A. McDOUGALL.

ORE WASHING DEVICE.

APPLICATION FILED JAN. 20, 1920.

1,409,385. Patented Mar. 14, 1922.

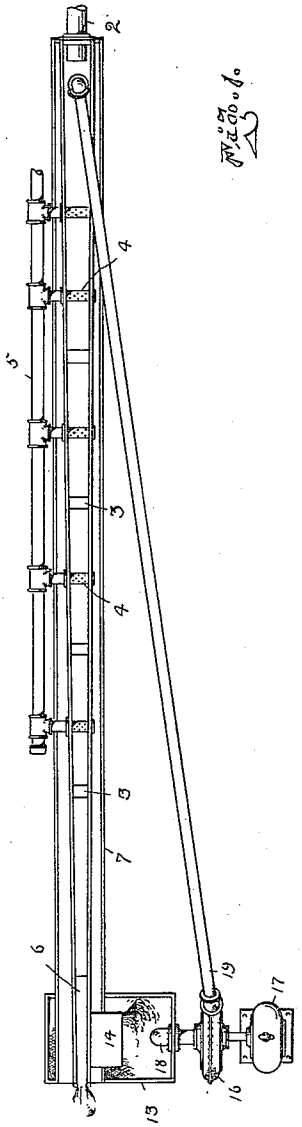


Fig. 1.

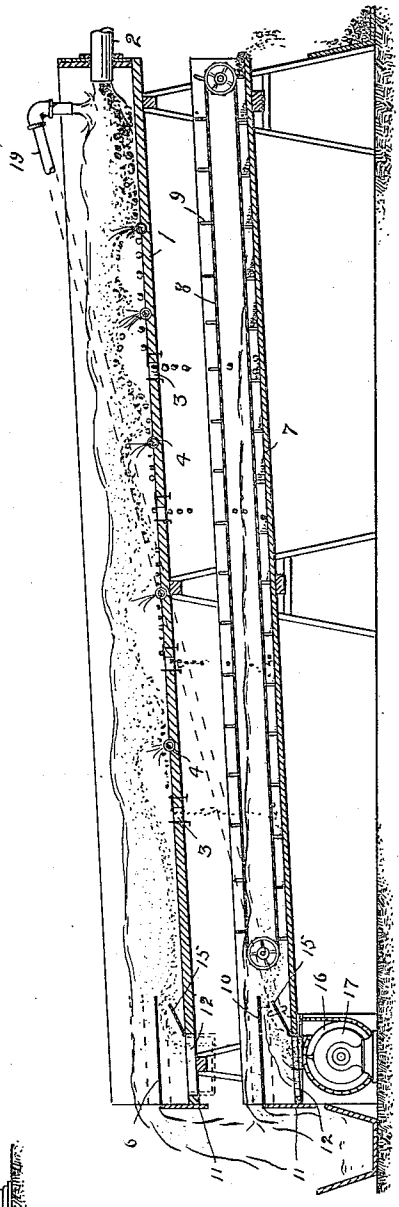


Fig. 2.

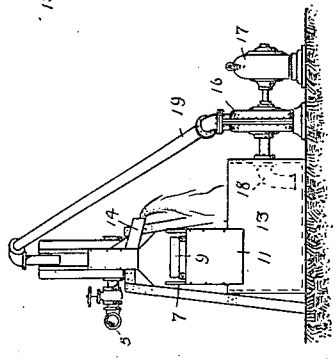


Fig. 3.

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UNITED STATES PATENT OFFICE.

ALEXANDER McDOUGALL, OF DULUTH, MINNESOTA.

ORE-WASHING DEVICE.

1,409,385. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed January 20, 1920. Serial No. 352,702.

To all whom it may concern:

Be it known that I, ALEXANDER McDOUGALL, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Ore-Washing Devices, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to ore washing devices and has special reference to that class of washer or separator shown in my United States Patent No. 822,753 dated June 5, 1906 and No. 963,721 dated July 5, 1910.

The principal object of my present invention is to improve upon the devices shown in my former patents with a view of providing means for more thoroughly washing and separating iron ore, such for example, as that found in some northern Minnesota iron mines and comprising a greatly diffused mixture of large and small pieces of ore resembling gravel formation, together with atomized paint rock, volcanic ash and exceedingly fine sand.

In some of these ores from about ten to twenty per cent are coarse pieces of better grade ore and can be easily separated by screening, while the remainder, comprising the finer particles, form a mass that can only be thoroughly disintegrated by mixing with water and violently agitating same. This I have found to be accomplished in the cheapest and most admirable manner possible by passing it through a centrifugal pump and in the present invention if the desired results are not accomplished by the first treatment of the ore and water, that portion of the tailings not properly separated is passed through a second pump and rewashed through the same trough.

Another object is to produce means whereby the depth of water in the trough of the washer may be maintained at as near equal depth throughout the length of the trough as possible for producing better results than where the depth of such water diminishes near the discharge end of the trough.

Another object is to provide simple means for returning a portion of the tailings from the initial washing process to the head of the trough and rewashing same for the purpose of saving as large a proportion as possible of the value therein.

Another object is to provide means for dividing the tailings as they leave the lower end of the trough and regulate the exact proportion discarded to that which is rewashed.

Still another object is to provide simple means for delivering the washed ore to the place of discharge with the least water possible.

Other objects and advantages of the invention will appear in the further description thereof.

