May 10, 1955 J. HERTRICH 2,708,035

CENTRIFUGAL DISCHARGER MECHANISM

Original Filed June 14, 1949 3 Sheets-Sheet 1

Fig. 1

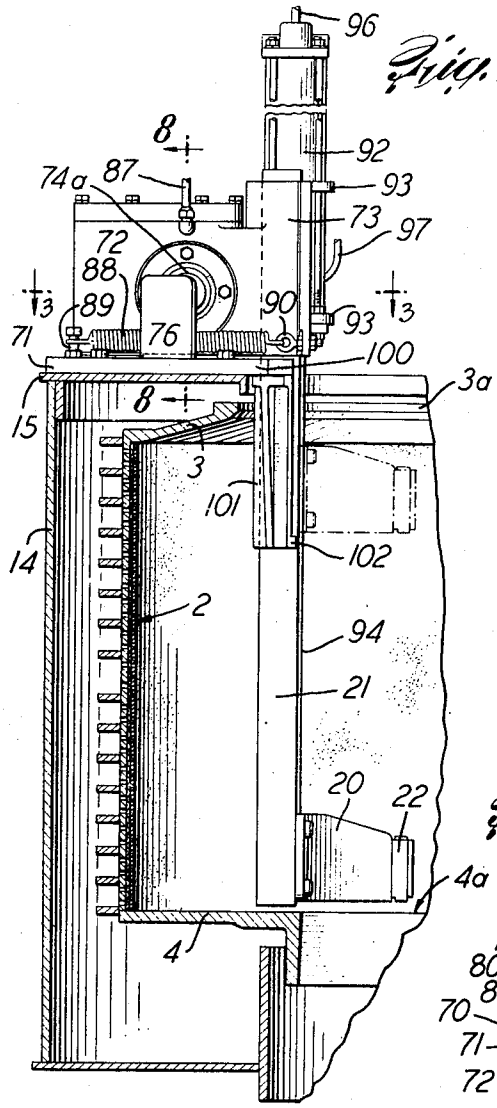

Fig. 2

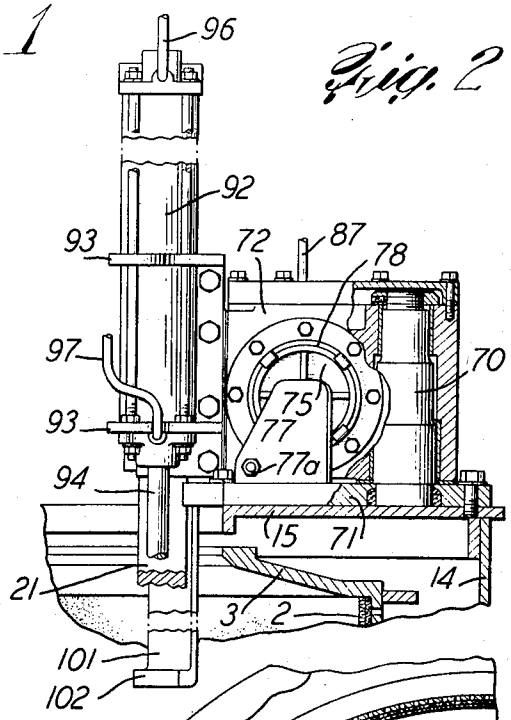

Fig. 3

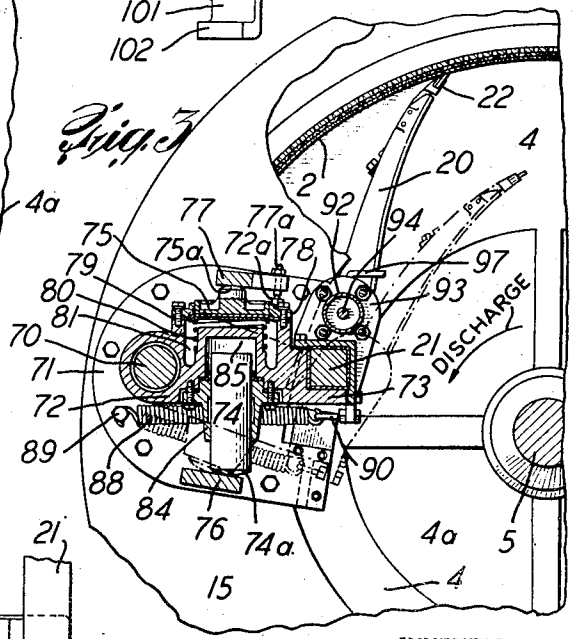

Fig. 4

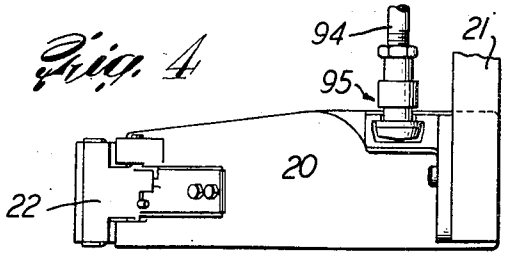

