May 25, 1943. J. P. HALL 2,319,901

VIBRATING SCREEN

Filed Oct. 11, 1939 2 Sheets-Sheet 1

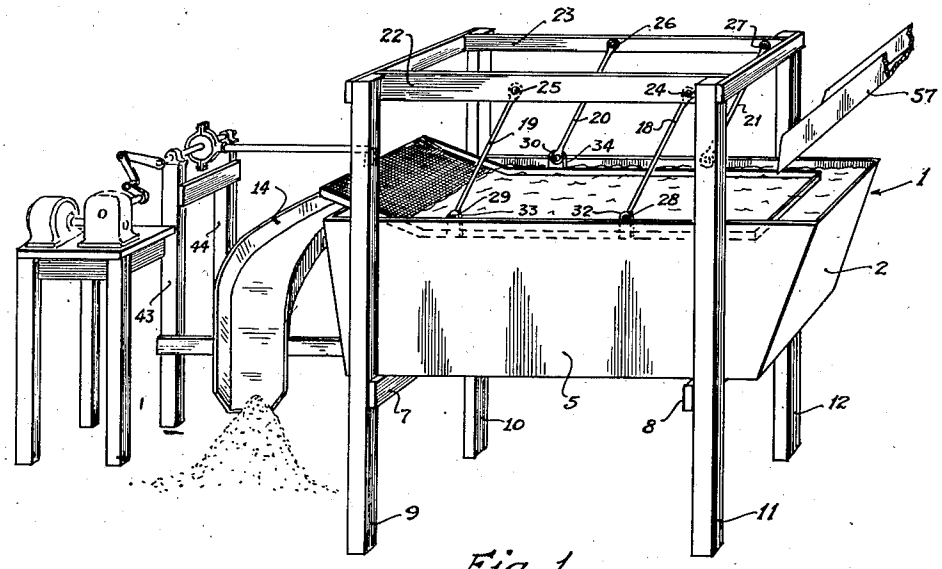


Fig. 1

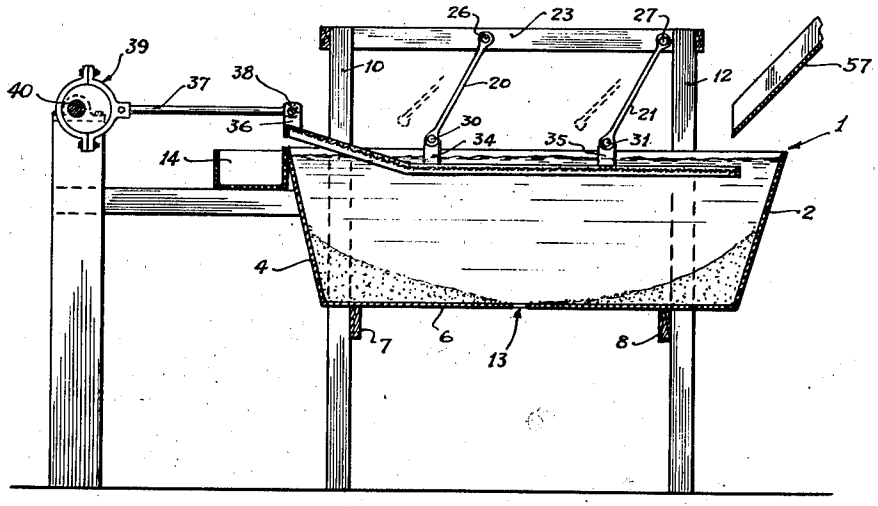


Fig. 2

ATTEST -
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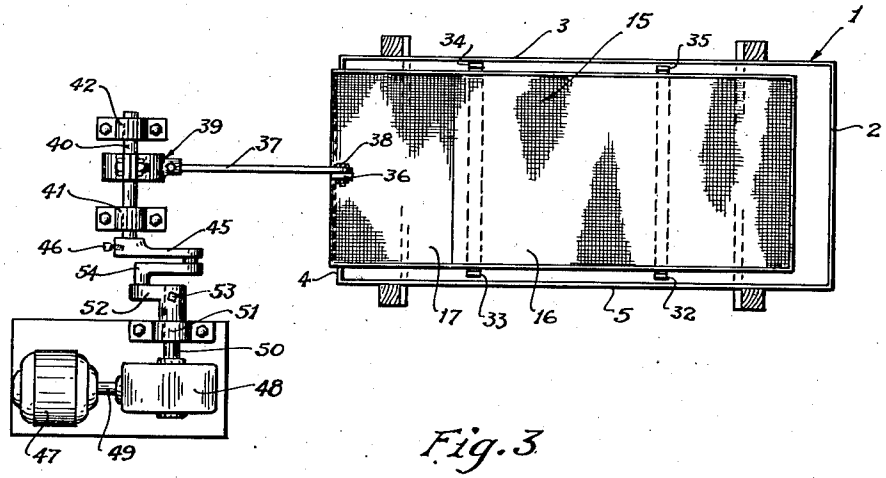


Fig. 3

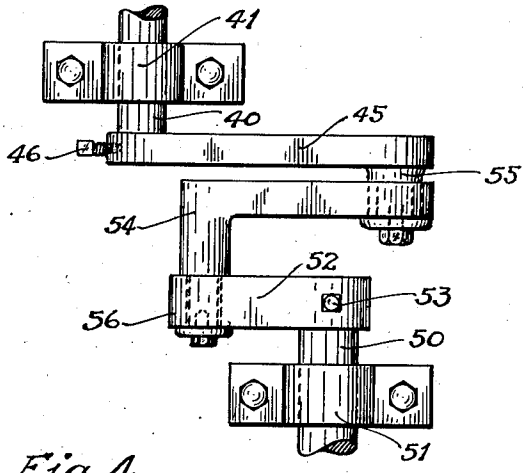


Fig. 4

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Patented May 25, 1943 2,319,901

UNITED STATES PATENT OFFICE

2,319,901

VIBRATING SCREEN

Jesse Pankey Hall, Bartow, Fla., assignor to Industrial Patents Corporation, Chicago, Ill., a corporation of Delaware

Application October 11, 1939, Serial No. 298,996

6 Claims. (Cl. 209—269)

This invention relates to an improved vibrating screen.

One of the objects of this invention is to provide an improved vibrating screen for the recovery of phosphate ore.

Another object of the invention is to provide an improved underwater vibrating screen for the separation of coarse from fine material such as gravel or sand.

Other objects of the invention will be apparent from the description and claims which follow.

Reference is had to the drawings in which similar characters are used to designate like elements.

Figure 1 is a perspective view of one embodiment of the vibrating screen constructed in accordance with the present invention.

Figure 2 is a longitudinal cross sectional view of the present invention.

Figure 3 is a plan view partly in section of Figure 1.

Figure 4 is an enlarged detail drawing of the linkage between the source of power and the vibrating screen.

