To all whom it may concern:

Be it known that I, HARRY J. MOYER, a citizen of the United States, residing at 1516 Wingehocking street, Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Stabilized Movable Bottom for Jiggers, of which the following is a specification.

My invention relates to jiggers for separating the slate from coal which use a fixed jigger box and produce pulsations of water through the box and contents by a plunger.

The purpose of my invention is to make the bottom of the box or a portion thereof movable with respect to the box, preferably in inverse proportion to the load upon the bottom or section, and to stabilize the bottom or section against undesirable movement in either direction.

A further purpose of my invention is to counterbalance a movable box bottom or section thereof by means which counterbalances different weights at different heights and to proportion the flow of slate from the bottom by the height of the bottom or section.

A further purpose of my invention is to provide a movable bottom section having a steeper slope than the fixed portion of the jigger box bottom.

A further purpose of my invention is to provide for slight vertical play of a bodily movable counterbalanced box bottom or section while retarding additional vertical movement.

A further purpose of my invention is to provide vertically movable closures for the slate outlet of a jigger box which will yield locally when an obstruction is caught between the closure and a movable box bottom or section thereof.

A further purpose of my invention is to provide a stabilizer for a movable box bottom or section thereof which stabilizer is capable of adjustment to permit predetermined quick oscillation of the movable part and to retard further movement thereof in either direction.

A further purpose of my invention is to provide for exterior adjustment of the rate of movement permitted by a stabilizer connected with a movable jigger box, jigger box bottom or section thereof.

A further purpose of my invention is to separate the parts of a closure for a jigger slate outlet making the parts separate and separately operative so as to permit full closure of some parts when others are open.

Further purposes will appear in the specification and claims hereof.

I have preferred to illustrate my invention by but a few of the various forms in which it may be utilized, selecting forms which are practical, efficient and relatively inexpensive, which can easily be applied to existing jiggers and which at the same time well illustrate the principles of my invention.

Figure 1 is a transverse vertical section through a jigger illustrating my invention.

Figs. 2 and 3 are sections of details of Fig. 1, taken parallel to that figure.

Fig. 4 is a section corresponding to Fig. 1 but showing a second form of my invention.

Fig. 5 is a broken end elevation of the structure of Fig. 4, omitting some of the parts.

Figs. 6 and 7 are partial sections corresponding in position to Fig. 1 but showing other constructions.

Figs. 8 and 9 are broken sections at right angles to each other showing another modified form.

Figs. 10 and 11 are sections in elevation and perspective, respectively, showing modified gate structure.

Similar numerals of reference indicate like parts.

This application is a continuation as to common subject matter of an application filed by me August 21, 1915, Serial No. 46,667 for a movable bottom screen jigger, from which have been taken claims specific to the fixed box with movable bottom and separate plunger.

The invention relates to the feeding of the slate which is being separated from the coal and is directed to the counterbalancing of a movable jigger box bottom or section thereof and to stabilization of the section at whatever height, so far as may be desired, preventing sudden movement of the bottom or section from water impulse or weight of the contents or limiting the sudden movement to that which is desired, at the same time permitting gradual change of height of the bottom or section in inverse proportion to the volume of slate present.

Taking up first the showing in Fig. 1:—

The tank 1 contains the water in which the jigger box is to be immersed, to some
such level as 2, above the reciprocable plunger 3. This plunger operates in any convenient space set off by a baffle or wall 4, so that the water impulses produced shall be applied to the perforated bottom 5 of the jigger box 6 rather than to the sides of the box.

At the front of the tank I provide casings or boots 7 and 8, in operative position to receive the discharges of coal and slate respectively. Within these casings conveyers 9 and 10 travel for the purpose of continuously removing the separated coal 11 and slate 12, which are received unseparated through a chute from any pocket, such as 13, or other storage or supply.

The chute delivers the mixed coal and slate to the jigger box behind a baffle, such as 14, adjustably spaced from the bottom of the box as by closure 15 moved by rod 16 and adjusting mechanism 17.

