March 25, 1941. G. A. OVERSTROM ET AL 2,236,378

VIBRATING SCREEN

Filed Sept. 7, 1939 3 Sheets-Sheet 1

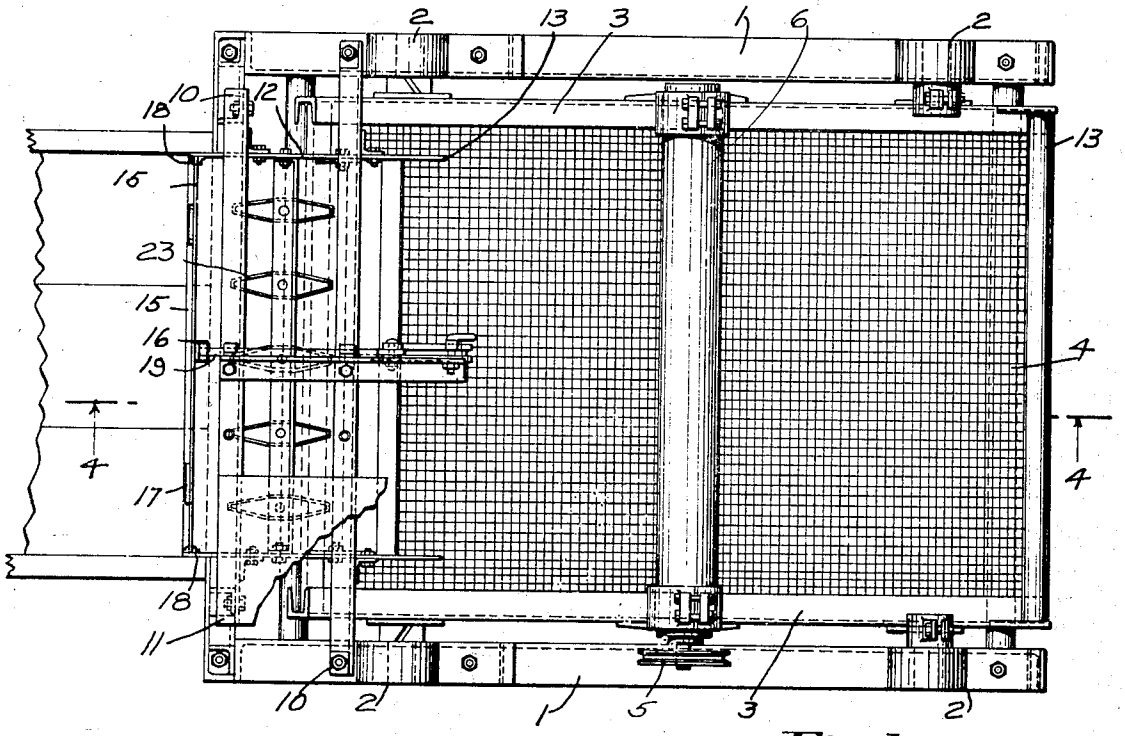


