Oct. 30, 1951 B. M. BIRD 2,573,389

LIQUID LEVEL CONTROL FOR JIG ELEVATOR CASINGS

Filed Oct. 8, 1949 3 Sheets-Sheet 1

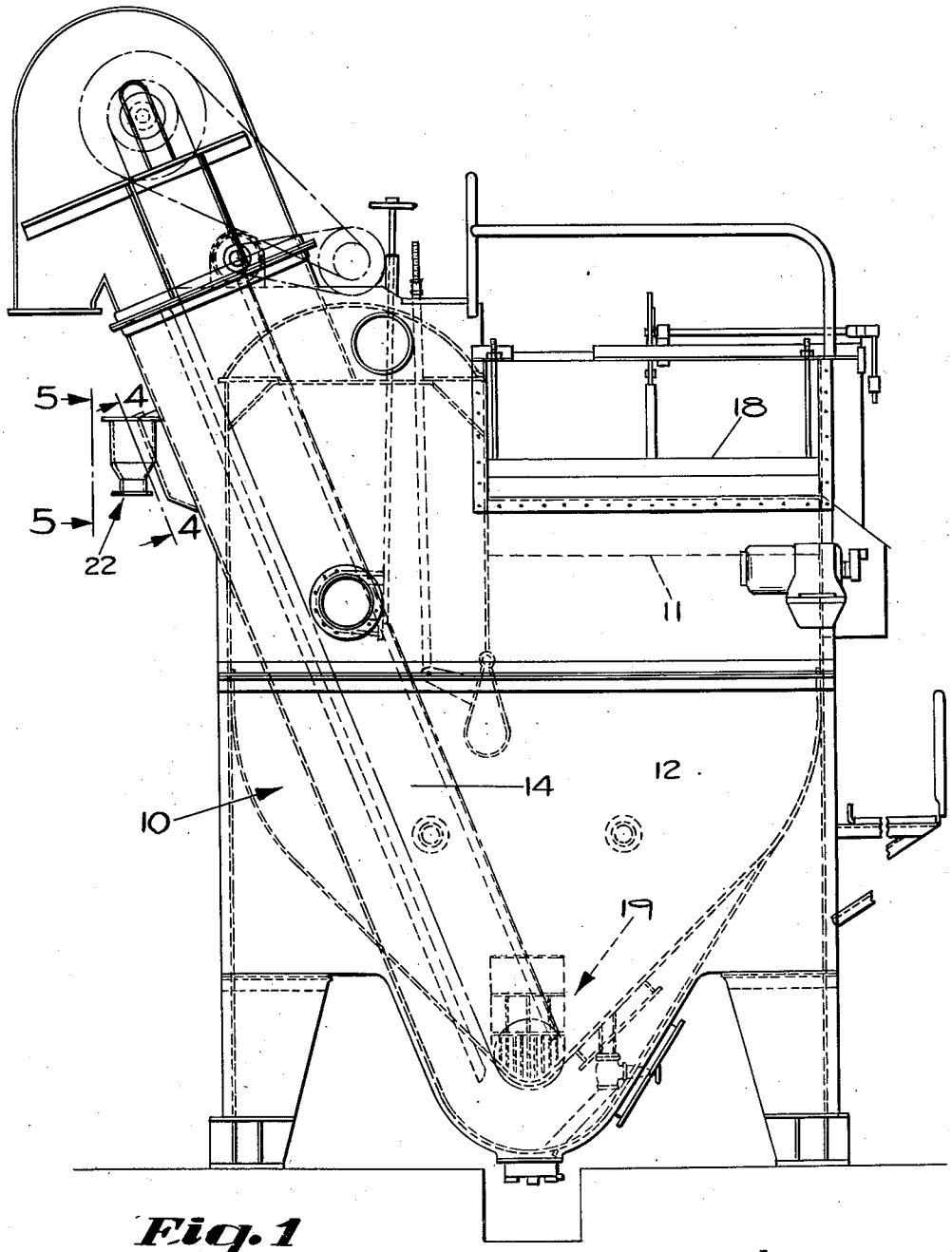


Fig. 1

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