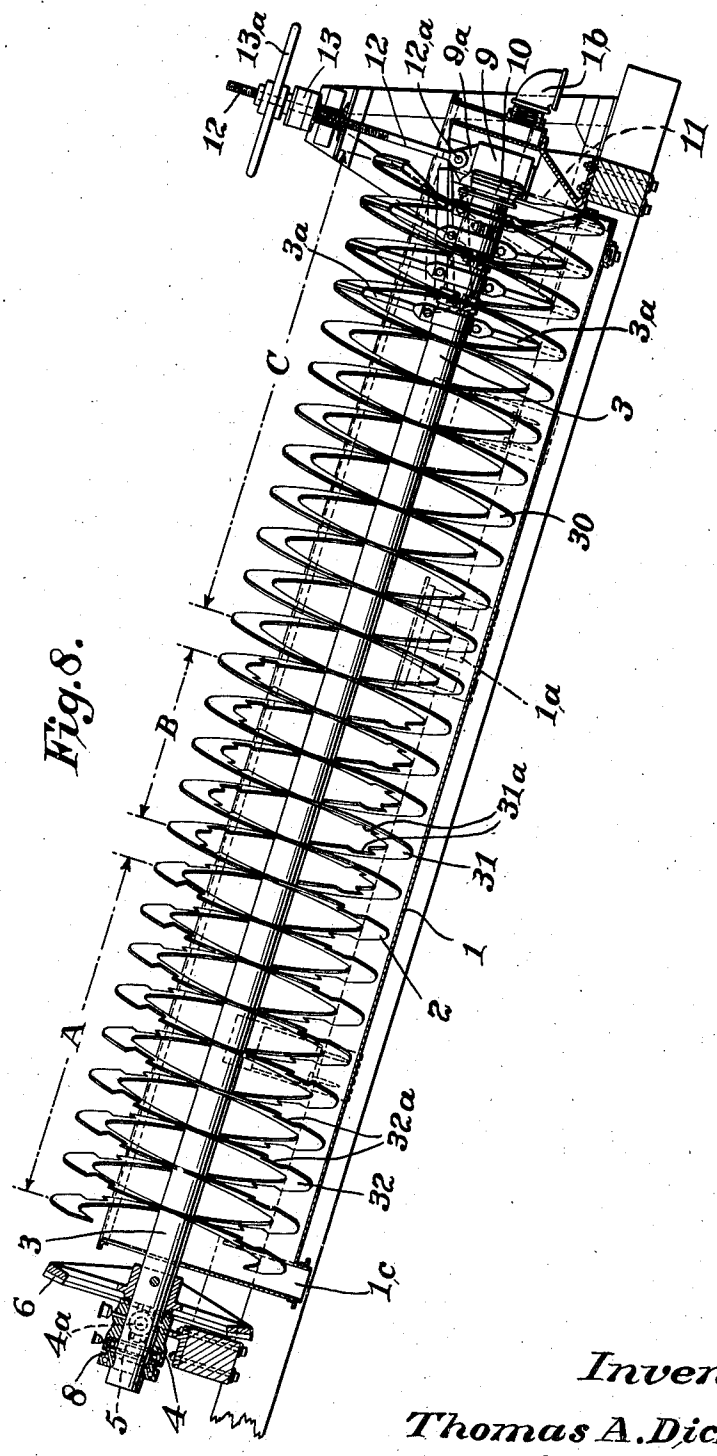


Fig. 8.

Inventor:
Thomas A. Dickson,
By Spear Middleton Donaldson & Hall
Attys.

Patented Dec. 16, 1930 1,785,302

UNITED STATES PATENT OFFICE

THOMAS A. DICKSON, OF DENVER, COLORADO, ASSIGNOR TO COLORADO IRON WORKS COMPANY, OF DENVER, COLORADO, A CORPORATION OF MAINE

ORE CLASSIFIER

Application filed January 10, 1928. Serial No. 245,709.

My present invention relates to improvements in the type of ore classifiers disclosed in Letters Patent of the United States No. 992,629, issued May 16, 1911, and No. 1,412,010, granted August 4, 1922.

