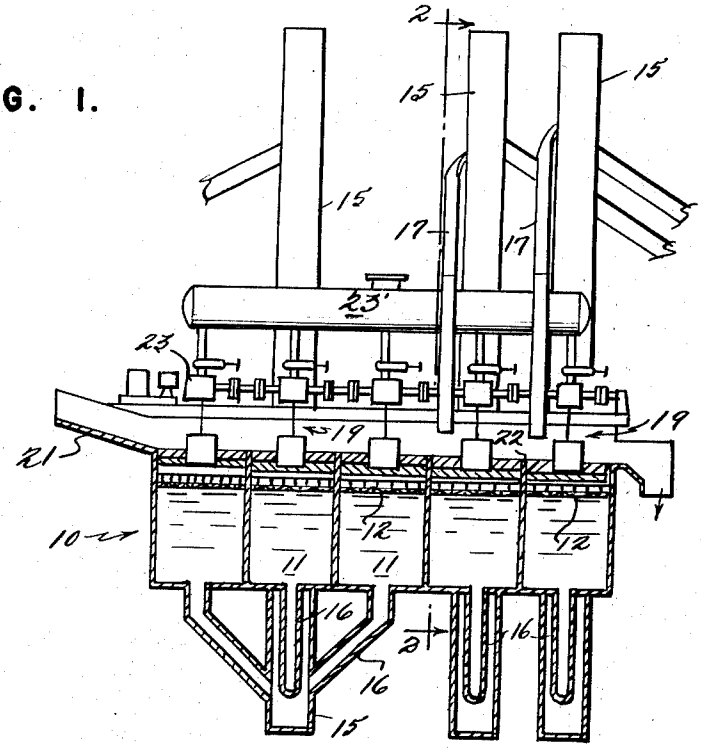
June 2, 1959 J. TURPIN 2,889,045

APPARATUS FOR WASHING COAL AND ORE

Filed March 4, 1955

4 Sheets-Sheet 1

FIG. 1.



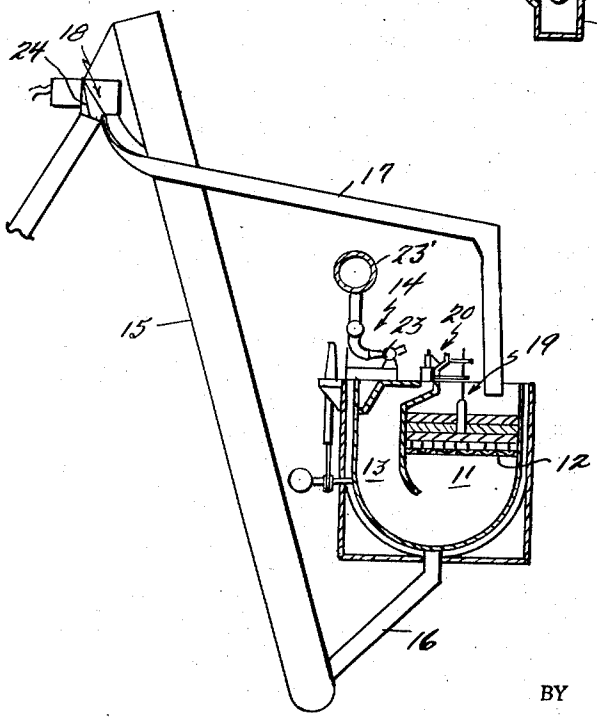


FIG. 2

INVENTOR

JACQUES TURPIN

BY Adams & Bush

ATTORNEYS

June 2, 1959 J. TURPIN 2,889,045

APPARATUS FOR WASHING COAL AND ORE

Filed March 4, 1955 4 Sheets-Sheet 2

FIG. 3.