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Fig. 6

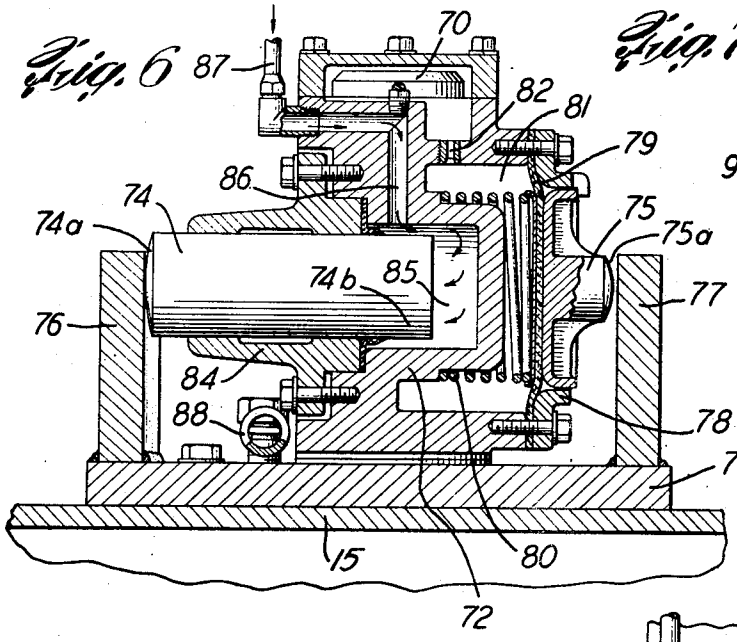


Fig. 7

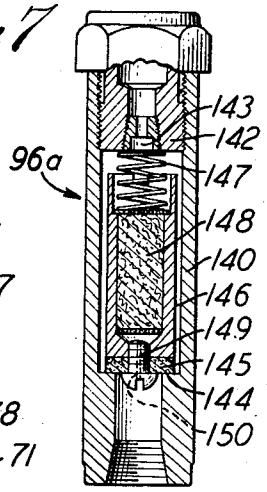
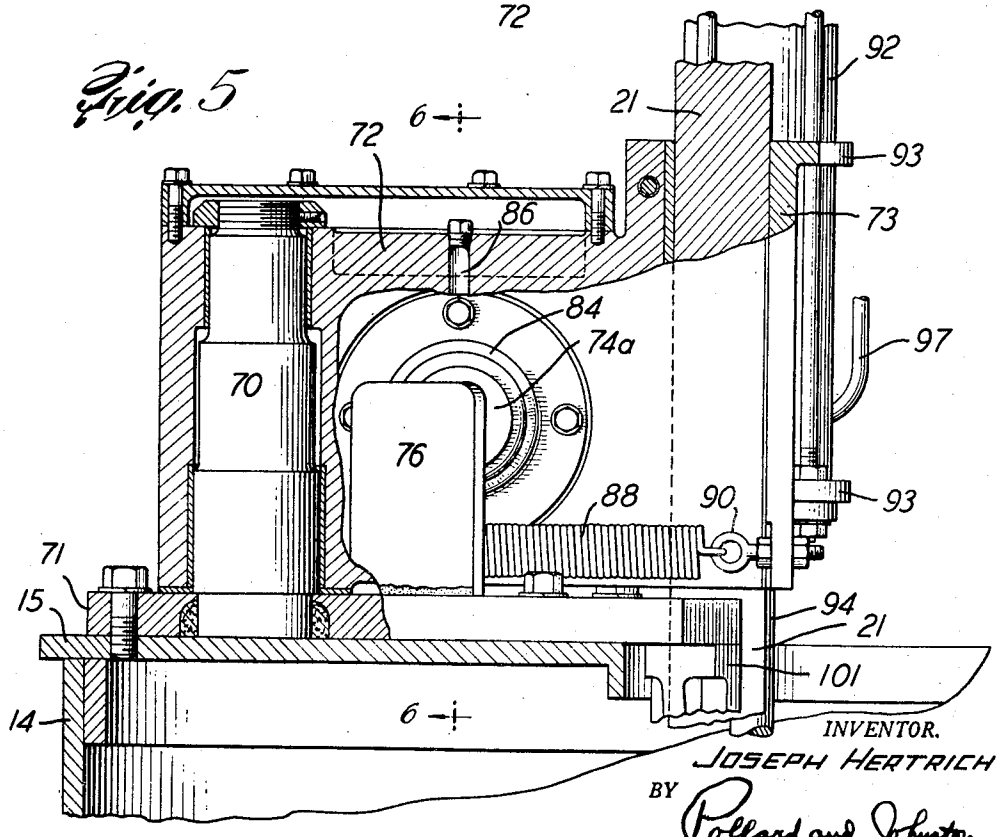


Fig. 5



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CENTRIFUGAL DISCHARGER MECHANISM