As is well known, the impulses given by the plunger are transmitted to the mixed coal and slate; the variance of whose specific gravities has been exaggerated by submersion of both in the water. As each impulse is applied through the perforated bottom the mixed coal and slate are lifted and subsided, rearranging in accordance with their subsidence values with the coal on top in position to pass over the month 18, and the slate progressively deepening toward the front along the sloping bottom, and having its outlet at the lower front of the bottom.

The greater bulk of the slate causes greater total weight upon the entire bottom and the progressive increase in slate depth causes corresponding increase in the pressure upon underlying parts of the bottom. The baffle 19 previously in use to relieve against crowding of coal down into the slate outlet does not affect the general distribution of the coal and slate, but does retard the lifting of the slate close to the outlet.

With the jiggers at present in general use the operator “taps” the slate at intervals, when he thinks that it has accumulated in sufficient quantity. Undue delay causes slate to be passed out with the coal, injures the quality of the coal and often requires rejigging of the condemned coal, expensive alive because of the re-handling and of the breakage of coal. Undue “tapping” causes waste of coal which passes out through the slate outlet.

Even when at its best, intermittent tapping of the slate is objectionable for various other reasons. The capacity of the jigger is limited by the amount of slate which it will hold before it is tapped. The slate conveyer is not operated economically. Every time slate is tapped the depth of slate at the front is greatly reduced while that farther back is but slightly affected, disturbing the normal distribution of the slate in which its upper surface lies nearly in a plane, and letting coal down into the space at the front in which the slate belongs. This coal which has followed the slate downward toward the slate outlet must be displaced by slate to a greater extent, relatively, than coal farther back before a body of slate can be accumulated again at the front. This loss part of the time of operation of the jigger before the rearrangement of the coal and slate is effected.

Various efforts have been made to utilize the pressure upon a section of the bottom, and in one case upon the entire bottom to move the section or bottom in an effort to discharge the slate regularly and automatically. These have failed for a number of reasons, among which might be stated, the absence of any stabilizer for taking the thrust due to the reciprocations of the plunger and the fall of the box content between water impulses, the lack of suitable counterweighting for the movable section or bottom to equalize different weights at different heights, ineffective outlets, within which the slate is caught, preventing free movement, and the lack of effective retardation of movement in either direction by reason of change in weight.

The result has been that the movable sections or bottoms have fluttered with the pulsations of the plunger, following up the coal and slate and interfering with the separation. The sections have dropped rapidly as soon as the counterweight value was exceeded and have allowed a sudden discharge of slate, disturbing the slate distribution quite as fully as is the case with hand discharge operation. Relieved of its extra weight the bottom or section closes nearly as rapidly as it opens and there is no maintained position at which average or uniform flow of slate takes place. Except as they have avoided excessive accumulation of slate before tapping and have been less open to objection from excessive discharge, carrying coal out along with the slate, they have been open to all of the objections as to intermittent character existing with hand operation.

I prefer that the slate outlet should not be quite closed when the movable bottom or section is at its highest position, leaving a space 20 about the width of the coal which is being jugged.

Instead of an integral door, such as might be used with my invention to some advantage, in this illustration I form the door of sections which move separately and preferably vertically. These sections 21 are shown as weighted at 22, moving between sides 23 of a channel which guides and supports the strips. The channel is vertically adjustable upon the bar 24 and is held in place by screws 25 passing through slots 26.
The sections may be made in the form of separate strips or in groups, if desired. Each strip or group may thus close to its full extent even though other strips or groups be lifted by engagement with outgoing slate, each resting between it and the movable screen of the bottom in the upward travel of the screen.

In Fig. 1 the greater part of the perforated bottom is fixed. A portion of the front, as at 27, is made moveable and is preferably lifted and lowered bodily, as in this figure and Figs. 4, 5 and 9, rather than swung, as in Figs. 6 and 7. The angle of slope is shown as greater for this section 27 than for the remaining portion of the bottom 5.