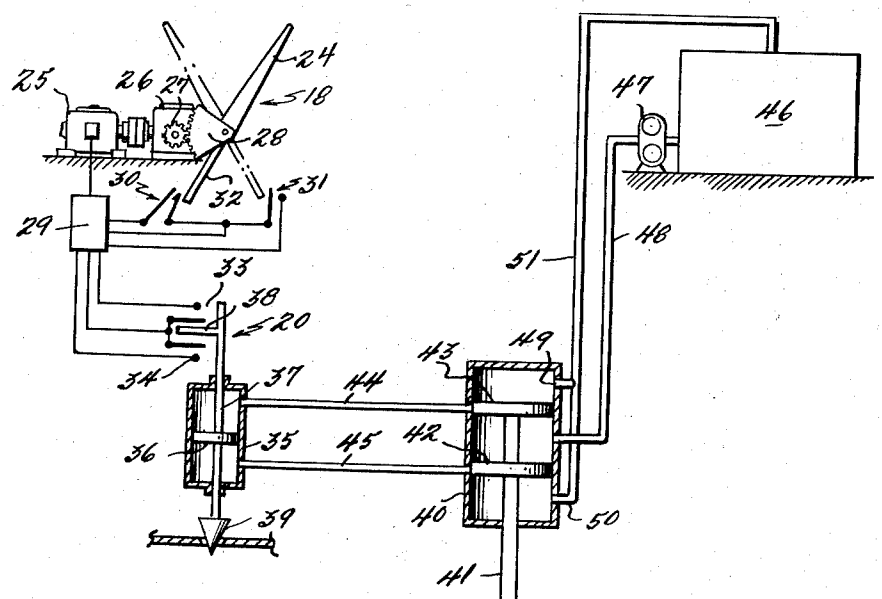
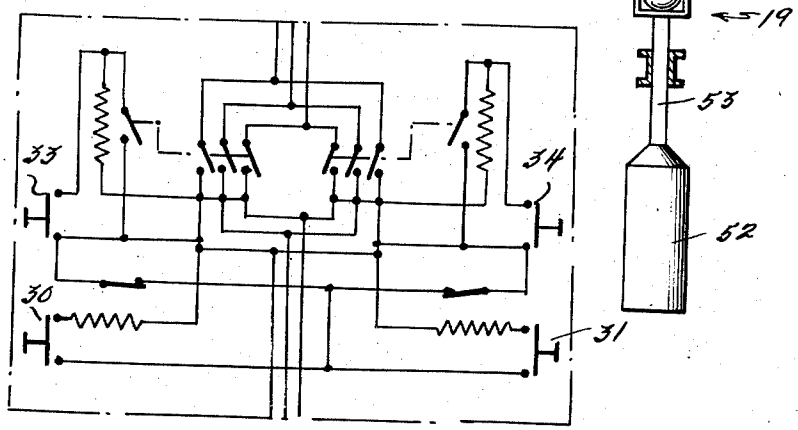


FIG. 4.



INVENTOR

JACQUES TURPIN

BY

Adams + Bush

ATTORNEYS

June 2, 1959 J. TURPIN 2,889,045

APPARATUS FOR WASHING COAL AND ORE

Filed March 4, 1955

4 Sheets-Sheet 3

FIG. 7

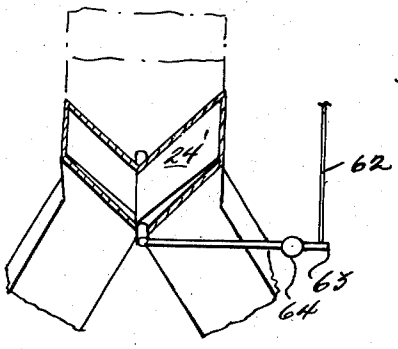
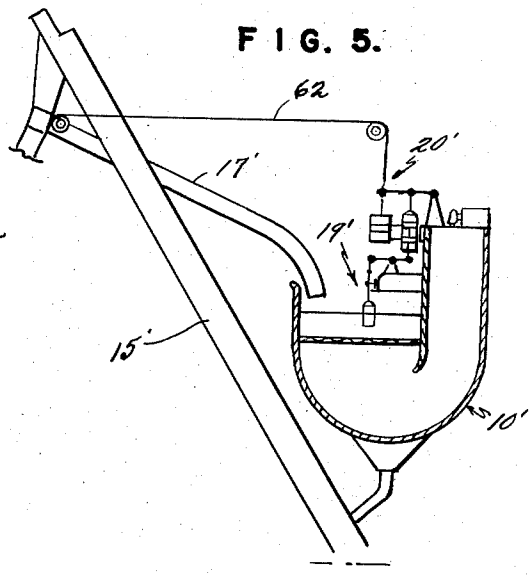


FIG. 5.