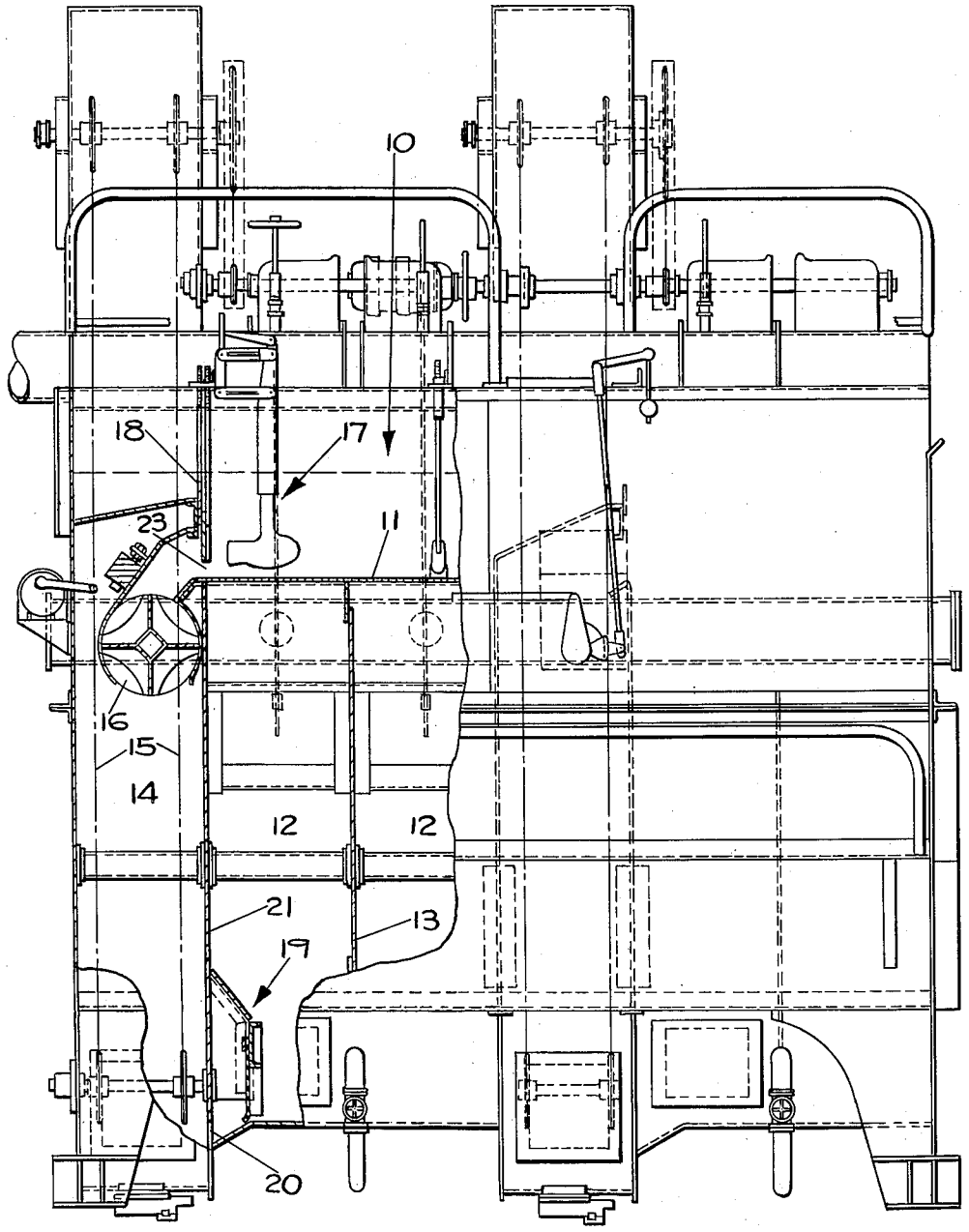


Fig. 2

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Fig. 3

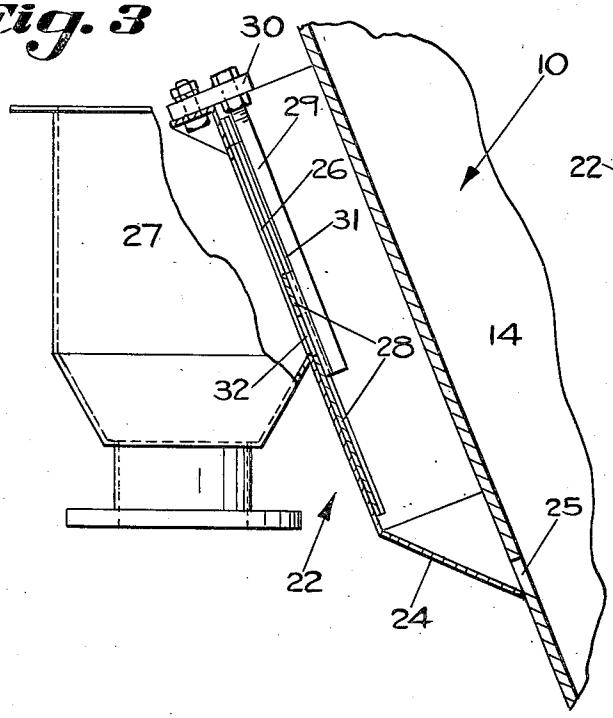
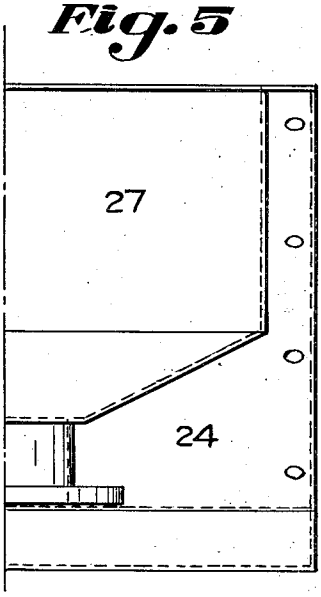