The movable section is guided by a flange 28 upon the adjoining, fixed portion of the bottom and by a flange 29 upon the under side of the forward edge of the section, as well as by the ends of the tank or box. This flange 29 closes the lower part of the outlet against undue leakage of pulsating water into the lower tank, confining the pulsations to the tank so as to make them effective upon the bottom of the box.

The section 27 is supported by a plurality of rods 30, here shown as three in number, which may be unprotected, as in Figs. 4, 5, 8 and 9 or may be movable within fixed protecting tubes 31 whose bottom edges are covered by surrounding tubes 32 which are movable with the section 27. The tubes greatly reduce friction with the coal and wedging of the coal and protect the rod from wear.

The rods 30 are connected with the counter-weighted frame 33, through which the section as shown is supported. The ends of the frame are provided with pairs of ears 34 in which pins 35 are secured so as to be engaged by the forked ends 36 of counterweight lever arms 37. The arms are pivoted on pins 38 fixed to the tank casing.

The counterweighting is split up for convenience in addition into two parts shown by weights 39 and 40 held in their adjusted position along the lever arms by screws 41 and 42.

It will be evident that the effective distance from the counterweighting to the pivot pin 38 will vary according to the harmonic law as the lever arm 37 turns, but that the effective distance from the load-supporting pin 35 to the pivot pin 38 will be substantially constant, with the result that, as the outer end of the lever arm in Figs. 1 and 3, carrying the counterweights, moves downwardly from the position there shown, it will be equalized by successively decreasing loads of combined coal and slate bearing upon the section. The movable section will therefore come to rest at different heights with different combined coal and slate loads upon it, lowering to a new position of equilibrium with increasing slate content and lifting to a higher position of equilibrium with decreasing proportion of slate.

This counterpoise mechanism would in itself secure and maintain a position of the section (or bottom, as in Fig. 8) at which an average flow of slate would take place, but for the pulsations produced by the plunger. These pulsations, if not provided for cause excessive fluttering of the section or bottom which is thus made to follow the coal and slate in the box upward undesirably, keeping the mass in compact form and not allowing room for the loosening of the mass and subsequent redistribution during the settling upon which the whole process of separation by jigging depends. Because the pulsations follow each other in too rapid succession for the section or bottom to drop to its true counterpoised position between these pulsations, they have another effect in lifting the section or bottom to a greater height than that at which it should counterbalance with the weight upon it. This tendency to lift the bottom abnormally can, however, be taken care of in the counterweighting if it be freed from excessive fluctuation.

In order to receive the thrust of the pulsations as well as support the section or bottom against the impact of the mass of slate and coal when it drops upon the section or bottom between pulsations, I apply a damper to its movements which I prefer to call by the general term stabilizer and to illustrate as of dash pot form. This form is very efficient and has the advantage of being equally effective throughout its entire range of movement. It comprises a cylinder 43 supported from the tank or other fixed point, as by table 44 and having its piston 45 connected at one end with the movable part, here conveniently with frame 33 and at the other end with the piston 46. The opening 47 through the piston shows an effective means of providing for the leakage necessary to permit slow movement of the section or bottom of the box from one position of equilibrium to another with variation in the rate of slate flow.

Either as supplemental to or instead of the opening 47 for providing flow of fluid between the two ends of the cylinder 48, I form an outside connection 49, valved at 50; so that the rate of flow may be adjusted to provide for different rates of speed of rise and fall of section 27, under the weight or pressure conditions to which it may be subjected so that special circumstances of intended operation or preferences of the designer or operator may be accommodated.