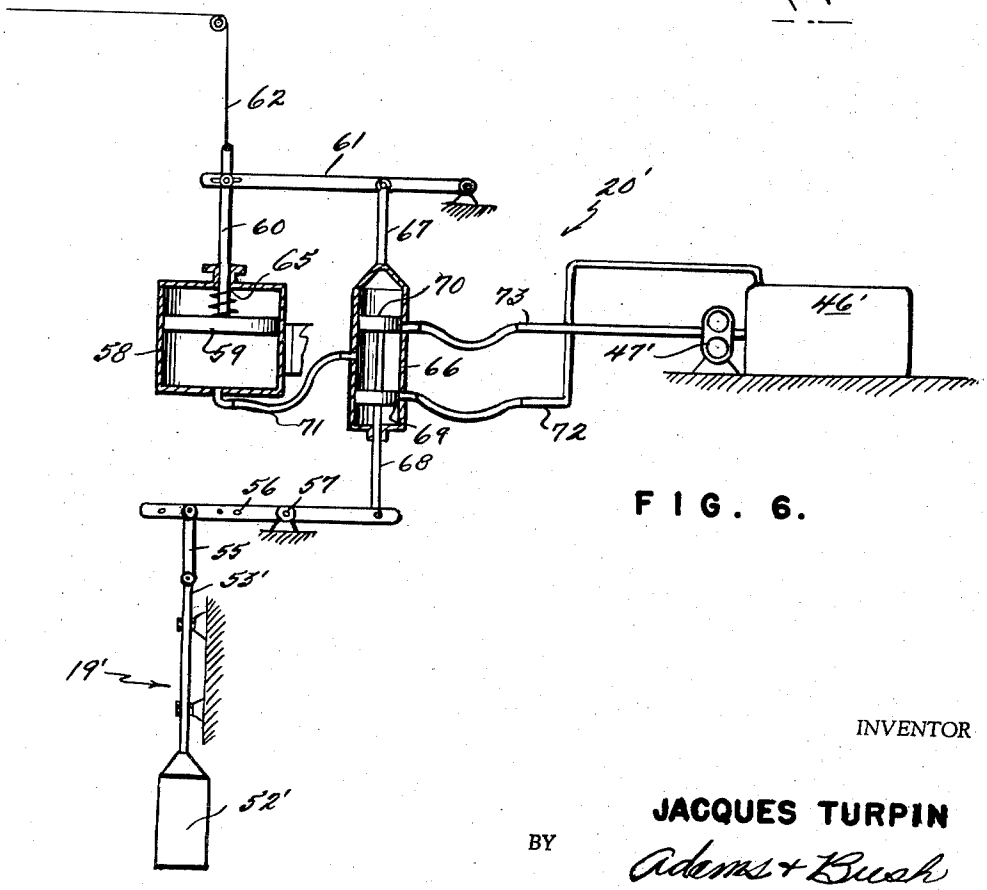


FIG. 6.

INVENTOR

JACQUES TURPIN

BY Adams + Bush

ATTORNEYS

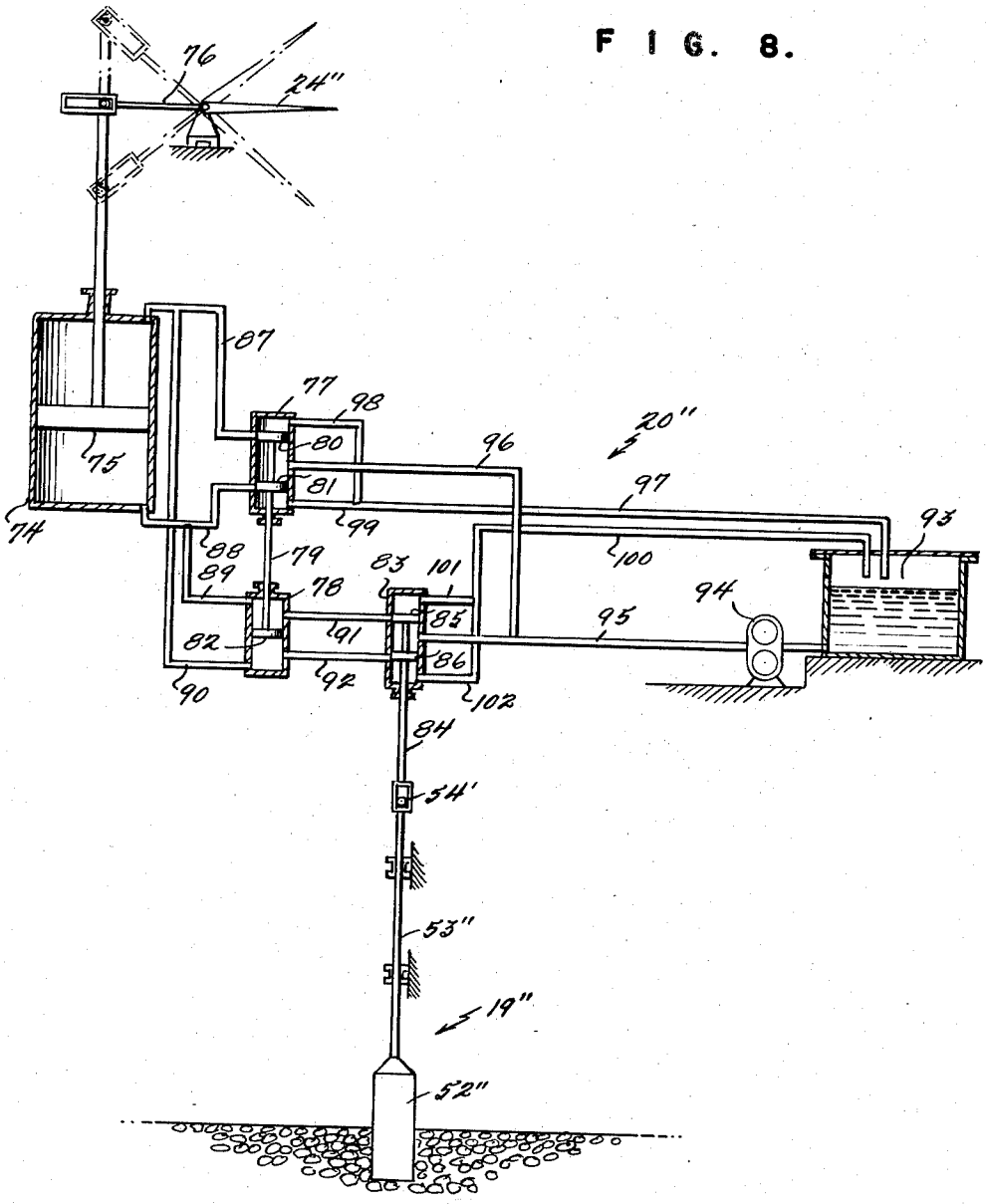
June 2, 1959 J. TURPIN 2,889,045

APPARATUS FOR WASHING COAL AND ORE

Filed March 4, 1955

4 Sheets-Sheet 4

FIG. 8.