One of the objects of the invention is to provide a construction suitable for conditions where interruptions to operation are frequent and unexpected, such as power failure for example, the classifier being so located or arranged that it continues to receive the flow of pulp after stopping, this adaptation embodying means by which the lower end of the shaft and spiral can be raised upon stopping, and, after starting gradually lowered to its working position. This obviates the necessity of digging out the tank or trough or assuming the liability of breakage on starting up.

Another object is to provide in connection with such elevating means, a submerged shaft bearing of a type which may be kept thoroughly lubricated and all danger of grit working into the bearing eliminated, while at the same time passage of lubricant from the bearing into the classifier tank will be prevented.

A further object is to provide a construction of interrupted conveyor blades or flights which will be strong and durable and which will provide different forms of drainage action at the point of emergence from the pool and the conveyor portion outside the pool whereby the action of the classifier is improved.

With these and other objects in view the invention includes the novel features of construction, and arrangement and combination of parts hereinafter described, what I regard as my invention being defined by the claims appended hereto.

What I at present regard as the preferred embodiment of the invention is illustrated in the accompanying drawings, in which:—

Fig. 1 is a perspective view of the classifier.

Fig. 2 is a view in elevation of the drive end.

Fig. 3 is a section on line 3—3 of Fig. 4.

Fig. 4 is a detail view partly in elevation and partly in section showing the elevating bearing and associated parts.

Fig. 5 is a horizontal section partly broken away and Figs. 6 and 7 are detail views of the conveyor blades.

Figure 8 is a longitudinal vertical section through the complete classifier, the supporting frame being shown broken away at one end.

Referring by reference characters to these drawings, the numeral 1 indicates the classifier tank or trough having the customary feed hopper 1*a* located in the side thereof intermediate the opposite elevated and overflow ends, which hopper communicates with the interior of the trough through an opening in its wall below the liquid level, the said trough having at its lower end an overflow weir and outlet 1*b* for the slime and lighter particles and at the opposite end a sand discharge 1*c*, all of which will be readily understood by those skilled in the art, particularly in view of the aforesaid patents.

2 designates the spiral as a whole which is carried by a tubular shaft 3 by means of radial connecting arms 3*a* suitably secured to the shaft and spiral. The upper end of the shaft which is above the liquid level in the trough or tank, projects through an opening in the end wall thereof and is journaled in a swivel bearing 4 having stub axles 4*a* journaled in bearings carried by the supporting brackets or standards 5. On one side of the bearing 4 the shaft carries fast thereon a large bevel gear wheel 6 with which meshes a small bevel gear 7, the shaft 7*a* of which may be driven from any suitable prime mover or source of power (not shown).

The shaft 3 carries on the other side of the bearing a thrust ring 8.

The submerged end of the shaft is supported by a bearing block 9 having grooved guides 10 preferably cast integral therewith which cooperate with suitable vertical guideways 11 (Fig. 5) carried within the tank or trough at the lower end thereof. Said bearing block has projecting from its upper side ears or lugs 9*a* Fig. 3 to which an elevating screw rod 12 is secured by means of a pin or bolt 12*a* passing through alining openings

in the lugs and an eye in lower end of the screw rod.

The rod passes through an opening in a bearing plate 13 Fig. 1 carried by the supporting frame and carries a hand wheel nut 13*a* by the operation of which the bearing block, and with it the shaft end, may be raised or lowered according to direction of rotation of the hand wheel.

In order to provide a strong durable well lubricated bearing which will be proof against entrance of grit and free from leakage of grease or oil into the trough, I provide the construction which will now be described.

The bearing block 9 is provided with an annular groove or recess into which the end of the hollow shaft projects. The cylindrical portion 9*c* which projects within the shaft end carries a bronze bearing sleeve 14 which cooperates with a removable bearing sleeve 15 located within the end of the shaft, which sleeve has its inner end welded to a relatively heavy steel plate or disc 16 which is removable with sleeve 15 and which bears against an internal annular shoulder formed by the rabbeted lower end of the tubular shaft.

This plate or disc 16 carries a thrust member 17 having a rounded or convex bearing face which co-acts with the similar face of a block 18 seated in a recess in the face of the block 9. It will thus be seen that the load is carried by the inside of the shaft and the end thrust is taken through disc 16 and members 17 and 18 which are also within the shaft. The external surface of the shaft is protected against wear by a wearing sleeve 19 of suitable material.

