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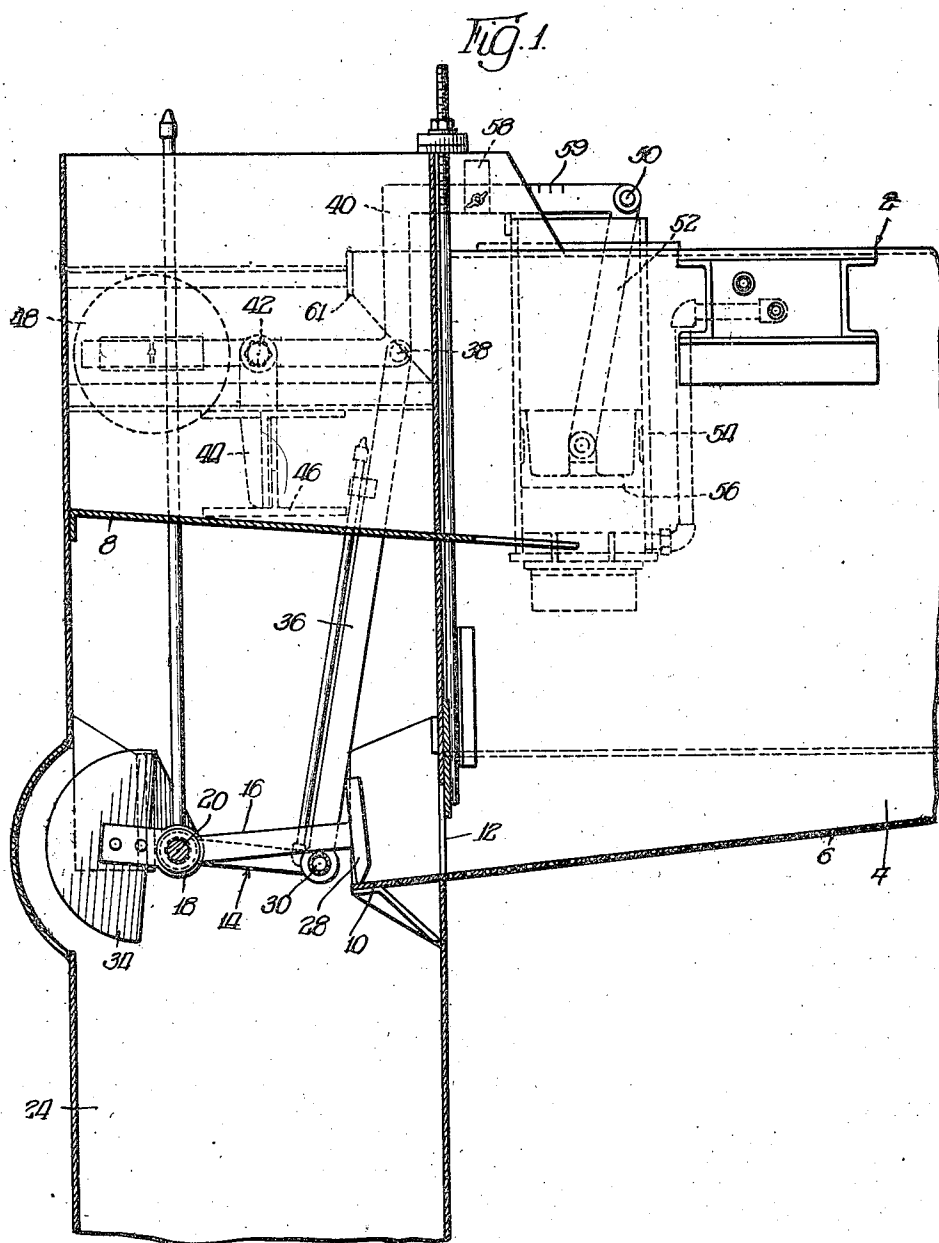
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GATE MECHANISM FOR MECHANICAL CONCENTRATING DEVICES