INVENTOR

JACQUES TURPIN

BY Adams + Bush

ATTORNEYS

United States Patent Office 2,889,045 Patented June 2, 1959

2,889,045

APPARATUS FOR WASHING COAL AND ORE

Jacques Turpin, Fontainebleau, France, assignor to Société Preparation Industrielle des Combustibles, Fontainebleau, France

Application March 4, 1955, Serial No. 492,209

Claims priority, application France March 5, 1954

5 Claims. (Cl. 209—491)

This invention relates to apparatus and processes for washing granular mineral material such as coal and ore and the like and has more particular reference to such apparatus and processes involving the densimetric classing of the granular material in a fluid medium submitted to pulsations and the separate removal of the light and heavy products.

Apparatus and processes for washing coal, ore, and the like, by means of densimetric classing in a fluid medium submitted to pulsations, wherein the discharge of heavy products is automatically adjusted in relation to the weight of the washing bed, are well known. In such apparatus and processes the products to be cleaned pass into one or several washing compartments upon perforated plates, sometimes covered with a layer of feldspar or the like. The densimetric classing, the progression and discharge of the products being washed being obtained by means of water pulsations through the perforated plates, pulsations which lift the washing bed, causing, when it falls back, its separation into heavy and light products with, often, one or several intermediate categories. The pulsations are made either by means of pistons or through the action of compressed air upon the free surface of the water, into compartments adjacent to the washing ones.

The automatic discharge of the heavy constituents of the raw product is, in the majority of cases, regulated in each compartment by means of an immersed float, either in a tube running across the washing bed or in the washing bed itself. The float's movements regulate, in either case, through the intermediary of suitable devices, the discharge of heavy products in relation to the weight of the washing bed.

In such apparatus, quantitative or qualitative variations of the automatic regulating system result in its defective operation. In fact, these apparatus are constructed and adjusted to treat an output varying between certain given limits which, as far as units operating correctly are concerned, must not be too widely exceeded. In the same way, the quality of the raw product, although subject to variations, must not differ too widely from an average composition, corresponding to the optimum operation of the units. Accordingly, whenever there is too weak an output of the raw products or a too weak quantity of heavy products in the material being treated, the washing bed becomes too light, resulting in the densimetric classing being incorrectly affected so that light products are discharged together with heavy ones and vice versa.

The primary object of the present invention is to provide a novel method of and improved apparatus for overcoming these drawbacks or defects.

Another object of the present invention is to provide a novel method of and improved apparatus for jig washing granular mineral products such as coal and ore, or the like, wherein means are provided for recycling the whole or part of the heavy products discharged from one or all of the washing beds so as to replace the recycled heavy products in front of or in a suitable point of one or more of the washing beds, the recycling of the heavy products

being automatically effected in relation to the amount of heavy products present in the washing bed.

Another object of the present invention is to provide improved jig washing apparatus, as characterized above, wherein the means for recycling the discharged heavy products includes a valve member controlled by the operation of the device employed in detecting the amount of heavy products in the washing bed or beds into which the diverted portion of the discharged heavy products is being recycled.

Other objects and advantages of the invention will appear in the following specification when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a diagrammatic elevational view, partly in cross section, of one embodiment of apparatus constructed in accordance with the present invention for carrying out the method of the invention;

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic view showing an electric system of automatic drive for controlling the replacement of the heavy products in the apparatus;

Fig. 4 is a diagrammatic view showing the circuits connecting the relay to the link switch;

Fig. 5 is a diagrammatic view, partly in transverse cross section, of a modified form of apparatus employing hydraulic means for controlling the recycling of the heavy product;

Fig. 6 is a diagrammatic elevational view, partly in cross section, of the hydraulic apparatus shown in Fig. 5;

Fig. 7 is a detail view of the valve shown in Fig. 5; and

Fig. 8 is a diagrammatic elevational view, partly in cross section, of another form of hydraulic apparatus for controlling the recycling of the heavy product.

In general, the present invention provides a novel process of and improved apparatus for jig washing coal, ore, and the like, by means of densimetric classing in a fluid medium submitted to pulsation, wherein automatic means are provided for maintaining a predetermined quantity of heavy products in the washing bed or beds by diverting and recycling a portion of the discharged heavy products from the bed or beds back into the bed or beds in response to the amount of heavy products present in the bed or beds.

Referring now to the drawings, there is diagrammatically shown, in Figs. 1, 2 and 3, one embodiment of apparatus for carrying out the process of the present invention.