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Fig. 8

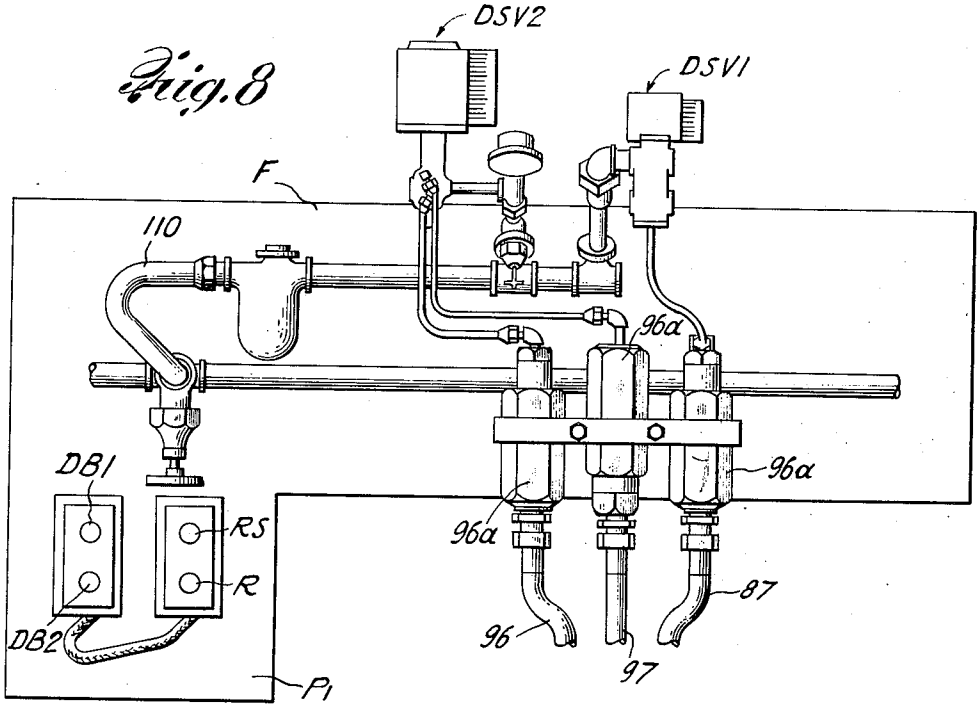


Fig. 9

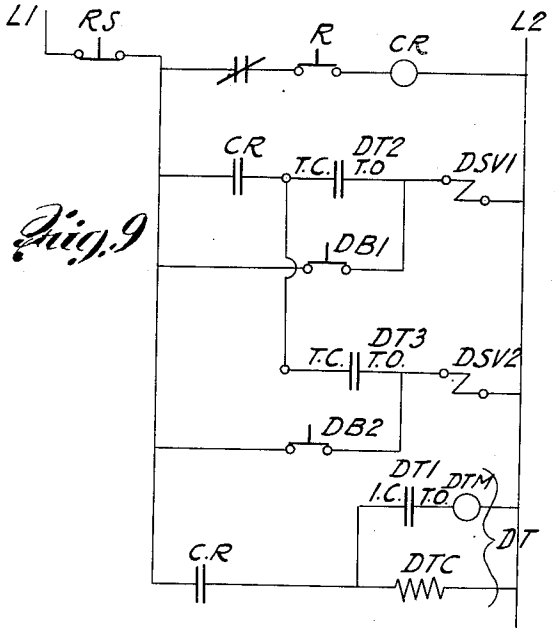
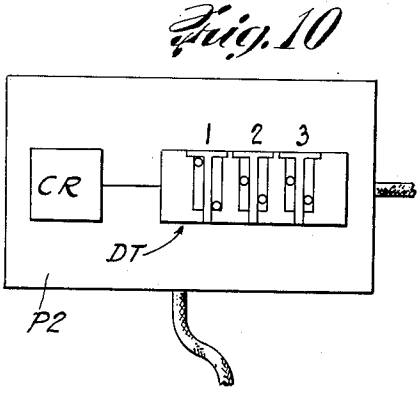


Fig. 10



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United States Patent Office 2,708,035 Patented May 10, 1955

2,708,035

CENTRIFUGAL DISCHARGER MECHANISM

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Original application June 14, 1949, Serial No. 99,040, now Patent No. 2,667,974, dated February 2, 1954. Divided and this application March 2, 1951, Serial No. 213,534

19 Claims. (Cl. 210—70)

This invention relates to a new and improved discharger mechanism for heavy centrifugal machines of the type used for separating liquid from solids in large scale industrial processes such as, for example, the manufacture, refining or drying of sugar, dextrose or other crystalline or granular solids. This application is a division of my copending application Serial No. 99,040, filed June 14, 1949, now Patent No. 2,667,974.

The treatments effected in filtration centrifugals of the type mentioned are often controlled adjustably by timing mechanisms which automatically coordinate actions of driving, spraying (washing) and braking elements in each cycle, but the steps necessary for discharging the basket at the end of each cycle are still performed under manual control for lack of safe, reliable and efficient means of performing them otherwise.

When the centrifugal is stopped after a spinning period, the treated solids usually remain in the basket as a more or less hard wall that is dug out by rotating the basket at a relatively slow rate to force this wall against a mechanical discharger shoe pressed into the solids. An attendant lowers the shoe into the basket and guides its digging movements by manipulations usually of a hand wheel and of a lever or other device controlling the shoe-carrying shaft. At the same time it may be necessary to move a device controlling the centrifugal drive, in order to bring or hold the basket to a suitable discharging speed.

Discharging in this manner is laborious, time consuming and costly. It places a premium on the attendant's skill and is a source of serious hazards in the use of the machines. Even the most skillful workmen are likely to damage basket lining screens, and under severe operating conditions, such as in discharging fine-grained dextrose after subjecting it to very high centrifugal force, dischargers sometimes are bent or even broken when the resistance of the hard wall of solids induces the attendant to work the discharger too strongly.

The need for a safe and efficient power-operated discharger mechanism has long been recognized in the art. The mechanisms heretofore proposed for this purpose, however, have not fulfilled the need for lack of sufficient safety, certainty and flexibility of operation, or because of being so complex or cumbersome that they would interfere with other essential elements or functions of the centrifugal machine.

The principal object of this invention is to provide a safe and efficient power operated discharger for heavy centrifugal machines of the filtration type, which overcomes in a practical manner the shortcomings of conventional discharging practice and is applicable with little or no modification to any design or make of such machines.

Another object is to provide such a power-operated discharger by which all the operations involved in discharging treated solids from the centrifugal basket can be performed automatically in proper sequence, and with adjustability to suit the needs of any material that may be processed in the centrifugal machine.