Filed Sept. 16, 1943

2 Sheets-Sheet 1



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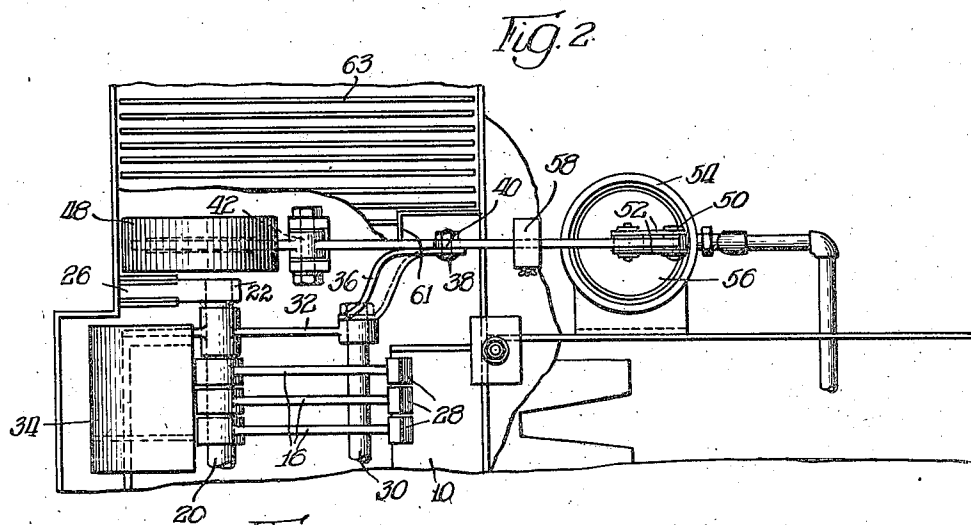
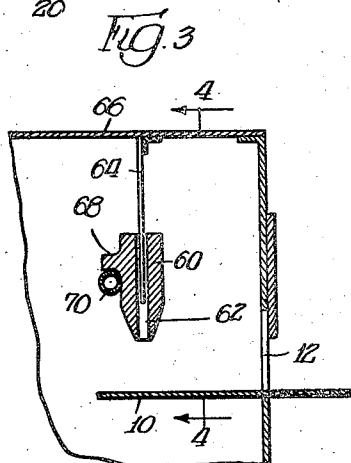
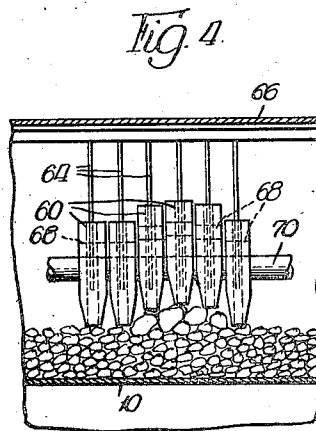
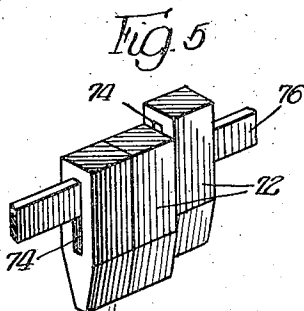
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GATE MECHANISM FOR MECHANICAL CONCENTRATING DEVICES

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2 Sheets-Sheet 2



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GATE MECHANISM FOR MECHANICAL
CONCENTRATING DEVICES

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The present invention relates to mechanical concentrating devices and more in particular to novel gate mechanisms therefor.

Among the objects of the present invention is to provide novel gate mechanism particularly adapted for use in mechanical concentrating devices, which is simple in construction and can be readily fabricated and installed at low cost, and which greatly increases the efficiency of said devices in handling and controlling discharge of material therefrom.

Mechanical concentrating devices, such, for example, as coal washers, are well known in the art and are dependent in their operation upon the principle of separation of the constituent components of the body of material introduced therein by the action of gravity within a fluid body such as water or the like, whereby the concentrates of the body of material are separated out, because of their greater specific gravity, on the bottom of the device and are discharged from the main body of material. In such conventional devices at the present time the discharge mechanism for the said concentrates may comprise "undercut" gate mechanisms which operate to progressively allow discharge of the concentrates from the top to the bottom of the discharge means in accordance with the desired operation of the device. Since the mechanical concentrating device operates on the principle of segregating these constituent components by the action of gravity, and since the higher gravity concentrates naturally seek the lower strata of the body of material being treated, the said "undercut" gate mechanisms are not entirely satisfactory in their operation except in full open position, since the concentrates are being discharged from the upper portions of the discharge mechanism in various adjusted positions of the gate mechanism less than full open position.