Fig. 1

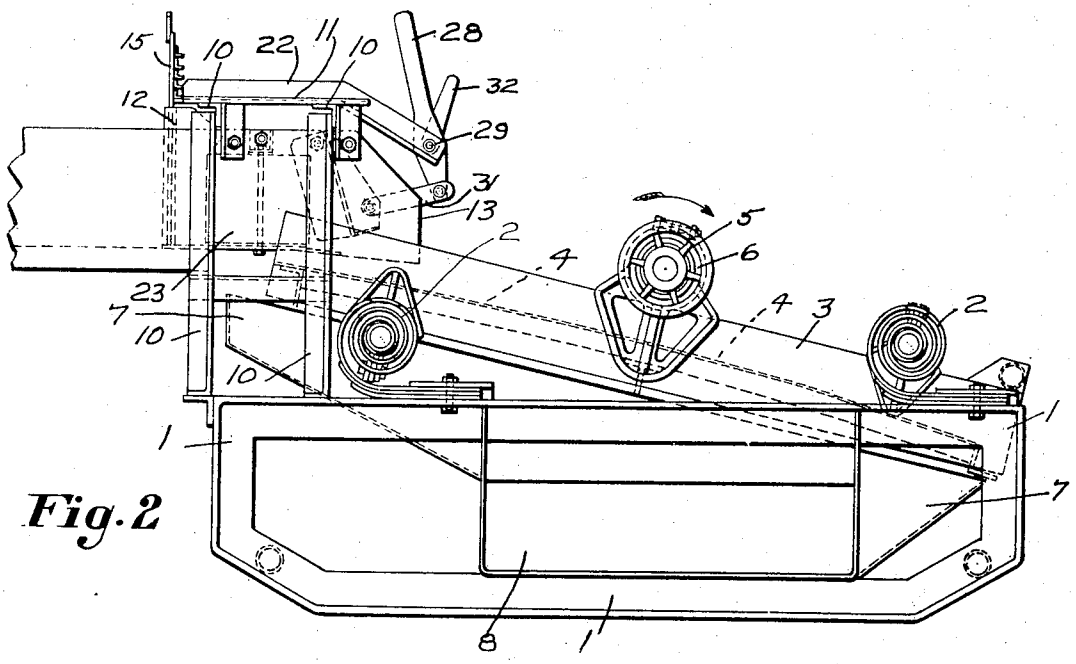


Fig. 2

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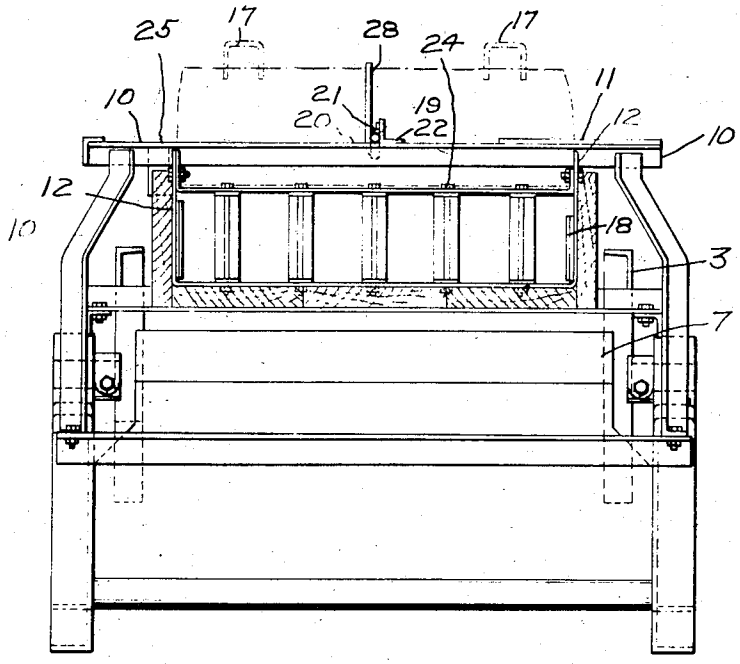