In the accompanying drawings forming part of this application and in which like reference characters indicate like parts:

Figure 1 is a top plan view of a washing trough embodying the invention.

Fig. 2 is a central vertical section longitudinally of the trough showing parts of the mechanism in elevation, and

Fig. 3 is an elevation of the lower end of the trough.

1 represents the washing trough which is preferably long, narrow and deep, and having the desired inclination to maintain the proper action and depth of water and granular mixture as the same is supplied thereto preferably through the medium of a centrifugal pump as illustrated in my former patents and discharging into the upper end of the trough as at 2. This trough has installed in the bottom thereof the usual ore discharge openings 3 and the transverse jet emitting pipes 4 which lift the lighter granular material in the water and over the openings during the process of separating and washing. The jet pipes are fed preferably by a manifold water supply pipe 5.

To maintain as even depth of water as possible throughout the length of the trough and compensate for that which passes out through the discharge openings 3, the sides converge from the upper to the lower end of the trough the latter being approximately one-half as wide at the lower end as at the upper.

In the lower end of the trough is installed a horizontally disposed division board or splitter 6 which may be made vertically adjustable in any desired manner to determine what portion of the tailings to be discarded and what portion to be returned for rewashing.

Below the washing trough 1 and on substantially the same incline is installed a second trough 7 which is somewhat wider

but not so deep as the washing trough. In this lower receiving trough and operative longitudinally thereof is a double endless conveyor belt 8 having transverse buckets or slats 9 thereupon and which latter upon the under side of the belt travel upwardly of the trough and along the bottom thereof. This belt runs continuously during the process of washing and in carrying the separated ore along the trough through the running water therein performs a further washing of the ore before it is discharged at the upper end in a substantially de-watered state, the bottom of the upper end of the trough being about on a level with the top of the lower end to prevent water from naturally following the cleaned ore out of the trough.

The endless portions of the belt will form little or no obstruction to the falling ore and water from the upper trough as they will fall intermediate of the buckets and the endless portions onto the bottom of the lower trough.

In the lower end of the trough 7 is installed a splitter board 10 similar to the board 6 in the upper trough and for the same purpose. I have shown as a means for supporting each of these division boards an L-shaped extension 11 which is fastened directly across the lower portion of the end of the trough and which may be readily raised or lowered as desired and thus carry the division boards with them, however other means of adjustably supporting the boards may be employed if preferred.

Directly beneath each of the boards 6 and 10 is formed an opening 12 through the bottom of each trough and through which that portion of the contents of the troughs below the division board freely passes, the one in the lower trough directly into the receiving box or sump 13, and that from the upper trough indirectly into same through the laterally projecting spout or chute 14. Adjacent the upper edge of each opening 12 is a pivotally supported tail-board or damper 15 which may be raised or lowered in any convenient manner to regulate the amount of water to be discharged into the sump 13 and which will regulate to some extent the depth of water maintained in the lower ends of the trough.

A centrifugal pump 16 driven by a suitable motor 17 is installed adjacent the end of the sump box 13 having its suction 18 entering the box and its discharge 19 extending to and discharging into the upper end of the washing trough 1.

By this means it is evident that if a perfectly satisfactory job of separating and washing is not accomplished by the initial treatment in the upper and lower trough combined, that any desired proportion of the discharging contents of either or both troughs may be super-agitated and disintegrated by passing through the second pump and returned to the source of the washing process, and in this manner the maximum of efficiency of hydraulic treatment of granular ore is accomplished and that in the simplest possible manner.

As the preferred and simplest manner of installing the splitter boards 6 and 10 and the damper 15, they are made of sufficiently close fit intermediate of the walls of the trough that they can not be adjusted except by hand.

It is to be understood that various modifications from the specific embodiment here shown and within ordinary mechanical skill may be resorted to without departing from the spirit of the invention.

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

1. An ore washer of the character described comprising two inclined troughs, one spaced above the other, openings in the upper trough for discharging ore and water into the lower one, an endless conveyor belt in the lower trough for conveying ore longitudinally the bottom thereof and discharging it in a de-watered state at the upper end of the trough, and means for discharging the water and tailings at the lower end of the troughs.

2. An ore washer of the character described comprising in combination two inclined washing troughs spaced one above the other, said troughs being inclined in the same direction, a suitable ore and water supply at the upper end of the uppermost trough, an ore and water discharge from the uppermost trough into the lowermost trough, and a pump adjacent the lower ends of the troughs for diverting a portion of the tailings from one or both of the troughs to the place of original entry into the washer.

3. The combination with an ore washing trough of the character described having a water and ore receiving end and a discharge end, and means at the discharge end for regulating and dividing the discharge, said means comprising an opening in the bottom of the trough, a horizontally disposed vertically adjustable dividing board above the opening to prevent a portion of the discharge of the trough from passing therethrough and a pivotally mounted deflector carried upon the bottom of the trough upwardly of the opening in respect to the inclination of the trough to regulate the amount of discharge of the tailings through said opening.

4. An ore washer of the character described comprising in combination two inclined washing troughs spaced one above the other, said troughs being inclined in the same direction, a suitable ore and water supply at the upper end of the uppermost

trough, a plurality of spaced ore and water discharges from the uppermost trough into the lowermost trough, a pump adjacent the lowermost ends of the troughs and means for diverting a portion of the tailings from one or both of the troughs to the place of original entrance into the washer.

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

ALEXANDER McDOUGALL.

Witnesses:
HENRY MAXIMER,
S. GEO. STEVENS.