Fig. 5



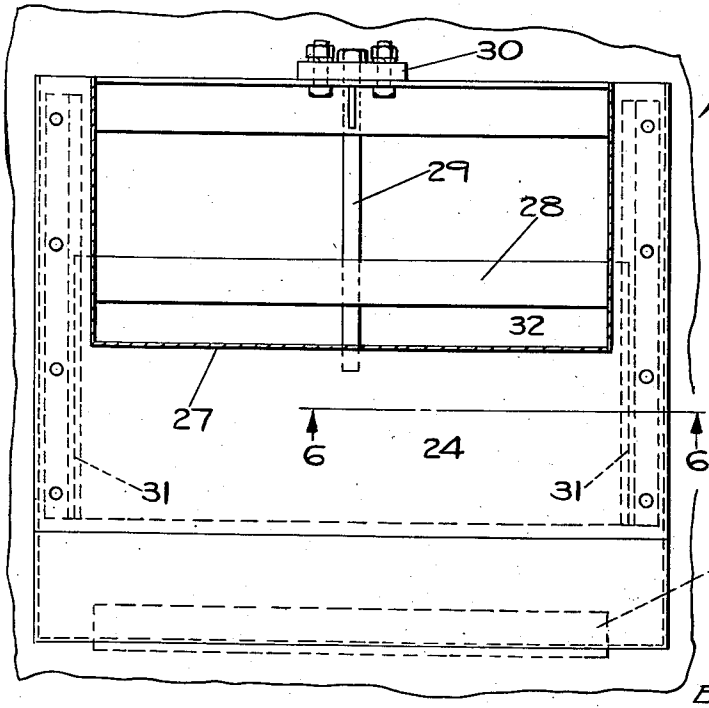


Fig. 4

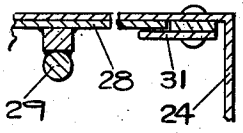


Fig. 6

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UNITED STATES PATENT OFFICE

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LIQUID LEVEL CONTROL FOR JIG ELEVATOR CASINGS

Byron M. Bird, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company, a corporation of Ohio

Application October 8, 1949, Serial No. 120,270

4 Claims. (Cl. 209—455)

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This invention relates to a jig, and an object of the invention is to provide apparatus in a jig which will prevent undesirable reverse flow of the jigging liquid through the high gravity material or refuse discharge, particularly adjacent the washed coal overflow lip.

A more specific object of the invention is to employ a liquid level controlling weir over which liquid can freely flow from the elevator casing, into which the high gravity material or refuse discharges.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings:

Fig. 1 is an end elevational view of a jig incorporating the features of my invention;

Fig. 2 is a side view of said jig, with parts broken away and in section;

Fig. 3 is an enlarged elevational detail view, with parts in section, showing the overflow control weir associated with the elevator housing;

Fig. 4 is a view taken on the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a view taken on the line 5—5 of Fig. 1, looking in the direction of the arrows; and

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 4, looking in the direction of the arrows.

The general construction of a typical Baum jig is disclosed in the patent to Orval R. Strawn, No. 2,281,530, dated April 28, 1942, to which reference is made for a more complete illustration of the jig illustrated particularly in Figs. 1 and 2 of the drawings, with certain modifications, to incorporate the features of my invention.

Another feature of the invention, as an element of the complete combination, particularly in the form of a control valve between the hutch compartment and the elevator compartment, is disclosed and claimed in the application of William J. Smith, Serial No. 119,788, filed October 6, 1949 entitled Hutch Valve for Baum Jig.