Some users, particularly in jiggering larger sizes of coal, desire a certain amount of movement of the bottom or section with each pulsation, upon the theory that it helps feed the slate, though they do not wish to
have the extent of movement which the pulsations would cause in a bottom or section which is not retarded. This limited movement or "play" can be provided in connection with the stabilizer already described by not filling the cylinder fully with fluid or, with a cylinder already filled, providing a discharge outlet for fluid at 50 so that a portion of the fluid may be drawn off, if desired, in order that a predetermined amount of free motion or vertical "play" may be given the section 27 in each direction before the stabilizer becomes effective.

By the pipes 51, 52, valved at 53, 54, I provide for a column of oil or other suitable fluid to bring pressure upon the volume of corresponding fluid within the cylinder where no lost motion is to be provided for the section 27, so as to reduce or eliminate bubbles and gain the full advantage of sensitive connection between the section or bottom and the stabilizer. These pipes provide convenient means for filling in the oil where a lost motion for section 27 has been provided and it is subsequently desired to reduce or eliminate.

I provide a lever for the purpose of lifting the section or bottom to a high position, without regard to the proportion of slate to coal in the box, when the jiggging operation is begun in order that there may be no discharge through the slate outlet until there has been time for the slate and coal to be somewhat separated and to form a sufficient slate layer on the bottom. I purpose using the same lever to hold the section or bottom down, to keep the slate outlet open as long as may be necessary when cleaning out the bottom of the jigger. Because of the relatively small weight upon the section which moves in Fig. 1, I have not considered it necessary to supply a separate lever for either purpose there but utilize one or both of the levers 37 instead.

In the forms shown in Figs. 6 and 7 I have illustrated two hinged-bottom constructions to which my stabilizer is intended to be applied. They are also intended to be counterweighted to reach equilibrium at different heights for different weights. The sections 27, 27', Figs. 6 and 7 are hinged at 56, 56', and are provided with curved flanges 29', 29', at their front edges. The doors and casing edges may be similarly curved. Because the section and bottom swing, the rods 30', 30' are pivoted to the movable grid parts as at 56, 56'. The extent of lateral movement required of the rod in the showing, Figs. 6, is slight. Ordinarily, it would not necessitate a pivot in the rod. Such a pivotal connection of rod parts is shown just below the frame at 57 in Fig. 7 because a part only, 57, of the entire bottom swings and the amount of lateral movement required of the rod would be considerable.

In operation, the jigger box is allowed to fill from the storage supply and the section or bottom is raised and retained in raised position by the lever for that purpose until sufficient bed of slate has accumulated, which may be determined readily by a little experience. The section or bottom is then allowed to seek its own level for the rate of slate-to-coal feed which is then running. This will take place rather slowly because of the action of the stabilizer, but the movement toward this position will be constant until it is reached. At this position the slate will work progressively out of the slate outlet, moving steadily from the back to the front and maintaining almost the same position and shape of upper contour throughout the operation upon coal and slate of the same proportions and specific gravities, changing with change in either of these. Should the proportion of slate accumulated at the start be in excess of the proportion for which the box is normally intended in constant operation, the box may move slightly below its normal position and back thereto before balance is effected.

In Figs. 4 and 5 the construction is of the same general character as shown in Fig. 1. However, the rod 30 is not there shown as protected, the by-pass for the stabilizer is not applied, the section 27' slopes the same as the remainder of the bottom, and a different character of door and door closure are seen.

Whereas the door in Fig. 1 is vertically movable and wholly independent of the compensating lever arms, the door 58 in Figs. 4 and 5 is hinged, as in Figs. 6 and 7 about some such rod as 59. The rod is secured to the doors by any strap or straps 60 having set screw 31 and turns in strap or straps 62. The door is connected with the counterbalancing lever 37 by means of rod 59, rocker arm 63 and rod 64, pivoted at one end to the rocker arm and the other end to the counterbalancing lever. The door is counterbalanced by arms 65 and any appropriate weight 66 and is shown as formed in a single plate or section, as shown by Fig. 5. In this figure which omits the boots and allied structure the stuffing boxes 67 (see Fig. 10) or other means for preventing leakage of water at the ends of the pivoting rod are also omitted.