As a further example of prior uses, "overcut" gate mechanisms of the solid type, conforming substantially to the "undercut" gate mechanisms hereinabove referred to, have been used and while satisfactory from the standpoint of withdrawing the concentrates progressively upwardly from the bottom of the discharge means in various positions of adjustment of the gate mechanisms, are nevertheless subject to the criticism that the same may be blocked open by larger particles being discharged, thus permitting continued passage of smaller particles even though a different adjustment is desired by the operator or an automatic control mechanism calls for a different setting.

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It is accordingly an object of the present invention to provide a novel gate mechanism for mechanical concentrating devices which operates to most effectively and efficiently control discharge of concentrates from such devices from the lower to the upper part of the discharge means therefor when in various adjusted positions.

Another object within the purview of the present invention is to provide a novel gate mechanism for mechanical concentrating devices which can be readily and easily installed in position to effect the most efficient discharge of concentrates of the material being treated, and is adapted for either manual or mechanical control. The invention further contemplates the provision of means whereby the same may be automatically controlled in accordance with the operation of the device.

The present invention further contemplates the provision of a novel gate mechanism for mechanical concentrating devices involving one or more gate elements adjustably positioned to provide various effective operating depths for the discharge orifice of said devices, and wherein means is provided to permit independent displacement of said one or more elements to increase the said effective operating depth for the orifice where concentrates of larger size than those for which the gate mechanism has been adjusted are discharged through the same.

The present invention has, as a further object, the idea of providing a gate mechanism as immediately hereinabove described in which the entire dead weight of the one or more gate elements is effective in moving the said one or more elements downwardly into normal position for which the gate mechanism has been adjusted after the same have been momentarily displaced by the discharge of said larger particles.

Still a further object within the purview of the present invention is to provide a novel controlled gate mechanism for mechanical concentrating devices in which the control mechanism is associated in operative relation to the one or more gate elements to permit independent movement of the latter with respect thereto and which is properly counterbalanced to reduce the power required to effect regulation and adjustment of the gate mechanism.

The invention further contemplates a gate mechanism as hereinabove described which permits of either manual or automatic control and which automatic control may be initiated by op-

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erative conditions existing within the concentrating device itself.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a fragmentary view in section of a mechanical concentrating device disclosing the gate and control mechanisms embodied thereon and which mechanisms are made in accordance with the present invention;

Figure 2 is a fragmentary view partly in plan and partly in section of the gate and control mechanisms shown in Figure 1 of the drawings;

Figure 3 is a fragmentary view in section disclosing a modified form of construction for gate mechanism adapted for use in a mechanical concentrating device such as shown in Figure 1 of the drawings;

Figure 4 is a fragmentary view in section taken in the plane represented by the line 4—4 of Figure 3 of the drawings; and

Figure 5 is a view in perspective of still another form of gate mechanism adapted for use in a mechanical concentrating device such as shown in Figure 1.

Referring now more in detail to the drawings, a gate mechanism made in accordance with the present invention is disclosed in Figures 1 and 2 as being incorporated in a mechanical concentrating device, generally referred to as 2, and comprising specifically a concentrating assembly for coal or other like bodies of material. Figure 1 of the drawings discloses the primary or intake end of the device which comprises one or more compartments, such as 4, extending longitudinally of the machine and having a perforated bottom, or screen, 6 for the support of a body of coal or other similar material which is introduced into the compartment, or compartments, 4 over the intake chute or apron 8 and which is then subjected to the pulsating action of a fluid such as water contained within the said one or more compartments. The water or other fluid within the device is subjected intermittently to air or other pressure which causes the same to rise through the screen 6 up into the body of material contained within the device to momentarily and intermittently rearrange the particles composing the same in accordance with their specific gravities. This movement of water or other fluid results in rearranging the particles of material forming the body within the device according to their specific gravities, whereby the particles of greater specific gravity are disposed in the lower part of the bed and the particles of less specific gravity are arranged progressively upwardly. Continued action of the water or other fluid causes the material of greater specific gravity to be discharged over a discharge apron 10 and through an orifice 12 which may be provided at both intake and discharge ends of the device, while the material of less specific gravity is discharged over an apron located above the orifice 12 at the discharge end of the device.