Fig.3

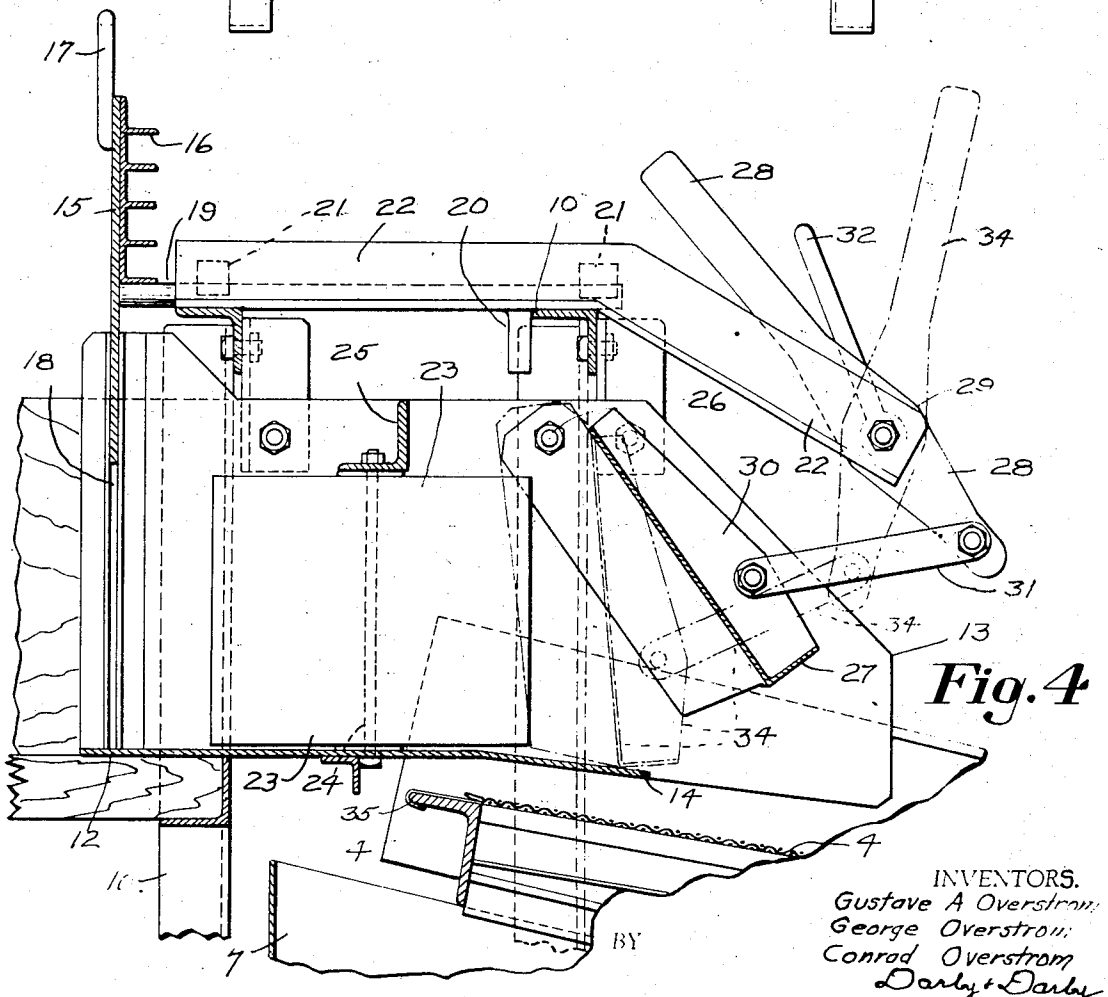


Fig.4

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Fig.5

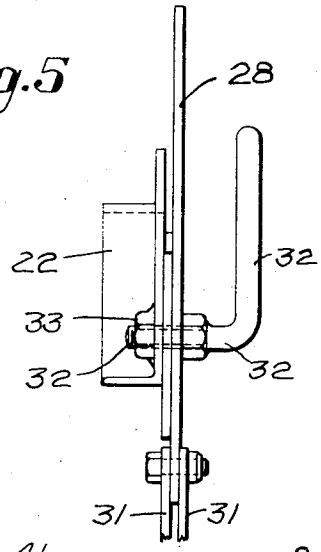
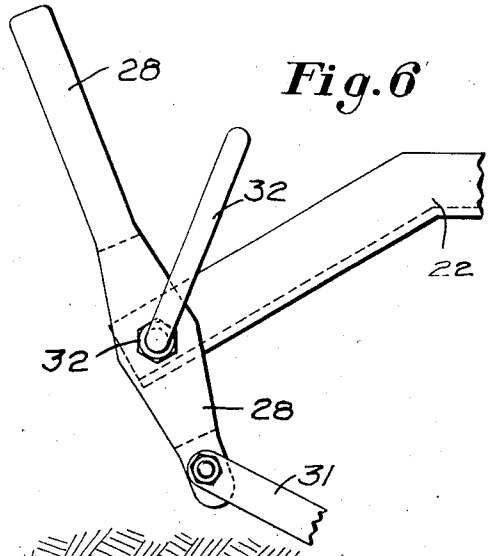