A further object is to provide an efficient power-operated discharger for centrifugals of the type mentioned which is organized so compactly that it occupies no greater space than do conventional manually operated dischargers.

According to an important feature of this invention, a discharger shoe is mounted within the basket for a power operated cycle of operation involving, first, a movement of the shoe from an inner idle position outward through solids rotating in the basket to dispose the tip of the shoe at the basket side wall, this movement removing a layer of solids from the charge, second, a movement of the shoe along the basket wall to remove the remaining solids of the charge, and then inward and return movements to dispose the shoe at its starting position; the respective movements being yieldably effected by power-operated means which act in the several stages of movement at predetermined rates suited to the practical requirements of the machine and the material to be discharged.

Another feature of the invention resides in an arrangement of the discharger mechanism wherein the power-operated means effecting the several discharger shoe movements are unified with a housing which supports the shaft of the discharger shoe and moves transverse to the basket axis to effect the inward and outward shoe movements.

According to another feature of the invention, the yieldable means serving to move the shoe inward is arranged to act continuously on the shoe-shaft and housing assembly with a limited force which is overbalanced by the force of the yieldable means which moves the shoe outward to the basket wall, so that inactivation of the latter means results immediately in inward shoe movement. A particularly efficient arrangement can be obtained by use of a constantly acting spring for the first-mentioned means, in conjunction with fluid pressure-operated means for the outward shoe movements.

A further feature of the invention resides in an arrangement acting to slow down the motion of the discharger shoe as its tip approaches the screens of the basket side wall in order to avoid or reduce danger of damaging the screens.

According to another feature of the invention, the cutting out or solids discharging movements of the shoe are brought about by fluid pressure-operated means and the rates of these movements are suited to the needs of the material to be discharged by the provision of flow control or bleeder means which regulate the rate of admission of the pressure fluid to the pressure-operated means.

Yet another important feature of the invention consists in the provision of a retaining or protective device to prevent inadvertent movement of the discharger shoe away from its idle position within the rotating basket in the event of inactivation of power-operated means which normally hold the shoe to that position.

A further feature of the invention resides in a combination of a power-operated discharger with control mechanisms whereby the sequence of the several movements of the discharger is controlled automatically and adjustably so that the duration of each discharging cycle and of individual movements involved in the cycle may be readily selected to suit practical requirements.

Other objects, features and advantages of the invention and the several new combinations and constructions which it provides will be apparent from the following detailed description and the accompanying drawings illustrating a preferred embodiment thereof.

In the drawings:

Figure 1 is a side elevation of a discharger mechanism embodying this invention in assembled relation to a centrifugal basket and curb of which portions appear in vertical cross section;

Figure 2 is an elevation, partly in vertical cross section, of the opposite side of the same discharger mechanism;

Figure 3 is a horizontal cross section through the discharger mechanism along line 3—3 of Figure 1, with parts of the basket and curb top broken away to show the discharger shoe inside the basket;

Figure 4 is a side elevation of a suitable discharger shoe connected with a plunger by which it is moved up and down;

Figure 5 is an enlarged side elevation and partial vertical section of certain parts appearing in Figure 1;

Figure 6 is a transverse vertical section through the discharger mechanism, along line 6—6 of Figure 5;

Figure 7 is a vertical cross section through a suitable air flow control used for regulating the rate of movement of the discharger shoe;

Figure 8 is a schematic front elevation of certain elements employed for motivating and controlling the discharger;

Figure 9 is an elementary wiring diagram of a suitable control circuit whereby the discharger can be operated either automatically or with manual initiation of its outward and downward movements; and

Figure 10 is a diagram of relay and timer elements suitable for the control system.

The drawings show certain conventional elements of a heavy centrifugal machine of the type for which the illustrated embodiment of this invention is adapted. These elements include a centrifugal basket having a perforated side wall **2**, a cap **3** and a bottom **4** which is secured to the lower end of a vertical driving shaft or spindle **5**. The spindle **5** is suspended in gyratory manner from a suitable supporting structure and is connected to a prime mover (both not shown). The prime mover is operative to effect rotation of the centrifugal basket in the direction indicated by the arrow of Figure 3, when discharge is to be effected. Around spindle **5**, basket bottom **4** has a central opening **4***a* forming a solids outlet, while basket cap **3** is provided with a central opening **3***a* affording access to the interior of the basket. The entire basket is surrounded by a stationary curb **14** which collects the liquid expelled from the basket and has a centrally open top **15** providing support for the discharger mechanism.

The principal element of the discharger is a shoe **20** carried on a vertical shaft **21** and movable inside the basket both (1) vertically, so that its tip or working end **22** can traverse the axial length of the basket between cap **3** and bottom **4** (see Fig. 1), and (2) horizontally, so that the tip **22** can move radially in and out relative to basket side wall **2** (see Fig. 3).

It will be noted from Figure 3 that the discharger shoe **20** extends from its supporting shaft **21** in such a direction that it will be effective to dig out solids in the basket when the basket is rotated in the direction of the arrow and the shoe is moved outward into the solids.

The discharger mechanism shown in the drawings embodies several important features of construction and operation. It is motivated entirely by fluid pressure and springs which relieve the centrifugal attendant of all the physical effort heretofore required for discharging. The movements of the discharger shoe have definitely determined lengths, yet no limit switches or other complex safety devices are required at the limits of shoe travel. The required movements are produced at definitely controlled rates which can be set as desired to suit any conditions encountered in the use of the centrifugal. The discharger shoe is kept inside the centrifugal basket at all times with complete safety against falling accidentally away from idle position. The discharger is so compactly organized that it requires no extra space on the curb top and may even reduce the usual space requirement by having the shoe always inside the basket away from the curb top.