To prevent the entrance of any grit or abrasive substance between the sleeve 19 and annular adjacent wall of block 9 packing means are interposed comprising preferably a pair of spaced bearing lantern rings 20, 20*a* with a plurality (say five) of interposed grease packing rings 21, a pair of rings of water packing 22, and a packing gland 23 adjustably held in place by means of a plurality of screw bolts 24.

To effect lubrication a pipe 25 provided with a suitable source of grease or other lubricant such for example as grease cup 26 communicates through duct 25*a* with a grease reservoir 9*d* formed in the center of the bearing block 9 which grease reservoir communicates by passages 9*e* with the space between the thrust blocks 17 and 18 which forms additional grease storage space. The only exit for the grease is between the wearing sleeves 14 and 15 into annular storage space 9*f*, whereby the said sleeves are kept thoroughly lubricated.

An exit passage 9*h* leads from the space 9*f* and connects with a pipe 27 provided with a valve 27*a*. In practice at suitable intervals (say daily), the valve 27*a* is opened and fresh grease forced in by the cup 26 or analogous means, whereby the old grease is forced out and replaced by fresh, the grease issuing from pipe 27 being collected in a suitable receptacle and thrown to waste. After the above operation the valve 27*a* is closed and a small additional quantity of grease forced in past lantern ring 20 and into or around the grease packing rings 21.

In order to prevent the possibility of any of the grease from the grease packing rings working its way into the interior of the trough and mingling with the contents thereof, I provide a pipe 28 connected with a suitable source of clear water under pressure (not shown) which communicates by a port in member 9 with the space of lantern ring 20*a*. By keeping water in pipe 28 at all times under suitable pressure (say five pounds), no grease can find its way into the interior of the trough to commingle with the classifier liquor. The amount of water leakage past the water packing rings can be regulated by tightening the gland 23.

While my improved bearing for the submerged end of the shaft is designed particularly for use in connection with elevating means it is obvious that it could be used to advantage in non-elevating constructions.

Though the members 17 and 18 are described as thrust members these do not sustain the main thrust of the spiral which is provided for at the unsubmerged end of the shaft.

The function of these thrust members in the submerged bearing is to keep the bearing definitely located on the shaft and prevent its slipping forward so that the end of the shaft would cut the bearing block or housing 9.

The flights working in the lower end of the trough (space *c* Fig. 1) and designated 30 are plain and continuous, while the remaining flights are interrupted for the purpose disclosed in the aforesaid patents. I have found that the action of the classifier may be materially improved by modifying the form of the interrupted portions in the manner which will now be described.

In this form, I make the upper end of the plain continuous spirals terminate short of the shallow end of the pool, and for a portion of said shallow end as indicated by the space —B— between the intermediate parallel lines I construct the spirals 31 as shown in detail in Fig. 6.

In these spirals the outer edge of the blade or blades is made continuous and at intervals said blades are provided with interruptions or recesses 31*a* on their inner edges occupying say approximately two-thirds of the width of the blade.

For convenience of manufacture the blades are made sectional, preferably of white cast iron, adapted to be bolted or riveted to the arms, and to reinforce the recessed or inter-

rupted portions, circumferential ribs 31*b* are cast integral on the back side extending a suitable distance on each side of the interruptions and merging in the surface of the blades at the ends of the ribs. Additional radial reinforcing ribs 31*c* may be provided if desired.

The remaining interrupted flights working in the portion of the tank above the pool in the space indicated at A are made in the form shown in detail in Fig. 7.

In these, the blades or flights 32 are made continuous on their inner edges while their outer peripheries are provided with interruptions or recesses 32*a*. These are likewise preferably made of white cast iron and like blades 31 are provided with circumferential reinforcing ribs 32*b* and radial reinforcing ribs 32*c* on their back sides.

By making the flights, operating in the zone B, continuous on their outer edges and interrupted or recessed on their inner edges, at which zone the sand is being raked out of the pool and is therefore sloppy and its upper part extremely wet, the interruptions 31*a* permit the upper layer of material to flow backward as the interruptions pass successively through the material, and afford renewed opportunity for the fine material to be freed from the sand before the latter is conveyed further along, where it would be relatively dry.