Fig.6



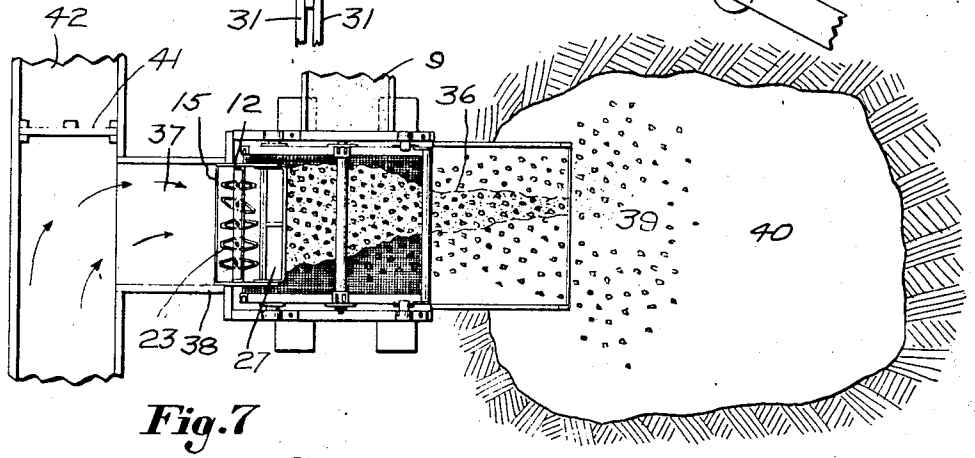


Fig.7

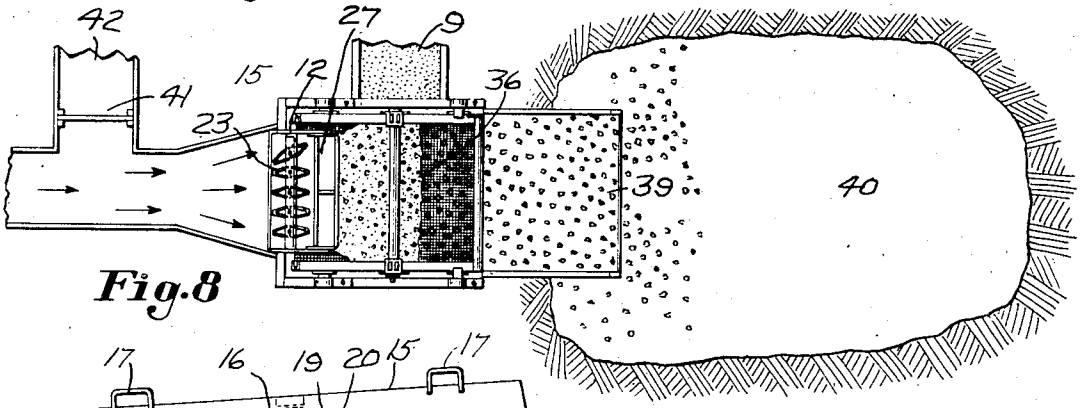


Fig.8

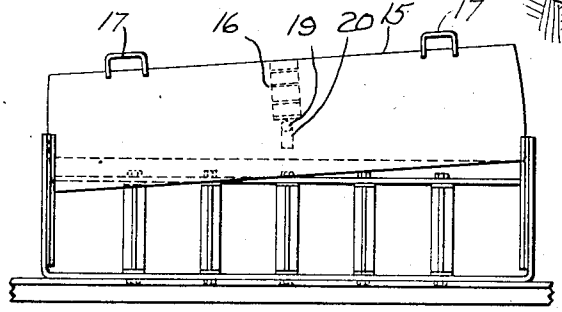


Fig.9

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2,236,378

VIBRATING SCREEN

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Application September 7, 1939, Serial No. 293,658