The operating mechanism of the discharger centers about a supporting stud **70** (best seen in Fig. 5) which projects upward from a base plate or flange **71** bolted to the curb top **15**. A bracket or housing **72** is mounted on stud **70** to swing horizontally about its axis, and extends from the stud toward shaft **5** (see Fig. 3) to a vertical guide portion **73** which overhangs the inner edges of curb top **15** and basket cap **3** and receives slidably the discharger shaft **21**. Shaft **21** and its bearing in guide **73** are made with a square or other angular cross section so that the discharger shoe **20** cannot swing with respect to the housing, although it can swing with the housing on stud **70** and is also free to be moved vertically through movement of shaft **21** in its guide passage.

From Figure 3 it will be seen that swinging movements of housing **72** and shaft **21** about stud **70** can dispose shoe **20** at the broken line or the full line position of Figure 3 or at any intermediate position. These swinging movements are brought about and are limited to the desired extent as follows: Extending laterally from opposite sides of housing **72** are two slidable members **74** and **75** having rounded abutment ends **74***a* and **75***a*, respectively, which face in opposite directions. These ends are arranged to abut against flat faces of fixed posts or abutments **76** and **77**, respectively, which extend vertically from opposite sides of the base plate **71**. The slidable abutment member **75** is movable axially in a bearing **78** on housing **72** and against a diaphragm **79** which in turn is sealed across a transverse cavity **81** in the housing and held under the pressure of a spring **80** in that cavity. Cavity **81** is filled with oil. Inward movement of member **75** and diaphragm **79** is thus resisted by the body of oil in cavity **81**, and when under compression the oil gradually escapes through a bleeding passage **82** (Fig. 6) which leads from the top of cavity **81**. During outward movements of member **75** and diaphragm **79** under the force of spring **80** the oil formerly expelled from cavity **81** returns through passage **82**.

The other slidable abutment member **74** extends through and in sealed relation to a transverse bearing member **84** and has an inner end **74***b* within a pressure chamber **85** inside the housing **72**. Member **74** thus constitutes a piston, and it acts as such to swing the housing and the discharger shaft counterclockwise about stud **70** (Fig. 3) upon the admission of fluid pressure into chamber **85**. For the latter purpose, a duct **86** in the housing structure (see Fig. 6) is connected with an air line **87** leading to a solenoid valve DSV1 (Fig. 8), so that actuation of the valve to admit compressed air through line **87** brings into chamber **85** fluid pressure which forces housing **72** and piston **74** apart in directions transverse to the longitudinal axis between stud **70** and shaft **21**. Since the abutment end **74***a* thrusts against the fixed post **76**, housing **72** must then move counterclockwise on stud **70** as seen in Figure 3, and shaft **21** swings with the housing so as to move shoe **20** from its broken line position toward its full line position. Before the shoe tip **22** reaches the basket side wall, however, abutment end **75***a* engages against fixed post **77**, so that the final outward movement of the shoe takes place under the retarding or dashpot effect of member **75** in cavity **81**. An adjustable stop **77***a* fixed in post **77** is engaged by part **72***a* on housing **72** so as to limit the horizontal outward movement of the shoe tip.

On the other hand, when the pressure in chamber **85** is released piston **74** is free to slide inward, and then the discharger housing **72** is immediately swung back to original position, to move shoe **20** inward from the basket side wall, under the pull of a heavy tension spring **88** which has one end fixed to pin **89** on base plate **71** and has its other end fixed to eye **90** on the shaft guide **73**.

The up and down movements of the discharger shoe

are brought about entirely by the action of a double-acting fluid pressure device comprising an air cylinder **92** which is carried in vertical position alongside shaft **21** by bracket flanges **93** fixed to guide **73**. Cylinder **92** has a plunger **94** extending downward to a detachable coupling at **95** with the body of the discharger shoe **20** (Fig. 4). The length of cylinder **92**, i. e., the stroke of plunger **94** in it, is fixed so that when the plunger lies at the upper limit of its movement the discharger shoe **20** will be held just below the basket cap **3**, as indicated by broken lines in Figure 1, while at the lower limit of plunger movement the shoe will lie just above the basket bottom **4** as seen in full lines in Figure 1. The cylinder **92** has upper and lower air inlets connected with compressed air lines **96** and **97**, respectively, which lead to a suitable solenoid valve DSV2 (see Fig. 8) whereby pressure may be admitted to either the upper or the lower end of the cylinder for moving the discharger shoe either down or up. Thus a single compact device is used for what could be two motivating devices.

The air flow through each of lines **87**, **96** and **97** is retarded to a selected rate that will give the desired rate of concommitant shoe movement. For this purpose, solenoid valves having adjustable air passages may be used, but an air flow control as shown at **96***a* preferably is placed in each line. The construction of these air flow controls is shown in detail in Figure 7, and as seen in Figure 8 the ones in lines **87** and **96** are placed in normal position while the one in line **97** is in reversed position. Each has a hollow cylindrical body **140** containing in one end a plug **142** which is bored axially and holds a removable restricted orifice member **143**. The other end presents an internal annular seat **144** for a nonmetallic valve disc **145** carried by a plunger **146** inside the body. A spring **147** presses the plunger to seated position. The plunger has a central cavity packed with an air filtering medium **148** and a removable member **149** having a small orifice **150** normally completes the air passageway through the valve. The orifice in member and orifice **150** together control the speed of air flow through the control in the direction from **143** to **150**, while air flow in the opposite direction is controlled only by the orifice in **143** since such air flow displaces plunger **146** from its seated position and allows orifice **150** to be by-passed between the sides of the plunger and body **140**.