As there shown, the jig comprises a tank or vat **10** provided with a plurality of washing boxes or compartments **11**, each having a washing table **12** mounted therein and each being in communication with an adjoining pulsation compartment **13** provided with a pulsating device indicated generally at **14**, for pulsating the water in the washing box up and down through the washing table, a plurality of drain elevators **15**, a plurality of evacuation pipes **16**, one connecting the bottom of each washing box with one of the drain elevators for removing the heavy product; one or more recycling conduits **17**, each having its inlet end in communication with one of the drain elevators and its outlet end positioned to discharge onto the washing table in one of the washing boxes; valve means, indicated generally at **18**, associated with the inlet end of each of the recycling conduits **17** for controlling the amount of heavy products diverted into the recycling conduit; a plurality of detecting means, indicated generally at **19**, one associated with each washing box for detecting the amount of heavy products present in the box and controlling the pulsating means for the box; and control means, indicated generally at **20**, each connected to control the operation of one of the valve means **18** in

one of the drain elevators in response to actuation by one of the detecting means **19** in one of the washing boxes.

The products to be treated enter the jig by means of inlet chute **21** and are classified in the washing boxes, by the up and down motion of the pulsating water passing through the washing tables in the washing boxes, into densimetric layers with the heavier products forming the bottom layers and the lighter products forming the top layers.

The products travel longitudinally through the vat, passing over sills **22** separating the washing boxes and in each washing box the heavy products are discharged through the beds and the perforated plates which form the washing tables, and leave the vat through the evacuation pipes **16** and drain elevators **15**.

The pulsations of the water in each of the washing boxes is controlled by means of compressed air entering the pulsating compartment through a suitable valve **23**, alternately connecting the compartment to a compressed air manifold **23'** connected to a source of compressed air (not shown) or to the atmosphere.

The detecting device **19** in each wash box controls air which flows through the valve **23** associated with the pulsating compartment communicating with the wash box through suitable mechanism (not shown).

The valve means **18** associated with the drain elevators **15** are identical in construction and, as shown in Figs. 2 and 3, each comprises a shutter **24** pivotally mounted in the drain elevator at the junction of the recycling conduit therewith and mounted to be moved from a closed position closing the inlet to the recycling conduit, to an open position closing the discharge opening from the drain elevator (see Figs. 2 and 3).

In this particular embodiment of the invention, the control means **20** for actuating the shutter **24** in the drain elevators are identical in construction and, as shown in Fig. 3, each comprises a motor **25**, reduction gearing **26** connected to the motor and carrying a pinion gear **27** engaging a segmented gear **28** secured to the axle of the shutter **24** for movement thereof, a relay **29** for controlling the direction of rotation of the motor **25** and having a circuit connected thereto including limit switches **30, 31** positioned to be closed by a depending arm **32** of the shutter **24** when it reaches the limit of its two positions to stop the motor, and a circuit connected thereto including limit switches **33, 34** for starting the motor; a hydraulic cylinder **35** having a piston **36** mounted therein on a stem **37**, the upper end of which projects from the cylinder and carries an arm **38** positioned to close the limit switches **33** and **34** as the piston moves up and down in the cylinder, the lower end of the stem **37** projects through the bottom of the cylinder **35** and carries a taper valve **39** which assists in regulating the pressure of the air in the pulsating compartment; a hydraulic feed cylinder **40** having a stem **41** carrying vertically spaced pistons **42, 43** slidably mounted therein, with the lower end of the stem projecting through the bottom of the cylinder; oil pipes **44, 45** connecting the upper and lower portions respectively of the cylinders **35** and **40**; an oil tank **46**; a compression pump **47** having its discharge side connected through a pipe **48** to the intermediate portion of the cylinder **40**; and evacuation pipes **49** and **50** connected to the top and bottom of the cylinder **40** and to pipe line **51** for evacuating the oil therefrom into tank **46**.

The up and down movement of the stem **41** and pistons **42, 43** in the cylinder **40** is controlled by the detecting device **19** associated therewith. And, as shown in Fig. 3, the detecting device comprises a float **52** connected to a vertical rod **53** slidably mounted on suitable supports fixedly attached to the jig frame and with its upper end connected to a driving eyelet **54** carried by the bottom of the stem **41**.

The operation of the device is as follows:

The hydraulic fluid put under pressure by the pump **47** enters the feed cylinder **40** through pipe **48**. A downward movement of the float **52** moves the piston valves **42, 43** downward in the cylinder **40**, permitting oil under pressure to flow through pipe **45** into the lower portion of cylinder **35**, pushing the piston **36** therein upward, causing arm **38** to close limit switch **33**, which, operating through relay **29**, starts the motor **25** to move the shutter **24** in a direction to open the inlet opening into the recycling chute **17** connected to the drain elevator **15** associated therewith, thereby starting the flow of heavy products through recycling chute **15**. As soon as the shutter **24** reaches its full open position, shown in dotted lines in Fig. 3, it closes limit switch **31** to stop the motor. As the piston **36** moves upwardly in cylinder **35**, the oil above the piston is forced through pipe **44** into feed cylinder **40** and through pipes **49** and **51** back into the tank **46**.