9 Claims. (Cl. 209—243)

This invention relates to improvements in feed distributing devices for vibrating screens of the type adapted to handle materials more or less suspended in liquids, for example the screens used for the screening of fluid mud in the rotary drilling of oil wells, for the fluid screening of pottery clap slip, for the wet screening of silt and sand, the screening of vegetable and fish oils, wood pulp, and the like.

In the past a number of different devices have been utilized for distributing the material fed to screens of the type mentioned above. In one of these a series of wings pivoted on vertical pivots and operable to swing about these vertical axes has been utilized. These wings were intended to divert the stream to one point or the other, as necessitated by the operating conditions, and were also operable to a position crosswise of the stream flow with the points of the wings overlapping, with the intention that the stream flow could be shut off entirely by the wings when in this position. This device proved unsatisfactory since the wings did not arrest and deepen the stream enough to properly direct it and furthermore it was a substantially complete failure as a gate for shutting off the stream flow.

Another attempted mode of distributing the material fed to the screen comprised a swinging gate placed at an acute angle to the bottom of the distributor box at a considerable distance inward, that is, toward the inflow or head of the distributor from the outflow lip. This device likewise was found to be practically of no value since it demands, in order that the feed be at all even, that the outflow opening must be greatly restricted. As a consequence of such restriction the outflow forms a jet which projects the feed so far toward the tail end of the screen that much valuable screen area and capacity is lost. Furthermore the outlet opening is so restricted that small chunks of clay and muck often clog up the outlet and a very uneven and messy overflow results.

Another method which has been tried is the directing of the feed stream straight downward upon leaving the outflow lip. This likewise has been found unsatisfactory since a large portion of the stream is often tossed back under the trough bottom and a part of it goes over the feed end of the screen and into the undersize without being screened.

Thus it is an object of the present invention to provide a feed box or distributor box so constructed and arranged that no matter how the feed inflow arrives to this feed distributor box the outflow therefrom can be uniformly distributed over the full width of the screening surface, so that as the liquid disappears through the screen cloth and the oversize becomes visible to the eye, a substantially uniform "apparent line of separation" appears transversely over the screen surface whereby liquid portions of the feed are prevented from going over the end of the screen into the oversize in a wedge-shaped "apparent line of separation". Portions of the screen cloth below the separation line act only as the conveying surface for oversize and perform no useful screening function.

Another object is to provide such a feed distributor that the greatest amount of useful screening area for the smallest amount of actual surface provided in the screen box is obtained, thereby lessening, for a given capacity, the first cost of the screening apparatus, as well as the cost of screening.

A further object is to provide such a feed distributor for a vibrating screen, that for a given fluid capacity to be screened, a finer mesh screen cloth can be used than has been customary in the screen apparatus, so that where the screened fluid is returned to a circulating pump, as for example in oil well drilling, the pump parts are subjected to less wear from undersize grit particles.

The above objects we attain by providing a feed distributor that has adjustments in both vertical, horizontal, and inclined planes.

Another object is to direct the outflow from the feed distributor onto the screen so that the feed stream is neither shot too far ahead, nor turned back, but falls onto the cloth at an angle that allows utilization of the greatest amount of screening surface. This object is attained by the position of the lower end of the swing gate in relation to the outflow lip of the end of the distributor.

A further object is to prevent wind and splash from carrying liquid mud over the side of the screen box as the feed falls onto the cloth. This object is attained by extending the sides of the distributor a considerable distance further ahead than the outflow lip.