It results that compressed air passing from DSV1 to chamber **85** flows at a rate determined by the sizes selected for the two orifices of the flow control in line **87**, which thus regulate the rate of horizontal outward movement of shoe **20**, while the rate of inward movement of the shoe also is limited, during the return of plunger **74** into chamber **85** under action of spring **88**, by the action of only one orifice at **143**. This generally is larger than orifice **150**. The flow through line **96** producing downward movement of the shoe is controlled similarly to that producing outward shoe movement, and a similar limitation is placed on the back flow through line **96** attending upward movement of the shoe. The control in line **97** being in reversed arrangement, the rate of air flow through that line from DSV2 is regulated only by the restrictions of one orifice **143**, while the back flow as the shoe is moved downward is restricted by two orifices **143** and **150**.

On the downward stroke both restrictions in each of the air lines **96** and **97** are effective, the restrictions in line **97** actually being predominant in their effect in that they prevent the shoe shaft from falling at a rate greater than that permitted by the rate of fluid flow through these restrictions, while on the upward stroke only the larger restriction at **143** is effective in each line and the one in line **96** is predominant. In this way the discharger shoe is moved at a relative low speed in downward direction, in order to limit the depth of charge removed in each revolution of the basket, while the upward motion of the shoe occurs at a faster rate in order to save time. That rate, however, is limited to one that prevents shocks. For example, the time for the downward stroke may be from about 8 to 16 seconds while the time for the upward stroke may be from about 1 to 3 seconds.

As further illustrated in Figure 1, the base plate **71** has a portion **100** which overhangs the inner edge of the curb top and to which a bracket **101** is fixed so as to extend downward into the basket. At its lower end this bracket forms a horizontal ledge **102** directed toward the discharger shaft **21**. Ledge **102** is located just below the bottom of shoe **20** when the shoe is in its raised position. Accordingly, when the shoe is down and the discharger is swung radially inward by spring **88**, the side of shaft **21** abuts slidably against the end of ledge **102**. Pressure acting in the lower end of cylinder **92** then moves the shaft **21** upward along the ledge end until the shoe has reached its upper position, whereupon a final inward swinging occurs to place the base of the shoe over the face of the ledge. That is the idle position of the discharger, from which it cannot fall toward the bottom of the basket even though the upward pressure in cylinder **92** be released.

When the discharger is to be operated the basket is rotated in the direction of the arrow in Figure 3 and air pressure is then admitted into chamber **85** from valve DSV1. The shoe tip **22** then swings slowly outward into the material in the basket and continues this movement, though at a slower rate against the dashpot effect of member **75**, until it reaches the basket side wall. Meanwhile, it has moved clear of ledge **102**. Having thus dug a complete swath from the top of the wall of solids, the shoe now is ready to move downward and dig out the remainder of that wall, which is accomplished by admitting pressure into the upper end of cylinder **92** through valve DSV2. At the limit of the downward movement, valve DSV1 is actuated to release the pressure from chamber **85**; the shoe swings radially inward under spring force to assume the position limited by abutment of shaft **21** against ledge **102**; and then pressure is shifted from the upper end to the lower end of cylinder **92** to raise the shoe to its idle position. It will be understood that in and out movements of the shoe may be brought about at any position in its vertical stroke by simple actuations of valve DSV1.

It may be pointed out that the movements of the discharger shoe into the solids and then along the wall for digging out the solids are effected by yieldable devices. As will be apparent to those skilled in the art, the force which a fluid pressure device is to exert can be easily selected or regulated to suit requirements. When the selected force becomes opposed by an equal or a greater resistance, the piston of the device no longer advances and may even undergo backward movement. In the discharger mechanisms of this invention, therefore, the discharger shoe movements can be brought about at the optimum efficiency, and if any unusual resistance in load is encountered, the fluid pressure-operated devices will automatically yield so as to protect the mechanism against damage or other operating troubles.

The illustrated control system of the discharger includes elements for selective manual control of its movements and also a system of automatic control by which all the discharger movements may be brought about automatically in desired sequence. The starting of the discharger movements may be brought about either manually or automatically.

The various control elements utilized may be of any suitable construction and are known per se. As diagrammed, they include push-button switches on a panel P1 and the several solenoid valves with pressure regulators on the control framing F, all available to an attendant at the machine by reason of the placement

of the panel P1 and framing F in the vicinity of the centrifugal; and an electrical control relay and timer on a remote control panel P2 (Fig. 10) at some other convenient location. The control elements are interconnected electrically for operation in the relationships indicated by the wiring diagram of Figure 9. In that diagram relay contacts are shown separately from the coil by which they are opened or closed, in order to indicate their functions clearly. The contacts belonging to a certain relay are designated, however, by corresponding reference characters.

Push-buttons at panel P1 close or open control circuits directly when pushed. These include buttons:

R, for starting the automatic operation of the discharger controls;

RS, for resetting the automatic controls of the discharger before starting a new cycle;

DB1, for manually actuating valve DSV1 to swing the discharger shoe outward and inward; and DB2, for manually actuating valve DSV2 to move the discharger shoe down and up.