By constructing the blades 32 with continuous inner edges and recessed outer edges as shown, a strong and durable construction is secured while maintaining an efficient action on the sand. The construction of both sets of blades 31 and 32 with intermediate recesses and blade attaching means at the ends (bolt or rivet holes) enables them to be economically manufactured out of wear resisting material and readily attached to the carrying arms.

It will be understood that while I have shown in the drawings certain specific zones for the spirals, or relative proportions, these are by way of example only, as the number of spirals in each zone and the relative proportions and position would vary according to the character of ore being treated, the amount of material being treated, inclination and speed of the conveyor, etc., as will be well understood by those skilled in the art.

What I claim is:

1. In apparatus of the class described, a trough having feed and delivery means, a tubular shaft therein having one end submerged, means for supporting and driving the unsubmerged end, and a bearing block closing the submerged end of the shaft and having a cylindric bearing part fitting within said end.

2. In apparatus of the class described, a trough having feed and delivery means, a tubular shaft therein having one end only submerged, means for supporting and driving the unsubmerged end, a disc member forming a partition in said shaft spaced from its submerged end, a wear sleeve within the shaft between its end and said partition, a bearing block closing the end of the shaft and having a cylindric part projecting into the shaft and provided with a wear sleeve co-acting with said wear sleeve of the shaft, said bearing block having an internal lubricant chamber communicating with the space within the shaft and means for supplying lubricant to said chamber.

3. The apparatus of claim 2 in which the juxtaposed faces of the partition disc and bearing member are provided with thrust blocks having co-acting convex faces.

4. In apparatus of the class described, a trough having feed and delivery means, a tubular shaft therein having one end only submerged, means for supporting and driving the unsubmerged end, a disc member forming a partition in said shaft spaced from its submerged end, a wear sleeve within the shaft between its end and said partition, a bearing block having an annular shaft end receiving recess forming a cylindric part within the shaft carrying a wear sleeve to co-act with the wear sleeve of the shaft, and providing also an annular cylindric wall enclosing the outer periphery of the shaft end and spaced therefrom, packing rings between said cylindric wall and the shaft, said bearing block having an interior lubricant chamber, and means for supplying lubricant thereto.

5. Apparatus according to claim 4 in which the packing means includes a lantern ring, and means are provided for supplying water under pressure to said lantern ring.

6. Apparatus according to claim 4 in which the bearing block is provided with an annular chamber adjacent the end of the shaft and means are provided for conducting spent lubricant therefrom coincident with the supply of fresh lubricant.

7. In apparatus for classifying ores comprising a trough having a discharge at one end for slimes and a discharge at the opposite end for sands and coarse material, and an inclined agitating and separating conveyor having one end partially submerged and provided with a continuous spiral, and at the other end with an interrupted spiral, an intermediate spiral conveyor portion located at the place of emergence from the pool comprising a blade having a continuous outer peripheral edge and an interrupted or recessed inner edge.

8. In apparatus for classifying ores comprising a trough having a discharge at one end for slimes and a discharge at the opposite end for sands and coarse material, and an inclined agitating and separating conveyor having one end partially submerged

and provided with a continuous spiral, a second spiral portion adjacent said continuous spiral having a blade provided with a continuous outer edge and recessed or interrupted inner edge, and a third spiral portion adjacent said second spiral portion having a blade provided with a continuous inner edge and recessed outer edge.

9. In apparatus of the class described, an inclined trough having feed and delivery means, a shaft therein having a hollow end submerged in the liquid of the trough and the other end unsubmerged, agitator and conveyor means carried by said shaft, a swivel bearing for the unsubmerged end of the shaft, means adjacent said swivel bearing for driving the shaft, and an internal bearing for said submerged hollow end of the shaft provided with lubricating means and means for preventing lubricant from reaching the liquid in the trough, and means for raising and lowering said bearing.

10. In apparatus of the class described, an inclined trough having feed and delivery means, a shaft therein having a hollow end submerged in the liquid of the trough and the other end unsubmerged, agitator and conveyor means carried by said shaft, a swivel bearing for the unsubmerged end of the shaft, means adjacent said swivel bearing for driving the shaft, and an internal bearing for said submerged hollow end of the shaft including thrust resisting means, and means for raising and lowering the submerged end of the shaft.

In testimony whereof, I affix my signature.

THOMAS A. DICKSON.