The hopper 1 comprises side walls 2, 3, 4, and 5, and bottom 6, resting upon cross pieces 7 and 8 affixed to uprights 9, 10, 11, and 12. Bottom 6 contains an opening 13 for the discharge of sand and water and discharge trough 14 is affixed to end wall 4.

Reciprocatable screen 15 comprising a relatively long horizontal portion 16 and a short inclined portion 17 adjacent to the discharge end of the screen, operates within hopper 1. The screen 15 is hung by means of rods of approximately equal length 18, 19, 20 and 21 from cross pieces 22 and 23 affixed to uprights 9 and 11, and 10 and 12 respectively. The upper end of each such rod 18, 19, 20 or 21 is respectively pivoted in bearings 24, 25, 26 and 27 in cross pieces 22 and 23, and the lower end is inserted in bearings 28, 29, 30 and 31 in lugs 32, 33, 34 and 35 attached to vibrating screen 15. At the discharge end of the screen is lug 36 to which is attached rod 37 by means of bolt 38 and connected with an eccentric 39 revolving on shaft 40. Shaft 40 revolves in bearings 41 and 42 affixed by suitable means to uprights 43 and 44. Affixed to one end of shaft 40 is crank 45 by means of set screw 46 or other suitable means. The entire apparatus is driven by motor 47 attached to reducing gears 48 by means of shaft 49, reducing gears 48 operating shaft 50 revolving in bearing 51. A small crank 52 is attached to shaft 50 by means of set screw 53 or other suitable means. Connecting cranks 45 and 52 is an L shaped link 54, one end being affixed to crank 45 by means of crank pin 55 and the other end being inserted in bearing 56 in crank 52. Sand or gravel is fed into the apparatus by sand charging chute 57, the finer material being removed with excess water through opening 13 and the coarser material by means of discharge trough 14.