The doors 58' and 58'' of Figs. 6 and 7 may be counterweighted and lifted in the same manner as door 58, if desired.

In the forms shown in Figs. 4 and 5 a space 68 is left, so that lifting of the section 27' will not catch pieces of slate between the edge of the section and the under surface of the tank outlet.
In Figs. 8 and 9 a different form of vertically movable door section is shown. Each of the spring pressed vertically movable strips 21" is shown here as separately movable and separately guided at the top by a bolt 69 moving in an opening 70 at the top of a channel 71 whose sides 72, 73 guide the lower parts of the strips against movement toward or from the observer in Fig. 8. Movement from side to side in these figures is prevented by engagement of the strips with each other.

In these two figures the section 27" is extended through the outlet in the tank at 74 somewhat more than are the sections in Figs. 1, 4 and 5 and the door strip structure is placed wholly upon the outside of the tank. A space 75 is here allowed, as in Figs. 1 and 2, for movement of slate smaller or flatter than the coal being handled, this space being open even when the section 27" is in its highest position. The rod 30" is here pivoted to the section to allow a slight amount of rocking movement exaggerated in the illustration, the purpose being to tend to move the slate toward the tank outlet by slight tilting movement of the section 27" responsive to the water pulsations. As will be seen, the pivot 56" is located slightly nearer the edge of the tank than to the flange 28. This is intended to partly or wholly counterbalance the additional weight upon the front of the section 27" because of the greater height of slate 55 upon the front of it, as compared with that upon the rear thereof.

The amount of rocking permitted is determined by the angular play between the edges 76 and 77 upon the two parts of the pivot and the extent of rocking will be further dependent upon the proportion between the surfaces exposed to pulsation in the front and rear of the pivot respectively. Slight rocking will affect the fit of the flange 29 against the inner surface of the tank and allow some escape of pulsed water here and thereby discharge must in each intended use be balanced against the advantage of the rocking to determine the value of providing for this rocking movement.

In Figs. 10 and 11 pivoted doors are shown having times 78, 79, separated by any desirable spaces and preferably of spring material. The door 58" in Fig. 10 is intended to be integral from end to end and to be operated from the counter-balance lever 37 by means of a rocker arm and rod construction of the same general character as in Figs. 4 and 5.

In Fig. 11 the door 58" is made up of sections 79 separately hinged about the rod—separately spring pressed by any suitable springs 80.

In both of these pivoted tine doors I prefer not to have the times extend quite down to the edge of the movable section when at its highest position.

It will be evident that the movable screen in the bottom of the jigger box may be an entire movable bottom, a movable portion or section of the bottom only as preferred by the designer or user or as dictated by the adaptability of an old jigger which is being changed to embody my invention.

It will be evident that the stabilizer is valuable independently of the character of outlet mechanism and counter-weighting used and that the forms of each of these and other features illustrated are also independently valuable.

It will be evident that while my application Serial No. 46,667 above referred to includes claims covering movable screen bottoms or sections thereof, whether the box be bodily movable or not broadly covering some of the subject matter specifically claimed herein, this application contains new subject matter not shown in the former application and applying generally to jiggers whether the jigging box be bodily movable or not. The provisions for an outside stabilizer by-pass with regulation and for tapping liquid from the stabilizer and the separately movable door sections, whether with vertical or nearly vertical movement or hinged movement, are capable of such general use; and the greater slope for a movable front section shown in Fig. 1 is applicable to both the plunger-acted and box-acted water impulse forms.

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

1. In a device of the character stated, a tank adapted to contain water, a jig box therein having a bottom screen movable with respect to the tank, means for causing relative movement between the screen and the water, counter-weighted support for the screen and a dash pot stabilizer for the screen adapted to be filled with fluid to retard all movement of the screen or insufficiently filled with fluid to permit predetermined lost motion in each direction and at the end of the lost motion retard movement of the screen.