As seen in Figs. 1 and 2, the jig includes a main tank or container 10 which, as illustrated, has two jigging compartments in which material is successively treated. The number of compartments may be increased or reduced as desired. Each jigging compartment includes a perforated screen plate 11 upon which a bed of granular materials is to be treated and classified according to specific gravity, illustrative materials being iron ore and coal. The jig illustrated is particularly adapted for cleaning coal and separating the pure coal from its gangue or refuse.

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Below the screen plate 11 there is a hutch compartment 12 divided into two cells by a vertical transverse partition 13. Adjacent and to the left of the hutch compartment 12 is an elevator compartment 14 within which there is a bucket type elevator mechanism 15 adapted to carry the refuse received in the compartment 14 upwardly and discharge it from the elevator compartment.

The jig illustrated is of the well known Baum type in which air is employed to cause cyclic pulsion and suction strokes or upward and downward movement of the jigging fluid, preferably water, through the screen plate 11 and the bed of materials supported thereby. As is well known in this art this action produces a stratification of the materials in said bed, with the high gravity materials in the lower stratum and the low gravity materials in the upper stratum.

The high gravity materials accumulate in refuse discharge mechanism 16 which is under the automatic control of refuse control float mechanism 17. The high gravity material or refuse discharged by the mechanism 16 is received in the elevator compartment 14. The low gravity material stratified in the bed on the screen plate 11 is carried with some of the cleaning water over the discharge lip 18 of the jig.

In order to minimize the fluctuation of the liquid level in the elevator or refuse compartment 14, there is a flexible check valve 19 associated with a bottom opening 20 in an upright partition 21 which constitutes a common wall with the hutch compartment 12 and the elevator compartment 14. As disclosed in more detail and claimed in the application of William J. Smith, above identified, the check valve 19 allows a relatively free flow of water from the hutch compartment 12 into the elevator compartment 14, but prevents a reverse flow of said water between said two compartments, thus increasing the effectiveness of the suction stroke on the bed of materials.

It has been found desirable to incorporate with the structure so far defined an overflow control or weir 22 in association with the elevator compartment 14, and this weir 22 is preferably so positioned that the maximum liquid level in the elevator compartment 14 does not greatly exceed the elevation of the discharge lip 18. For example, it is preferably not more than a few inches above it, this expression being understood to mean from two to ten inches and, as a maximum, not more than a foot.

The function of this control weir 22 is to pre-

vent the development of an undesirably high head of water in the elevator compartment 14 which might otherwise develop during the pulsion stroke. This high head of water is undesirable as it has been found that when allowed to develop it frequently causes a reverse flow of the liquid from the elevator compartment 14 through the refuse discharge 16 and into the tank 10 above the screen 11 and through the variable refuse discharge opening 23, through which the refuse or high gravity material will pass in moving from the screen 11 into the discharge mechanism 16. This reverse flow of liquid is undesirable because it tends to destroy the stratification of the material adjacent said opening 23, thus interfering with the efficiency of the separation of the material according to specific gravity.

By maintaining the maximum height of the liquid level in the compartment 14 to a few inches above the height of the discharge lip 18, a periodic disturbance of the stratification of the material on the bed of the screen 11, particularly adjacent the high gravity discharge opening 23, is greatly minimized or completely eliminated.

It has been found that the control weir 22 is particularly desirable in combination with the check valve 19, though in certain aspects of the invention it might conceivably be used alone.

Attention is now directed particularly to Figs. 3 to 6 of the drawings in which the details of the weir 22 are illustrated. Associated with the bottom sloping walls of the elevator compartment 14 there is an open top box 24 into which water can flow from said compartment 14 by means of an opening 25 in said elevator casing bottom wall and adjacent the bottom of the box 24.

The left-hand wall of the box 24, as viewed in Fig. 3 of the drawings, is provided with a large opening 26 which communicates with a discharge spout 27. Slidable over the opening 26 is a gate 28 which is mounted upon an adjusting rod 29 held in adjustable position by a pair of lock nuts cooperating with a holding bracket 30 which is carried at the upper end of the box 24.

The opposite ends of the gate 28 are slidable in guides 31 carried by the box 24. Extending transversely across the gate 28 there is an elongated slot 32, the lower edge of which is the effective overflow control or weir which determines the maximum height of the liquid in the elevator compartment 14. It is obvious that by adjusting the gate 28 the maximum level of the liquid within said compartment 14 may be varied.

In the operation of the device, the material to be treated, such as coal, will be delivered to the first compartment of the jig, which when of the two compartment type, as illustrated in Fig. 2, will be the right-hand compartment, wherein it will undergo a jigging action which is not different in kind from that which takes place in the second compartment. It will be understood that the features shown in detail in association with the second compartment are also incorporated in the first compartment. A description of the action which takes place in the second compartment will therefore suffice for both.