Another object is to enable one to shut off the mud stream entirely from running over the end of the outflow lip when changing screen cloth, thereby greatly facilitating that operation, under clean ideal conditions.

Another object is to regulate the depth of the mud stream in the distributor, thereby making

adjustment of the swinging wings more effective, and this is accomplished by the swinging gate.

A further object is to be able to shut off the flow entirely without disturbing other feed adjustments.

Another object is to provide both inlet and outlet gates that can be instantly adjusted and safely locked in the adjusted positions.

Further objects and features of the invention will become apparent when the following description is considered in connection with the annexed drawings, in which

Figure 1 is a plan view of a screening apparatus, showing the distributor device above the screening surface at the left hand thereof. In this plan view the motor stand is broken away to show the feed box more clearly.

Fig. 2 is an elevation of the screening apparatus showing the distributor box above the screen with both the inlet and outlet gates opened.

Fig. 3 is a rear view, with parts broken away, of the same structure looking at the inlet end of the distributor. The shut-off gate is shown in dot and dash lines, and for convenience, shown wide open.

Fig. 4 is an enlarged cross-sectional detailed view of the distributor box and gates taken along lines 4—4 of Fig. 1.

Fig. 5 is a detail of the operating handle of the outlet gate toggle mechanism and its locking device.

Fig. 6 is a side elevation of Fig. 5.

Fig. 7 is a plan view showing a typical installation of the screening structure, where the stream flow has not yet been properly adjusted, the stream making a right angle turn.

Fig. 8 is a plan view of the same kind of apparatus but with a different type of installation and showing the feed distributor properly adjusted. The flow is spread out fan shape.

Fig. 9 is a rear view of the distributor box showing the shut-off gate tilted at a transverse angle to cut into the mud stream, when too much flow occurs on one side, to distribute the feed more evenly.

In the drawings the same part is designated by the same reference numeral.

Referring now more particularly to the drawings, in Figs. 1, 2 and 3 a complete mud screen is shown in which 1 is the supporting base. The outer ends of coil springs 2 are attached to this base. The inner ends of the coil springs are attached to a vibrating screen box 3 in which a screen cloth 4 is rigidly clamped to the screen box and moves in unison with it. The screen box is vibrated by an unbalanced shaft 5, running in the direction shown by the arrow, and supported in bearings placed inside a tube 6, which is rigidly clamped to the screen box 3.

Within the base 1 is a mud receiving tank 7 in which is gathered the screened mud which then flows out of openings 8 in the sides of the mud tank into a flume or ditch 9 (see Figs. 7 and 8) leading to the usual storage tank, not shown. A frame 10 is attached to base 1. This frame carries a plate 11 for a motor, and also supports all of the feed distributing device.

This feed distributing device consists of a feed trough 12, having sides and bottom. At the inlet end the two sides and the bottom are even, but at the outflow end the side ends 13 extend beyond the outflow edge 14 a considerable distance. Near the inflow end is a sliding gate 15 that has several lugs 16 fastened to it on the inside and near the upper central part, and a handhold 17 near each end above the top of, and attached to, the gate. On the inside of the trough 12 are deep guides 18 in which the gate 15 is adapted to slide, and to be adjusted at any height or transverse angle (as shown in Fig. 9) or to be dropped to the bottom of the trough 12 to act as a shut-off gate.

A sliding bolt 19 provided with a handle 20 is held in position by means of clips 21 attached to the bent angle bracket 22. The handle when it hangs down prevents the bolt from sliding back by bearing against one of the transverse angles of the frame 10, as shown in Fig. 4. The bolt 19 can be withdrawn from the lugs 16 by revolving it a quarter turn and sliding it back, so that the handle rests on the before-mentioned angle of frame 10.