An upward movement of the float **52** moves the piston valves **42, 43** upwardly in cylinder **40**, permitting the oil under pressure to flow through pipe **44** into the upper portion of cylinder **35**, pushing the piston **36** therein downward, causing arm **38** to close limit switch **34**, which, operating through relay **29**, starts the motor **25** to move the shutter **24** in a direction to close the inlet opening into the recycling chute **17**, to thereby cut off the recycling of the heavy products. As soon as the shutter reaches its closed position, as indicated in full lines in Fig. 3, it closes the limit switch **30** to stop the motor. As the piston **36** moves downward in the cylinder **35**, the oil below the piston is forced through pipe **45** into feed cylinder **40** and through pipes **50** and **51** back into the tank **46**.

This electro-servo driving system for operating the shutter **24** is an "all or nothing" process. As the shutter **24** is always in its closed position or in its open position, the amount of products diverted from the drain elevator into the recycling chute is all or nothing.

The electric diagram illustrated in Fig. 4, shows the general arrangement of the relays in the relay box **29**.

In Figs. 5, 6 and 7, there is shown a jig **10'** generally similar to the jig shown in Fig. 1, but provided with a modified form of detecting device, indicated generally at **19'**, and a modified form of control device, indicated generally at **20'**, for controlling the operation of the shutter valve **24'** in the drain elevator **15'** to divert the heavy products into the recycling chute **17'**.

In this particular embodiment, each of the detecting devices **19'** is identical in construction and, as shown, each comprises a float **52'** connected to a vertical rod **53'** slidably mounted in suitable supports fixedly attached to the jig frame and with its upper end pivotally connected to the lower end of a rod **55** which, in turn, has its upper end pivotally connected to one end of a lever **56** having its fulcrum **57** mounted on a support fixedly attached to the jig frame. The other end of the lever **56** is connected to control device **20'** in a manner hereinafter to be explained.

The control devices **20'** are identical in construction and, as shown in Fig. 6, each comprises a cylinder **58** mounted on a support fixedly attached to the jig frame and having a piston **59** slidably mounted therein and having an upstanding stem **60** pivotally connected adjacent its upper end in a slot formed in one end of a lever **61**, which has its other end pivotally mounted on a support fixedly secured to the jig frame; a cable **62** having one end secured to the upper end of the stem **60** and its other end secured to an arm **63** fixedly connected to the axle of the shutter **24'**, the arm **63** being provided with a balancing counterweight **64**; a coiled compression spring **65** mounted on the piston stem **60** for normally forcing the piston downwardly in the cylinder; a feeder hydraulic cylinder **66** having an integral vertical rod **67** on its upper end pivotally connected to the lever **61** intermediate the ends thereof for interlocking the cylinder **66** with the piston **59**; a piston rod **68** carrying vertically spaced piston valve members **69, 70** slidably mounted in

cylinder 66, with the lower end portion of the rod projecting through the bottom of the cylinder and pivotally connected to one end of the lever 56 of the detecting device; a flexible pipe 71 connecting the bottom of the cylinder 58 to the intermediate portion of feeder cylinder 66; an oil tank 46' having a flexible evacuation pipe 72 connecting the bottom portion of cylinder 66 thereto; and a pressure pump 47' having its suction connected to the tank 46' and its discharge connected to a flexible pipe 73 which is connected to the upper end portion of cylinder 66.

The thicknesses of the piston valves 69 and 70 are such, relative to the diameters of the inlet openings to the pipes 72 and 73, and the valves are so positioned relative thereto, that normally they close the inlet openings to the pipes 72 and 73 until moved out of closing position by movement of the float 52' and at no time will oil be admitted to the cylinder 66 above the upper piston valve 70 or below the lower piston valve 69.

The operation of the device is as follows:

The hydraulic fluid put under pressure by the pump 47' enters the feed cylinder 66 through flexible pipe 73. A downward movement of the float 52' moves the piston valves 69, 70 upwardly in feed cylinder 66, opening the inlet of pipe line 73 while the inlet of pipe line 72 remains closed thereby permitting oil under pressure to pass through flexible pipe 71 into the bottom of cylinder 58, pushing piston 59 upwardly against the downward pressure of coiled spring 65. The upward movement of piston 59 permits the counterweight 64 on the arm 63 to move the shutter 24' toward its full open position to thereby divert the heavy products into the recycling chute 17'. Also, as the piston 59 moves upwardly, its stem 60 will swing the lever 61 about its fixed pivot, thereby raising the feed cylinder 66 until the upper piston valve 70 closes the outlet of the oil pipe 73, the piston valve 69 maintaining the inlet opening in pipe line 72 closed during the foregoing movement. This results in a balancing of the oil pressure in the cylinder 58 on the piston 59 with the pressure exerted on the piston by the spring 65 and the shutter will be held in equilibrium in partially open position corresponding to the particular position of the float 52'. Any further downward movement of the float resulting in a corresponding further opening of the shutter.

An upward movement of the float 52' moves the piston valves 69, 70 downwardly in feed cylinder 66, opening the inlet of pipe line 72 while the inlet of pipe line 73 remains closed thereby permitting the oil in cylinder 58 to be pushed by the pressure of the spring 65 on piston 59 through pipe 71 into the feed cylinder 66 and through evacuation pipe 72 into tank 46'. As the piston 59 moves downwardly, stem 60 acting through lever 61, will lower the feed cylinder 66 until the lower piston valve 69 closes the inlet of pipe 72, the piston valve 70 maintaining the inlet opening in pipe line 73 closed during the foregoing movement and the pressures on the piston 59 are again brought into balance. When the float is in its high position the shutter 24' is entirely closed.