For the purpose of the present description of the invention, the gate mechanism and control means therefor at the intake end of the concentrating device is disclosed in the drawings, although it is to be understood that such gate mechanism and control means can be incorporated at the discharge end of the device by a mere reversal of the parts thereof.

The present invention is particularly directed

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to the provision of novel gate mechanisms, generally represented in the drawings as 14, which comprises one or more gate elements, such as 16, each having a hub 18 at one end for rotatably mounting the same upon a supporting shaft 20 which extends transversely of the device and is mounted adjacent its ends in brackets, such as 22, secured to the wall of a well or compartment 24, as at 26. This shaft 20 is disclosed in substantial opposed relation to the discharge orifice 12 and the said gate elements 16 are provided with barrier parts 28 disposed substantially in normal relation to the main body of said elements and which barrier portions are disposed to overlap the discharge shelf or apron 10 for the orifice 12.

The orifice 12 is preferably of rectangular shape, being defined by substantially vertical marginal edges and the height above the shelf 10 being such as to provide for maximum discharge of concentrates for which the device was designed. The said gate elements are adapted to be adjustably positioned with respect to the shelf 10 for controlling the effective operating depth of the discharge orifice 12 for any operating conditions for the concentrating device.

While the gate mechanism as disclosed can be manually adjusted to secure any desired variation in the effective operating depth of the discharge orifice, nevertheless the present embodiment as herein disclosed contemplates the use of an automatically controlled mechanism responsive to fluid operating conditions in the concentrating device which is adapted to regulate and adjustably position the gate elements 16.

According to the embodiment as herein disclosed in the drawings, such regulating mechanism comprises a supporting shaft 30 extending transversely of the device and beneath the gate elements 16 and which shaft has its ends secured to frame elements, such as 32, which are rotatably and pivotally mounted upon the shaft 20. The frame elements or levers 32 extend beyond shaft 20 and may have the counterweight 34 secured thereto for a purpose to be hereinafter more fully described. Secured to one end of the shaft 30 and adjacent the end of a frame element 32 is a link 36 which has its other end pivotally connected as at 38 to a Z-shaped lever 40. The operating lever 40 has one of its arms pivotally mounted as at 42 to a supporting bracket 44 which is connected to the frame element 46 of the device. The arm of the lever 49 which is pivoted as at 42 extends therebeyond and has mounted thereon the counterweight 48 which operates in conjunction with the counterweight 34 to balance the control mechanism for the gate elements. Another arm of the lever 49 is pivotally connected as at 50 to the link 52 of the pneumatic cylinder generally represented as 54, the said link 52 having its other end connected to the piston 56 of said pneumatic control means. The pneumatic cylinder is disposed to one side of the concentrating chamber 4 as clearly shown in Figure 2 and operation thereof may be initiated in any desired manner, as for example in accordance with the operating conditions existing within the bed or body of material disposed within the chamber 4. It will be clearly seen that by virtue of the link and lever mechanism as immediately hereinabove described, operation of the pneumatic means causes movement of the support element 30 to adjustably position the gate elements 16 in any selected relation to the orifice 12. Such link and lever mechanism

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further embodies the counterweight 58 which is adjustable with respect to the lever 40 to secure final and minute adjustments of the operating characteristics of such mechanism in order to counterbalance the same so as to reduce the power required to effect regulation of the gate elements.

The total length of counterweight 34 is approximately the same as the length of the gate 14. This construction therefore provides proper counterbalancing for the gate elements for all lengths of gate. The operating linkage for the control means 14 is the same for all washer sizes, i. e. for all lengths of gate and is counterbalanced by the counterweight 48 which is the same for all assemblies. The final adjustment of the reaction is then obtained by shifting the counterweight 58 along the graduated scale 59. This adjustment, especially in connection with the pneumatic means 54, provides the final control of the relative speeds of opening and closing the gate.

The movement of lever 40 is limited by bracket 61 which likewise serves as a support for the steel grating flooring 63 which extends laterally beyond the opening provided for lever 40.