The contacts of push-button RS are normally closed, as shown in Figure 9, while those of push-buttons R, DB1 and DB2 are normally open. Valve DSV1 is a three-way air solenoid valve connected with a compressed air header 110, and has an energized position connecting the header with the air line 87, as well as a deenergized position connecting the air line 87 to a vent. The valve DSV2 is a four-way solenoid valve connected with header 110 and with the air lines 96 and 97 extending from cylinder 92. The valve DSV2 in either position serves to connect one of the lines 96 and 97 with the header while venting the other line to atmosphere. Thus, when DSV2 is energized it transmits air pressure to the upper end of cylinder 92 to move the discharger shoe downward, while when it is deenergized the air pressure is released from the upper end of the cylinder and transferred to the lower end to raise the discharger shoe.

The timer DT indicated on panel P2 is an adjustable time relay or time delay switch of known construction. It preferably is of the "Multiflex" type wherein several individually timed contacts are incorporated in a composite unit, although a much larger number of separate timer units would also serve. The "discharge timer" DT is provided with three numbered contacts. The respective contacts of the timer are indicated on the diagram of Figure 9 by corresponding numbers. The driving motor and the clutch of timer DT are designated, respectively, as DTM and DTC. Designations I. C., T. C. and T. O. beside the several timer contacts in Figure 9 indicate, respectively, that a contact is closed when its timer is energized (instantaneously closed), or closed by action of the timer (timer closed), or opened by action of the timer (timer opened).

Aside from the discharge timer DT, the control panel P2 may carry the control relay CR. Energizing current for the control elements is supplied by lines L1 and L2 (Fig. 9).

As shown in Figure 9, solenoid valves DSV1 and DSV2 which control the motivators of the discharger mechanism are normally held deenergized by the normally open contact of relay CR and the normally open contacts of manually operable switches DB1 and DB2. Thus, the discharger is normally held safely in its idle upward and inward position. When desired, the discharger shoe 20 may be moved outward by manually closing the switch DB1 to energize valve DSV1, or it may be moved downward by manually closing the switch DB2 to energize valve DSV2.

A complete sequence of automatic operation of the discharger will now be described:

A. The basket being rotated in the direction of the arrow in Figure 3 at a speed suitable for the discharging of solids therein, the run button R is pressed to energize the relay CR and start the discharge timer DT through a normally open CR contact. The discharge timer then takes over the control of the movements of the discharger, its motor DTM being energized through the instantaneously closed contact DT1, and proceeds to actuate the discharger at desired intervals determined by the timed settings of the contacts DT2 and DT3.

B. First, contact DT2 closes to energize DSV1, thus applying air pressure into chamber 85 of discharger housing 72 which causes the discharger shoe 20 to swing outward into the wall of solids in the rotating basket.

C. After a time interval suitable for digging a complete swath of solids from the top of that wall, contact DT3 closes to energize DSV2 which applies air pressure in the upper end of cylinder 92, thus moving the discharger shoe downward in the basket. During this movement contact DT2 remains closed and the remainder of the wall of solids is dug away from the basket side wall by rotation against the lower edge and face of the downwardly moving shoe.

D. After an interval suitable for downward shoe movement contact DT2 opens to deenergize DSV1, whereupon pressure is released from housing chamber 85 and spring 88 acts to swing shoe 20 inward over the face of basket bottom 4. The inward movement is stopped by the abutment of shaft 21 against the front edge of ledge 102, at a location where the shoe still extends over the basket bottom in a manner to sweep solids from the rotating basket bottom through the opening 4a.

E. After an interval suitable for inward shoe movement, contact DT3 opens to deenergize DSV2, whereupon air pressure is shifted from the upper end of cylinder 92 to the lower end thereof and the discharger shaft and shoe move upward. The shaft 21 moves along the edge of ledge 102 until the shoe 20 has reached a position thereabove, at which point spring 88 pulls the discharger assembly further inward so as to hold the shoe in idle position over the face of the ledge 102. Though fluid pressure and spring tension normally hold the shoe in that position, a failure of air pressure in the header 110 merely lets the ledge support the shoe and cannot cause the shoe to interfere with the spinning operation of the basket.

F. Finally, the reset button RS is pressed to open the control circuit, whereupon relay CR is deenergized and timer DT becomes reset. The discharger is then ready to start on another cycle.

The above arrangement provides a very effective discharger and a simple control therefor. The construction and organization of the means provided bring about easy and safe operation of the discharger in either manual or automatic control, along with full achievement of the other objects set forth hereinabove.

It is to be understood that the detailed description and the accompanying drawings are illustrative and that the improvements herein disclosed may be embodied in various forms of construction within the scope of the appended claims, as will be apparent to those skilled in the art.

I claim:

1. In a discharger mechanism for removing solids from a rotating centrifugal basket, a discharger shaft carrying a solids discharging member rigidly secured to the shaft, said shaft being movable so as to move said member outwardly to and axially along the basket side wall to discharge solids from the basket and then back to an initial position, power-operated means in driving relation to the shaft for effecting the outward and axial discharging movements, and yieldable means in driving relation to the shaft acting continuously to urge it inwardly so as to move said member away from said wall, the power-operated means for moving the shaft outwardly being operative with a force exceeding the force of said yieldable means.

2. In a discharger mechanism for removing solids from

a rotating centrifugal basket, a discharger shaft carrying a solids discharging member rigidly secured to the shaft, said shaft being movable so as to move said member outwardly to and axially along the basket side wall to discharge solids from the basket and then back to an initial position, respective fluid-pressure operated means in driving relation to the shaft for effecting the outward and axial discharging movements, each of such means having a supply line for leading a pressure fluid into and from such means in working and return strokes thereof, respectively, and a valve in such line for controlling the direction of fluid flow, control mechanisms for operating said valves in predetermined sequence, and a flow constrictor in each of said lines having a restricted orifice member limiting to a predetermined rate the flow of such fluid through such line into the corresponding fluid-pressure operated means.