This device is called proportional because each position of the float determines one position of the shutter.

In Fig. 8 there is shown another modified form of hydraulic mechanism for operation of the shutter 24'' to move it from a closed position, which prevents any of the heavy products from entering the recycling conduit, to an open position which effects the diversion of all of the heavy products into the recycling conduit.

In this particular modification, each of the detecting devices 19'' are identical in construction and, as shown in Fig. 8, each comprises a float 52'' connected to a vertical rod 53'' slidably mounted on suitable supports fixedly attached to the jig frame and with its upper end connected through driving eyelet 54' to the control device 20''.

The control devices 20'' are identical in construction and, as shown in Fig. 8, each comprises a hydraulic cylinder 74 having a piston 75 slidably mounted therein with its upstanding stem projecting through the top of the cylinder and pivotally connected at its upper end to the slotted outer end of an arm 76 fixedly secured to the axle of the shutter 24'' for rotating it to and from its closed and open positions; a pair of vertically spaced hydraulic cylinders 77, 78 having a common stem 79 extending into each cylinder and carrying a spaced pair of vertical piston valves 80, 81 on its upper end portion, which are slidably mounted in the upper main feed cylinder 77, and a single piston 82 on its lower end which is slidably mounted in the lower auxiliary cylinder 78; a pilot cylinder 83 having a stem 84 extending downwardly through the bottom of the cylinder with its lower end carrying an eyelet 54' connected to the upper end of the float rod 53', and carrying on its upper end portion a pair of vertically spaced piston valves 85, 86 slidably mounted in the pilot cylinder; a pair of pipes 87, 88 connecting the upper and lower end portions, respectively, of the cylinders 74 and 77; a pipe 89 connecting the upper end portion of the cylinder 78 to pipe 88; a pipe 90 connecting the lower end portion of cylinder 78 to pipe 87; a pair of pipes 91, 92 connecting the upper and lower end portions, respectively, of cylinders 78 and 83; a tank 93; a pressure pump 94 having its suction end connected to tank 93 and its discharge end connected to pipe 95 which is connected to the intermediate portion of the pilot cylinder 83; a pipe 96 connecting pipe 95 to the intermediate portion of the feeder cylinder 77; an evacuation pipe 97 connected to the tank 93 and to branch pipes 98, 99, which, in turn, are connected to the upper and lower ends, respectively, of feeder cylinder 77 and an evacuation pipe 100 connected to the tank 93 and to branch pipes 101, 102, which, in turn, are connected to the upper and lower ends, respectively, of the pilot cylinder 83.

The operation of the device is as follows:

The hydraulic fluid put under pressure by the pump 94 enters the pilot cylinder 83 through pipe 95 and the feed cylinder 77 through pipe 96. A downward movement of the float 52'' moves the piston valves 85, 86 downwardly in the pilot cylinder 83 permitting oil under pressure to pass through pipe 92 into the bottom of the auxiliary cylinder 78, pushing piston 82 upward which, through common stem 79, moves the piston valves 80, 81 in the feed cylinder 77 upward, thereby permitting oil under pressure to pass from the feed cylinder 77 through pipe 87 into the top of cylinder 74, where it pushes the piston 75 downward to move, by means of the piston stem and arm 76, the shutter 24'' to its open position. At the same time, oil under pressure passes from the cylinder 78 through pipe 90 into pipe 87 and into the top of the cylinder 74.

As piston 75 moves downward, the oil in the cylinder 74 below the piston 75 is pushed through pipe 88 into the bottom portion of feed cylinder 77 and from there through pipes 99 and 97 back into tank 93. A portion of the oil flowing through pipe 88 is diverted through pipe 89 and enters the upper portion of the auxiliary cylinder 78, and from there flows through pipe 91 into the upper portion of pilot cylinder 83 and from there flows through pipes 101 and 100 into the tank 93. Thus, a very small oil feed in the pilot cylinder completely opens the shutter 24.

An upward movement of the float 52'' moves the piston valves 85, 86 upwardly in the pilot cylinder 83, permitting oil under pressure to pass through pipe 91 into the top of the auxiliary cylinder 78, pushing piston 82 downward which, through common stem 79, moves the piston valves 80, 81 in the feed cylinder 77 downward, thereby permitting oil under pressure to pass from the feed cylinder through pipe 88 into the bottom of cylinder 74, where it pushes the piston 75 upward to move the shutter 24'' to its closed position. At the same time, oil

under pressure passes from the auxiliary cylinder **78** through pipe **89** into pipe **88** and into the bottom of cylinder **74**.

As piston **75** moves upward, the oil in the cylinder **74** above the piston **75** is pushed through pipe **87** into the top of feed cylinder **77** and from there through pipes **98** and **97** back into tank **93**. A portion of the oil flowing through pipe **87** is diverted through pipe **90** and enters the lower portion of the auxiliary cylinder **78** and from there flows through pipe **92** into the lower portion of the pilot cylinder **83**, and from there through pipes **102** and **100** into the tank **93**.