A plurality of wing deflectors 23 are pivoted vertically on pivot bolts 24, which extend between the bottom of the feed trough 12 and a transverse angle 25 that connects the sides of the trough. The friction between the wings and the trough bottom and angle 25 holds the wings in the adjusted positions. The angle 25, by its stiffness and through the pivot bolts, keeps the bottom of the trough from sagging down from the weight of the fluid feeds.

Nearly in line with the end of the wings a hinge 26 is provided in the end flanges of a transverse swinging gate 27. This gate is swung by means of a hand lever 28 which is fulcrumed at 29 in the downward pointing end of angle bracket 22. To the center of the gate is fastened a rib 30, to which are pivoted links 31 that at their other ends are pivoted to the short end of the hand lever 28. A handle bolt 32 (see Figs. 5 and 6) threaded in a nut 33 attached to bracket 22, serves to quickly lock the gate 27 in any position desired; for example, in the shut-off position shown by dot and dash lines 34, or in completely open position as shown by the full lines of the swinging gate mechanism. The lower end of lever 28 and the links 31 form a powerful toggle motion to shut or open the gate instantly with one motion of the attendant's hand.

The side extensions 13 of trough 12, beyond the outflow lip 14 thereof, are for the purpose of preventing side splash of the mud over the screen box sides, and preventing wind and drafts from carrying the mud drops and mists outside the box, as would happen if the trough sides ended even with the outflow lip 14, which is far enough ahead of the cross angle 35 of the screen box (see Fig. 4) so that none of the unscreened mud can splash back into the mud receiving tank 7.

Installations of oil well mud screens are very rough, and temporary for the duration of drilling one well only; and hardly any two installations are alike, due to topography and approach of the location. Hence the mud, which may vary from 300 to over 1000 gallons per minute stream flow, does not arrive evenly to the distributor but in actual operation may be deep on one side and thinner on the other. This often happens in an installation such as indicated in Fig. 7, where the stream turns a right angle. In operation the sliding gate 15 is lowered into the mud stream and by tilting the gate transversely on the sliding bolt 19 so as to cut more into the deep part of the stream than into the shallow part, at the bottom of which a relatively deep sand layer usually has accumulated, more fluid mud is compelled to go to the shallow side, where-

by the sand accumulation is cut away, and both the sand and mud flow are partly evened out.

The flow is still further evened out by closing the swinging gate **27** until it cuts partly into the stream. Usually the wings **23** are adjusted last to give the final even distribution, because these wings distribute better when the stream has been deepened by the contraction of the outflow opening, accomplished by the adjustment of the swinging gate **27**. If the "apparent line of separation" should appear like in the ragged lines **36** in Fig. 7, where the fluid mud goes over the tail end of the screen and down the chute **39** and into reject pit **40**, the gate **15** is adjusted to cut into the stream flow on the side **37** of the stream, and the wings **23** are adjusted to take flow away from the center of the stream and push it more towards side **38** of the stream. When properly adjusted, the "apparent line of separation" will appear like ragged line **36** in Fig. 8, in which case no fluid mud goes over the tail end of the screen, but only rejects free from the costly fluid slide down into the reject pit **40**.

When it is desirable to by-pass the mud stream from the screen, the gate **41** is lifted out of the by-pass flume **42** and the gate **15** is dropped down to the bottom of the feed trough **12**, leaving the wings **23** and the swinging gate **27** undisturbed. When the screening operation is to be resumed, the gate **41** is dropped down and the gate **15** in the distributor is lifted up to its former position. In a few minutes the stream flow will act exactly as it did before the by-pass operation, so the attendant does not have to waste any time trying to readjust the distribution of the flow.

While a preferred embodiment of the invention has been described, it is understood that many changes and modifications can be made without departing from the spirit of the invention and therefore we wish to be limited not by the foregoing description, but solely by the appended claims.