2. In a device of the character stated, a tank adapted to contain water, a jig box therein having a bottom screen thereof movable with respect to the tank, means for causing relative movement between the screen and water and a stabilizer for the movable screen having lost motion therein and adapted to retard movement in either direction beyond the extent of the lost motion.

3. In a device of the character stated, a water tank, a jig box therein having a slute outlet and a screen in the bottom mov-
able with respect to the tank, support for the screen, means for causing relative movement of the screen and water and a stabilizer for the screen comprising a cylinder, a piston therein connected with the screen and a bypass between the ends of the cylinder capable of regulation to determine the rate of flow of liquid from one end of the cylinder to another.

4. In a device of the character stated, a water tank, a jigger box therein having a bottom screen movable with respect to the tank, means for causing relative movement between the screen and water, support for the screen and a dash pot stabilizer for retarding movement of the screen provided with a tap for withdrawing part of the fluid from the dash pot to permit predetermined lost motion of the screen before the stabilizer becomes effective.

5. In a device of the character stated, a water tank, a jigger box therein having a screen in the bottom movable with respect to the tank, means for causing relative movement between the water and screen, support for the screen and a dash pot stabilizer for the screen having an outside regulable bypass for fluid between the ends of the dash pot and a tap for withdrawing liquid from the dash pot.

6. In a device of the character stated, a water tank, a jigger box therein having a portion of the bottom screen relatively fixed and sloping downwardly toward the front and another portion of the screen movable with respect to the fixed portion and sloping downwardly toward the front to a greater extent than the fixed portion, means for causing relative movement between the water and the entire bottom screen, counter-weight support for the movable portion of the screen and a dash pot stabilizer, damping movement of the movable section and counter-weight.

7. In a device of the character stated, a water tank, a jigger box therein having a portion of the bottom screen relatively fixed and sloping downwardly toward the front and another portion movable with respect to the fixed portion screen and sloping toward the front to a greater extent than the fixed portion, means for causing relative movement between the water and the entire bottom screen, counter-weight support for the movable portion of the screen and a stabilizer for retarding movement of the movable portion of the screen.

8. In a device of the character stated, a water tank, a reciprocable plunger therefor, a jigger box adapted to extend into the water and have a plate outlet, a screen section in the bottom of the jigger box movable with respect to the box by reason of the weight of increasing quantity of overlying water content to open the outlet and a damper connected with the section to retard upward movement of the section induced by plunger action.

9. In a device of the character stated, a water tank, a reciprocable plunger therein, a jigger box within the tank having a movable bottom section and an outlet opened and closed by movement of the section, a damper connected with the bottom section to retard vertical movement thereof in both directions and counter-weighting support for the bottom section.

10. In a device of the character stated, a water tank, a jigger box therein having a plate outlet, a reciprocable plunger for giving impulse to the water, a bottom section movable up and down by reason of weight of overlying water content to tend to close and open the outlet, a damper directly connected with the movable bottom to retard the movement and variant fulcrum lever counter-weighting for the movable bottom adapted to support differing weights at different heights.

11. In a device of the character stated, a tank adapted to contain water, a fixed jigger box therein, plunger means for causing pulsation of the water in the box, a screen in the bottom of the box adapted to support mixed coal and water, means for moving up and down, variant leverage counter-weighting for the screen adapted to come to rest at different weights inversely proportionate to the weight of the mixed content.

12. In a device of the character stated, a tank adapted to contain water, a fixed jigger box therein, plunger means for causing pulsation of the water in the box, a screen in the bottom of the box adapted to support mixed coal and water, means for moving up and down, variant leverage counter-weighting for the screen adapted to come to rest at different heights inversely proportionate to the weight of the mixed content and dash pot retardation mechanism connected with the screen and damping its movement in both directions.

HARRY J. MOYER.

Witnesses:

Wm. Streil Jackson,
J. Lutheria Kaufman.