As the liquid goes through its repeat cycles of pulsion and suction stroke to stratify the bed of material on the perforated screen 11, it is evident that during the pulsion stroke the liquid can flow freely from the hutch compartment 12 into the elevator compartment 14 through the check valve 19. This will produce an upward movement of liquid through the bed of materials and the screen plate 11. It will also produce an upward movement of liquid in the elevator compartment 14.

The maximum height of this liquid in the elevator compartment 14 will be determined by the weir or control gate 22 associated therewith.

During the suction stroke the liquid will move downwardly through the bed of materials and through the screen plate 11. During this time check valve 19 will be closed so that there is a minimum variation of liquid level in the elevator compartment 14, since it will be prevented from flowing into the hutch compartment 12. This will increase the effectiveness of the suction stroke on the bed of materials.

During the pulsion stroke the maximum height of the liquid in the elevator compartment 14 will not exceed greatly the height of the liquid in the jigging compartment above the screen 11, as it flows with the low gravity material over the discharge lip 18. As a consequence there will not be an appreciable head of liquid in the elevator compartment 14, which, if present, might tend to cause a bed stratification disturbing reverse flow of liquid through the refuse discharge mechanism 16 and the refuse discharge opening 23.

In the specification, reference has been made primarily to a jig for treating coal. It is to be understood that the features of my invention are likewise applicable to the treatment of iron ore or to any other similar material.

In the case of iron ore the high gravity material is, of course, the valuable constituent, the gangue being the low gravity material. In this case, of course, the valuable ore is discharged through discharge mechanism 16 and ultimately delivered from the jig by the conveyer 15. The physical characteristics of an ore jig as distinguished from a coal jig are well recognized, one difference being that they are generally considerably smaller for any given tonnage.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and applicant therefore wishes not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of the invention, what it is desired to secure by Letters Patent of the United States is:

1. A jig including a material supporting screen on which material is stratified by pulsating fluid flow therethrough, a hutch compartment below said screen, an elevator compartment, high gravity material discharge means operable to control discharge of high gravity material from said screen into said elevator compartment, check valve means restricting the flow of fluid from said elevator compartment into said hutch compartment while providing for ready reverse flow of said fluid, and fluid discharge control means provided on said elevator compartment and positioned above said screen and high gravity material discharge means for controlling the maximum height of fluid in said elevator compartment to thus control undesirable flow of fluid from said elevator compartment through said high gravity material discharge means.

2. A jig including a material supporting screen on which material is stratified by pulsating fluid flow therethrough, a hutch compartment below said screen, an elevator compartment, high gravity material discharge means operable to control discharge of high gravity material from said screen into said elevator compartment, check valve means restricting the flow of fluid from said elevator compartment into said hutch com-

partment while providing for ready reverse flow of said fluid, and fluid discharge control means provided on said elevator compartment positioned above said high gravity material discharge means for controlling the maximum height of fluid in said elevator compartment to thus control undesirable flow of fluid from said elevator compartment through said high gravity material discharge means.

3. A jig including a jigging tank having a screen above a hutch compartment and an adjacent low gravity overflow lip, an elevator having an elevator compartment and elevating means therein, said jig being operable to cause liquid to flow successively upwardly and downwardly through said screen to stratify materials thereon with the high gravity material in the bottom stratum, an ejector operable to control the discharge of high gravity material from said screen into said elevator compartment, check valve means located below said screen and controlling the flow of fluid between said hutch compartment and said elevator compartment and constructed and arranged to restrict the flow of fluid from said elevator compartment into said hutch compartment as said liquid flows downwardly through said screen, and an overflow control on said elevator compartment operable to limit the maximum height of fluid in said elevator casing to a few inches above said overflow lip to thus control the undesirable flow of fluid from said elevator compartment through said high gravity material discharge means.

4. A jig including a jigging tank having a screen above a hutch compartment and an adjacent low gravity overflow lip, an elevator having an elevator compartment and elevating means therein, said jig being operable to cause liquid to flow successively upwardly and downwardly through said screen to stratify materials thereon with the high gravity material in the bottom stratum, an ejector operable to control the discharge of high gravity material from said screen into said elevator compartment, check valve means located below said screen and controlling the flow of fluid from said elevator compartment to said hutch compartment, and an overflow control on said elevator compartment operable to limit the maximum height of fluid in said elevator casing to thus control the undesirable flow of fluid from said elevator compartment through said high gravity material ejector.

BYRON M. BIRD.

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The following references are of record in the file of this patent:

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