What is claimed is:

1. In a device of the class described, in combination, a feed trough having an outflow lip and sides extending beyond said lip, a sliding gate at the inflow end of said trough, said gate being positionable so that its lower edge is at an angle to the trough bottom in a vertical plane transversely of said trough, and means between said outflow lip and said gate and pivoted on vertical axes spaced across said trough to direct the flow of material as modified by said gate.

2. In a device of the class described, in combination with a vibrating screen box, a feed trough located above the feed end of said screen box, a sliding gate positioned at the input end of said feed trough, a plurality of vertically pivoted wings spaced across said feed trough in front of said sliding gate, an outflow lip at the front bottom edge of said feed trough and a swinging gate pivoted to coact with said outflow lip so as to deflect the stream of material downwardly.

3. In a feed distributor device for a vibrating screen of the type described, in combination, a feed trough comprising bottom and side walls, said bottom wall being bent downwardly at its bottom edge to form an outflow lip and said side walls extending beyond said outflow lip to form windshields, a transverse gate arranged adjacent the inflow end of said distributor box, said gate being vertically adjustable and rotatable about a horizontal axis extending longitudinally of the trough whereby the space left by said gate at the two sides of said trough may be adjusted, and a plurality of wings pivotally mounted on vertical axes spaced across said trough to direct the stream of material after modification of the flow thereof by said gate.

4. In a feed distributor device for a vibrating screen of the type described, in combination, a feed trough comprising bottom and side walls, said bottom wall being bent downwardly at its bottom edge to form an outflow lip and said side walls extendng beyond said outflow lip to form windshields, a transverse gate arranged adjacent the inflow end of said distributor box, said gate being vertically adjustable and rotatable about a horizontal axis extending longitudinally of the trough whereby the space left by said gate at the two sides of said trough may be adjusted, a plurality of wings pivotally mounted on vertical axes spaced across said trough to direct the stream of material after modification of the flow thereof by said gate, and a swinging gate pivoted on a horizontal axis located toward the feed end with respect to said outflow lip, said gate being adjustable to limit the area above said outflow lip and further modify the flow of material as desired.

5. In a device of the class described, a plurality of wings pivotally mounted on vertical axes spaced across said device, said wings being frictionally held in adjusted position, means comprising an outflow lip and a swinging gate cooperating therewith for modifying the flow of material as directed by said wings to deflect it downwardly as it leaves said lip, said means being manually adjustable, and means for locking said gate means in adjusted position.

6. In a vibrating screen device of the type described, the combination of a screen box and a distributor box mounted above said screen box in operative relation therewith, said distributor box comprising in the direction of flow of the material a transverse gate, vertically pivoted deflecting wings and a swingable gate, all of said elements being adjustable with respect to the stream of material flowing through said box and cooperating to render the stream of material smooth and uniform whereby a substantially straight line of separation across said screen box is formed.

7. In a device of the class described the combination of a vibrating screen box, a feed trough located above the feed end of said screen box, a sliding gate positioned at the input end of said feed trough, and means on said gate for supporting it in elevated position and for rendering it pivotally adjustable about said support, the adjustment of said gate being about a horizontal axis extending longitudinally of the trough.

8. In a device of the class described the combination of a vibrating screen box, a feed trough located above the feed end of said screen box, a sliding gate positioned at the input end of said feed trough, and means on said gate for supporting it in elevated position and for rendering it pivotally adjustable about said support on an axis at right angles to the plane of the gate, said means comprising lugs on said gate and a slidable member adapted to cooperate therewith.

9. In a vibrating screen device of the type described, the combination of a screen box and a distributor box mounted above said screen box so as to discharge into it, said distributor box comprising successively from its feed to its

discharge end a transverse gate, vertically pivoted deflecting wings and a swingable gate, all of said elements being adjustable with respect to the stream of material flowing through said box and cooperating to render the stream of material smooth and uniform whereby a substantially straight line of separation across said screen box is formed, and means to lower said transverse gate to cut off the flow of material to said screen box without disturbing the adjustment of said deflecting wings or said swingable gate.

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