The device is operated by the motion supplied by the motor 47 which, by means of shaft 49 and reducing gears 48, rotates shaft 50. The uniform speed of rotation of shaft 50 is converted to a variable speed of rotation in shaft 40 by means of the respective cranks 52 and 45 and the link 54 connecting the two cranks. This mechanism provides a rotation of shaft 40 which is comparatively rapid for approximately one half of each revolution and comparatively slow for the balance of each revolution. This causes the motion supplied to the rod 47, which is in turn attached to screen 15, to be relatively rapid in one direction and relatively slow in the other direction, and through the proper adjustment of the mechanism results in the screen moving rapidly toward the charging end of the tank and slowly toward the discharging end of the tank. The screen 15 is hung in the hopper 1 by the rods 18, 19, 20 and 21 so that the direction of movement of the screen is actually at a slight angle with the horizontal. When the machine is in operation, each rotation of the shaft 40 causes the screen to move relatively rapidly toward the charging end, while dropping below the surface of the water, and then comparatively slowly return to a position at the discharge end and above the surface of the water. The movement toward the charging end forms countercurrents in the water which sweep the rocks or gravel toward the inclined discharge end of the screen. The screen then moves comparatively slowly so as not to disturb any of the material on the screen and returns to its original position above the surface of the water. The resistance of the water to the longitudinal movement of the screen and the material thereon serves to move the coarser material toward the discharge end and prevents the screen from binding while the finer material is dropped through the screen. Material to be classified is fed constantly on the screen from charging chute 57. The coarser material is constantly moved toward the discharge end of the machine and finally out through the discharge trough 14, while the finer material is dropped through the screen and is removed through opening 13.

I claim:

1. A classifier having means to feed material to the classifier and a means to receive a portion of the classified material comprising a screen reciprocable between said feeding means and said receiving means to effect a separation of the particles of the material to be classified such that the larger particles are retained on the screen; said screen being generally horizontally disposed but having an upwardly inclined portion adjacent said receiving means; means to drive said screen rapidly in one direction; a body of liquid cooperating with said screen; means for directing the movement of the screen through said liquid for a substantial distance; said directing means causing said screen to be lifted out of the body of liquid adjacent said receiving means; and means associated with the screen to constrain the material to a path of movement over the screen as it is reciprocated; said drive means being operative to move said screen rapidly from its position nearest the receiving means to the position nearest the feeding means; whereby the material on the screen is subjected to a thorough agitation upon striking the liquid, is washed and given a forward feeding movement while said screen moves therethrough; the material being washed and classified during movement in the opposite direction; and the larger particle sizes of the material being caused to roll over said upwardly inclined portion and off of the screen into the receiving means at that end of its stroke and after the screen has been lifted out of the liquid.

2. A classifying apparatus comprising a reciprocable screen; means to feed material onto said screen; means to receive the classified material which does not pass through said screen; means for supporting a body of liquid; means for supporting and directing the movement of said screen to cause the screen to be lifted above the surface of the body of liquid at the end of its reciprocation near the receiving means, and when moving toward the feeding means, to enter the liquid and then submerge a distance beneath the surface of the liquid whereby the material on the screen will be frictionally engaged by the liquid so that the liquid will push the material across the screen toward the receiving means; said classifier being operative such that the fine material passes through the screen and the coarse material falls over the end of the screen into the receiving means; and means for reciprocating the screen relatively slowly toward the receiving means and rapidly toward the feeding means whereby as the screen submerges said distance, sufficient resistance will be generated between the material and the liquid, as the screen moves toward the feeding means, to advance the material toward the receiving means.