This hydraulic driving system for operating the shutter **24''** is an "all or nothing" process. As the shutter **24''** is always in its closed position or in its open position, the amount of products diverted from the drain elevator into the recycling chute is all or nothing.

From the foregoing, it readily will be seen that there has been provided a novel method and improved apparatus for jig washing coal, ore and similar solid products; apparatus which comprises one or more washing compartments each having an evacuation conduit for removing the heavy products discharged from the washing bed; a recycling conduit connected to the evacuation conduit for recycling all or a portion of the heavy products back into the bed; and a pressure responsive detecting device actuated by the amount of heavy products present in the bed for controlling the amount of heavy products to be diverted and recycled; whereby a sufficient quantity of heavy products will be maintained in each bed to prevent the discharge therefrom of light products which would become misclassified due to lack of heavy products in the bed.

Obviously, the invention is not restricted to the particular embodiments thereof herein shown and described.

What is claimed is:

1. In a jig for washing coal, of the type comprising a wash box having a washing table therein for supporting a bed of materials adapted to be acted upon by a body of washing liquid, and means for producing a pulsating flow of the washing liquid through said bed of materials for densimetrically classifying the materials; the improvement which comprises means including an evacuation conduit for removing the heavy products discharged from said bed of materials; a recycling conduit having its inlet end connected to communicate with said evacuation conduit and its outlet end positioned to discharge the recycled products passing therethrough back into said bed of materials; a valve member associated with the inlet opening of said recycling conduit; means for operating said valve member for regulating the passage of products through said recycling conduit including motive means connected to move said valve from closed position to open position and from open position to closed position and hydraulic means for controlling the operation of said motive means; and detecting means including a float positioned in said bed of materials and movable up and down therein in response to variations in the amount of heavy products in said bed of materials for actuating said hydraulic means so that the valve will be regulated in response to variations in the amount of heavy products in said bed and thereby control the rate of recycling products through said recycling conduit,

2. Apparatus as set forth in claim 1, wherein said motive means includes an electric motor connected to move said valve from closed position to open position and from open position to closed position; limit switches connected to stop said motor when said valve has reached its opened position and its closed position; and a relay for starting the motor in either direction; and wherein said hydraulic means includes a hydraulic device actuated by said detecting means for controlling the operation of said relay.

3. Apparatus as set forth in claim 1, wherein said motive means includes a drive cylinder having a piston therein connected to move said valve from open to closed position and from closed position to open position as said piston moves in alternate directions in said cylinder; and wherein said hydraulic means includes a feed cylinder having piston valves therein for controlling the flow of hydraulic fluid under pressure to and from said drive cylinder and a pilot cylinder actuated by said detecting means for controlling the movement of the valve in said feed cylinder.

4. Apparatus as set forth in claim 1, wherein said motive means includes a drive cylinder having a piston therein connected to actuate said valve, and spring means for moving said piston in one direction; wherein said hydraulic means includes a hydraulic feed cylinder having piston valves therein for controlling the flow of a hydraulic fluid to and from the bottom end of said drive cylinder for moving the piston therein in the opposite direction, said last named piston valves being connected to be actuated by said detecting means; and wherein means are provided for interlocking said feed cylinder and the piston in said drive cylinder including a lever having one end pivotally mounted on the jig frame and its other end portion connected to said feed cylinder and said piston, the construction and arrangement being such that the control device will maintain said valve in a position corresponding to the position of the float of the detecting means, whereby the valve will be opened to permit the recycling of heavy products as called for by the particular position of the float as determined by the amount of heavy products in said bed.

5. In a jig for washing coal, of the type comprising an elongated vat having a plurality of liquid washing compartments formed therein, each having a washing table for supporting a bed of materials adapted to be acted upon by a body of washing liquid, and means for producing a pulsating flow of the washing liquid through the bed of materials therein for densimetrically classifying the materials; the improvement which comprises means associated with each of said washing compartments for recycling a portion of the heavy products discharged from the bed of materials therein back into the bed of materials in response to the amount of heavy materials in the bed, said means including an evacuation conduit for removing the heavy products discharged from the bed of materials in the washing compartment; a recycling conduit having its inlet end connected to communicate with said evacuation conduit and its outlet end positioned to discharge the recycled products passing therethrough back into the bed of materials; a valve member associated with the inlet opening of said recycling conduits; means for operating said valve member for regulating the passage of products through said recycling conduit including motor means connected to move said valve from closed position to open position and from open position to closed position and hydraulic means for controlling the operation of said motive means; and detecting means including a float positioned in the bed of materials and movable up and down therein in response to variations in the bed for actuating the amount of heavy products in said hydraulic means so that the valve will be regulated in response to variations in the amount of heavy products in the bed and thereby control the rate of recycling products through the recycling conduit.

References Cited in the file of this patent

UNITED STATES PATENTS

2,694,490 Harvengt ---------- Nov. 16, 1954

FOREIGN PATENTS

301,812 France ---------- Dec. 3, 1928