As will be appreciated, the gate elements 16 are mounted for movement independent of the control mechanism so that when said gate elements are in any one of their adjusted positions, the same may be displaced upwardly in the event that concentrates of a size larger than that for which the machine was adjusted are discharged through the orifice 12. It will be further clearly appreciated that by virtue of the particular operating relation of the gate elements to the control mechanism the entire dead weight of the individual gate elements is effective to cause the same to move downwardly in shearing relation to the concentrate bed into their normal adjusted relation to the orifice 12. Furthermore, where it is desired to decrease the effective operating depth of the discharge opening, an adjustment downwardly of the supporting shaft 30 results in the dead weight of the gate elements being effective in moving the same through the concentrate bed into their lower adjusted position. By virtue of the particular arrangement of the gate mechanism and the control means therefor, immediate and effective adjustments of the gate mechanism can be readily made, yet one or more of the gate elements can be readily displaced by oversized particles to permit them to be evacuated from the machine.

While the invention contemplates the mechanism according to Figures 1 and 2 as a preferred structure, nevertheless the invention may take the form as shown in Figures 3 and 4 which comprises one or more gate elements 60 of similar construction, each having a longitudinal slot 62 adapted to receive the guide element 64 secured to the frame 66 of the concentrating device, the said elements being mounted for vertical movement with respect to the discharge orifice 12 and the shelf 10 which latter elements conform in substance to corresponding elements in the device shown in Figures 1 and 2. The said gate elements 60 are each provided with a laterally disposed shoulder 68 adapted to be supported by a transversely arranged shaft 70 conforming to the shaft 30 of the embodiment hereinbefore described. This shaft 70 constitutes the supporting element of a control mechanism such as shown in Figures 1 and 2 whereby the one or

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more gate elements may be adjustably positioned with respect to the orifice 12.

It will be further apparent that the gate elements 60 have independent movement with respect to the supporting shaft 70 and are adapted to be displaced upwardly to permit discharge of concentrates larger than the concentrates for which the gate mechanism has been adjusted. It is to be observed that, as in the embodiment of Figures 1 and 2, the entire dead weight of the gate elements 60 is effective in returning the same to their normal adjusted position after the same have been displaced, the said elements being effective in shearing the concentrate bed in returning to said normal adjusted position.

As a further illustration of a modified construction for a gate element, reference may be made to Figure 5 which discloses one or more gate elements 72 conforming substantially to gate elements 60 of the embodiment shown in Figures 3 and 4 which are provided with the elongated slots 74 adapted to receive a supporting and guide element 76 conforming substantially to the shaft 70 of Figures 3 and 4. Furthermore, the supporting element 76 conforms substantially to the supporting element 30 of the control mechanism shown in Figures 1 and 2 and the present invention contemplates the use of such mechanism in conjunction with the gate elements 72, if so desired. It will be readily apparent that the supporting elements 76 may be disposed transversely of the machine in the same manner as supporting elements 70 and that the same may be adjusted as desired in relation to the orifice 12. When the shaft 76 is in any of its adjusted positions gate elements 72, by virtue of the slot formation 74, may be displaced upwardly for discharge of concentrates of a larger size than the size for which the gate mechanism has been adjusted, all in accordance with the previous disclosures.

While the embodiments selected to illustrate the invention are representative of washing machines for cleaning coal, nevertheless the invention is of such a scope that the gate mechanism and its controlling device may be incorporated in any other type of mechanical concentrating device as desired.

While I have herein described and upon the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit of the invention.

What is claimed is:

1. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate mechanism for said discharge means comprising a plurality of elements each provided with a facing movable substantially normal to the flow of concentrates from said discharge means, means for mounting said elements for movement with respect to the orifice for said discharge means and with respect to each other, and control means providing a common support adjustably positioning and determining lower limits of movement for said elements, said elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice at one or more of said elements when said elements are in any of their adjusted positions.

2. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate mechanism for said discharge means comprising a plurality of elements each having a barrier part movable substantially normal to the flow of concentrates from said discharge means, means providing a fixed pivotal mounting for said elements for movement thereof with respect to the orifice for said discharge means and with respect to each other, and control means providing a common support adjustably positioning and determining lower limits of movement for said elements, said elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice at one or more of said elements when said elements are in any of their adjusted positions, said mounting for said elements being such that substantially the entire dead weight thereof is effective in returning the same to any of their adjusted positions after displacement thereof.

3. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate movably mounted with respect to the orifice for said discharge means comprising a plurality of elements each having a barrier part movable substantially normal to the flow of concentrates from said discharge means, means providing a fixed pivotal mounting for said elements for movement thereof with respect to said discharge means and with respect to each other and a substantially counterbalanced control means providing a common support upon which said elements are adapted to rest for adjustably positioning said gate to provide for various effective operating depths of said orifice and for holding said gate in any of said adjusted positions, said gate having movement independent of said control means to provide for the increased effective depth of said orifice when said gate is in any of its adjusted positions.

4. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate movably mounted with respect to the orifice for said discharge means and comprising a plurality of elements each provided with a facing movable substantially normal to the flow of concentrates from said discharge means, and a substantially counterbalanced control means providing a common support adjustably positioning and determining lower limits of movement for said elements, said elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice at one or more of said elements when said elements are in any of their adjusted positions.

5. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate movably mounted with respect to the orifice for said discharge means and comprising a plurality of elements each provided with a facing movable substantially normal to the flow of concentrates from said discharge means, and a substantially counterbalanced control means providing a common support upon which

said elements are adapted to rest for adjustably positioning and determining lower limits of movement for said elements, said elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice when said gate is in any of its adjusted positions, said mounting for said elements being such that substantially the entire dead weight thereof is effective in returning the same to any of their adjusted positions after displacement thereof.

6. In a mechanical concentrating device, the combination of a concentrating compartment for material being treated by said device, discharge means for evacuating concentrates from said compartment, a gate mechanism for said discharge means comprising a plurality of elements each provided with a facing movable substantially normal to the flow of concentrates from said discharge means, means for mounting said elements for movement with respect to the orifice for said discharge means and with respect to each other, control means providing a common support adjustably positioning and determining lower limits of movement for said said elements, said elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice at one or more of said elements when said elements are in any of their adjusted positions, and fluid responsive means for operating said control means.

7. Gate mechanism for mechanical concentrating devices, comprising a plurality of gate elements, means providing a fixed pivotal mounting for said elements for movement thereof with respect to a discharge orifice for said device, and control means for said gate elements characterized as including a pivotally mounted adjustable supporting element providing a common support adjustably positioning and determining lower limits for said elements with respect to said orifice, said gate elements having a part disposed in association with said orifice for movement substantially normal to the flow of concentrates through said orifice and being freely movable independently of said supporting element under certain operating conditions under the action of concentrates passing through said orifice.

8. Gate mechanism for mechanical concentrating devices, comprising a plurality of gate elements, means providing a fixed pivotal mounting for said elements for movement thereof with respect to a discharge orifice for said device and each having a part serving as a barrier in association with said orifice, control means for said gate elements comprising a frame providing a common support adjustably positioning and determining lower limits for said elements, said frame member being pivotally mounted independently with respect thereto, whereby said gate elements are independently movable in a substantially upward direction relative to said control means and substantially normal to the flow of concentrates from said orifice, and counterbalancing means connected to said frame and disposed in opposed relation to said barrier parts.

9. Gate mechanism for mechanical concentrating devices, comprising a plurality of gate elements adjustably mounted for substantially vertical movement with respect to a discharge orifice for said device, guide means for said one or more gate elements, and control means for said gate elements characterized as including an adjustable supporting element providing a common support

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adjustably positioning and determining lower limits for said elements with respect to said orifice, said gate elements each having a shoulder engageable with said control means, said gate elements being freely adjustable independently of said control in substantially an upward direction to provide an adjustable upper limit for said orifice at one or more of said gate elements.

10. Gate mechanism for mechanical concentrating devices, comprising a plurality of gate elements adjustably mounted for substantially vertical movement with respect to a discharge orifice for said device, and means for guiding and con-

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trolling said gate elements including an adjustable supporting element providing a common support adjustably positioning and determining lower limits for said elements with respect to said orifice, said gate elements each having an elongated slot for receiving said supporting element and having a lost motion connection therewith to provide for free and independent movement thereof in substantially an upward direction with respect to said supporting element to provide an adjustable upper limit for said orifice at one or more of said gate elements.

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