3. A classifying apparatus comprising a reciprocable screen; means to feed material onto said screen; means to receive the classified material which does not pass through said screen; means for supporting a body of liquid; means for supporting and directing the movement of said screen through an arcuate path to cause the screen to be lifted above the surface of the body of liquid at the end of its reciprocation near the receiving means, and when moving toward the feeding means, to enter the liquid and then submerge a distance beneath the surface of the liquid whereby the material on the screen will be frictionally engaged by the liquid so that the liquid will push the material across the screen toward the receiving means; said classifier being operative such that the fine material passes through the screen and the coarse material falls over the end of the screen into the receiving means; and means for reciprocating the screen relatively slowly toward the receiving means and rapidly toward the feeding means whereby as the screen submerges said distance, sufficient resistance will be generated between the material and the liquid, as the screen moves toward the feeding means, to advance the material toward the receiving means.

4. A classifying apparatus including a frame comprising a reciprocable screen; means to feed material onto said screen; means to receive the classified material which does not pass through said screen; means for supporting a body of liquid; means for supporting said screen comprising a plurality of links pivotally mounted between said screen and said frame, said links directing the movement of said screen to cause the screen to be lifted above the surface of the body of liquid at the end of its reciprocation near the receiving means, and when moving toward the feeding means, to enter the liquid and then submerge a distance beneath the surface of the liquid whereby the material on the screen will be frictionally engaged by the liquid so that the liquid will push the material across the screen toward the receiving means; said classifier being operative such that the fine material passes through the screen and the coarse material falls over the end of the screen into the receiving means; and means for reciprocating the screen relatively slowly toward the receiving means and rapidly toward the feeding means whereby as the screen submerges said distance, sufficient resistance will be generated between the material and the liquid, as the screen moves toward the feeding means, to advance the material toward the receiving means.

5. A classifier having means to feed material to the classifier and a means to receive a portion of the classified material comprising a screen reciprocable between said feeding means and said receiving means to effect a separation of the particles of the material to be classified such that the larger particles are retained on the screen; said screen being generally horizontally disposed but having an upwardly inclined portion adjacent said receiving means; means to drive said screen rapidly in one direction; a body of liquid cooperating with said screen; means for directing the movement of the screen in an arcuate path through said liquid for a substantial distance; said directing means causing said screen to be lifted out of the body of liquid adjacent said receiving means; and means associated with the screen to constrain the material to a path of movement over the screen as it is reciprocated; said drive means being operative to move said screen rapidly from its position nearest the receiving means to the position nearest the feeding means; whereby the material on the screen is subjected to a thorough agitation upon striking the liquid, is washed and given a forward feeding movement while said screen moves therethrough; the material being washed and classified during movement in the opposite direction; and the larger particle sizes of the material being caused to roll over said upwardly inclined portion and off of the screen into the receiving means at that end of its stroke and after the screen has been lifted out of the liquid.

6. A classifier including a frame and having

means to feed material to the classifier and a means to receive a portion of the classified material comprising a screen reciprocable between said feeding means and said receiving means to effect a separation of the particles of the material to be classified such that the larger particles are retained on the screen; said screen being generally horizontally disposed but having an upwardly inclined portion adjacent said receiving means; means to drive said screen rapidly in one direction; a body of liquid cooperating with said screen; means comprising a plurality of pivotally mounted links between said screen and said frame for directing the movement of the screen through said liquid for a substantial distance; said directing means causing said screen to be lifted out of the body of liquid adjacent said receiving means; and means associated with the screen to constrain the material to a path of movement over the screen as it is reciprocated; said drive means being operative to move said screen rapidly from its position nearest the receiving means to the position nearest the feeding means; whereby the material on the screen is subjected to a thorough agitation upon striking the liquid, is washed and given a forward feeding movement while said screen moves therethrough; the material being washed and classified during movement in the opposite direction; and the larger particle sizes of the material being caused to roll over said upwardly inclined portion and off of the screen into the receiving means at that end of its stroke and after the screen has been lifted out of the liquid.

JESSE PANKEY HALL.