3. In a discharger mechanism for removing solids from a rotating centrifugal basket, a discharger shaft carrying a solids discharging member rigidly secured to the shaft, said shaft being movable so as to move said member outwardly to and axially along the basket side wall to discharge solids from the basket and then back to an initial position, respective fluid-pressure operated means in driving relation to the shaft for effecting the outward and axial discharging movements, each of such means having a supply line for leading a pressure fluid into and from such means in working and return strokes thereof, respectively, and a valve in such line for controlling the direction of fluid flow, control mechanisms for operating said valves in predetermined sequence, and a flow constrictor in each of said lines having a restricted orifice member limiting to a predetermined rate the flow of such fluid through such line into the corresponding fluid-pressure operated means, said restricted orifice member being displaceable by fluid flow through such line from the corresponding fluid-pressure operated means to permit faster movement of such means in the return stroke thereof than in the working stroke thereof.

4. A discharger mechanism for removing solids from a rotating centrifugal basket, comprising a movable shaft support, means to mount said support for movement in a plane transverse to the axis of the basket, a shaft non-rotatably carried by said support but movable axially relative thereto, a discharger shoe rigidly mounted on said shaft, power-operated means carried by said support for moving it and said shaft in a direction to move said shoe outwardly from an idle position within the basket to the basket side wall, other power-operated means carried by said support for moving the shaft axially relative to the support so as to move said shoe along said wall, and yieldable power applying means acting continuously on said support to move it and said shaft oppositely to said one direction so as to move said shoe inwardly from said wall.

5. In a discharger mechanism for removing solids from a rotating centrifugal basket, a shaft carrying a discharger shoe rigidly secured thereto at one end, power operated means respectively operative upon the shaft to move it and the shoe within the basket from an inner idle position outwardly toward the basket side wall and along such wall to discharge solids therefrom and then inwardly and back to idle position, the means for moving the shaft and shoe inwardly being yieldable and acting continuously with a predetermined force, and the means for moving the said shaft and shoe outwardly being operative with a force overbalancing the force of said yieldable means.

6. In a discharger mechanism for removing solids from a rotating centrifugal basket, a movable shaft support, means to mount said support for movement in a plane transverse to the axis of the basket, a discharger shaft non-rotatably carried by said support but slidable axially relative thereto, a discharger shoe rigidly mounted on said shaft for movement thereby within the basket, fluid-pressure operated means carried by said support for moving it and said shaft in a direction to move the shoe from an inner idle position outwardly into solids on the basket side wall, other fluid-pressure operated means carried by said support for moving the shaft and shoe axially relative to said support, and power applying means acting continuously upon said support for moving the shaft and shoe inwardly upon inactivation of the first mentioned fluid-pressure operated means.

7. In a discharger mechanism for removing solids from a rotating centrifugal basket, a movable shaft support, means to mount said support for movement in a plane transverse to the axis of the basket, a discharger shaft non-rotatably carried by said support but movable axially relatively thereto, a discharger shoe rigidly mounted on said shaft for movement thereby within the basket, a first fluid-pressure operated means carried by said support for moving it and said shaft in a direction to move the shoe from an inner idle position outwardly into solids on the basket side wall, a second fluid-pressure operated means carried by said support for moving the shaft and shoe axially along said side wall through such solids, spring means acting continuously upon said support for moving the shaft and shoe inwardly upon the inactivation of the first fluid-pressure operated means, and a third fluid-pressure operated means carried by said support for moving the shaft and shoe back to idle position.

8. In a discharger mechanism as described in claim 7, said support itself comprising a fluid pressure cylinder constituting said first means, a double acting fluid pressure cylinder being fixed to said support and connected with said shaft to constitute said second means and said third means.

9. In a discharger for removing solids from a rotating centrifugal basket, a discharger shaft carrying a discharger shoe and adapted to hold and move it within said basket, a movable support for said shaft, means to mount said support for movement transverse to the axis of rotation of said basket, relatively fixed abutments at different sides of said support, power operated means carried by said support and operative against one of said abutments for moving the support and shaft so as to move said shoe from an inner idle position outwardly into solids on the basket side wall, and means operative against the other of said abutments and reactive against the support for retarding its movement by said power operated means as the shoe approaches said side wall.

10. In a discharger for removing solids from a rotating centrifugal basket, a discharger shaft carrying a discharger shoe and adapted to hold and move it within said basket, a movable support for said shaft, means to mount said support for movement transverse to the axis of rotation of the basket, power operated means carried by said support for moving the support and shaft so as to move said shoe from an inner idle position outwardly into solids on the basket side wall, a fluid containing chamber within said support having a bleeder outlet and having a sealed movable wall portion carrying a member protruding from a side of the support, and a fixed abutment in the path of said protruding member to stop its outward motion and thereby compress said wall portion against fluid in said chamber as the support and shaft carry the shoe near to said side wall.

11. In a discharger mechanism for removing solids from a rotating centrifugal basket, a shaft carrying a discharger shoe rigidly secured thereto at one end, means respectively operative upon the shaft to move it and the shoe within the basket from an inner idle position outwardly toward the basket side wall and along such wall to discharge solids therefrom and then inwardly and back to idle position, the means for moving the shaft and shoe inwardly being yieldable and acting continuously with a predetermined force, and the means for moving the said shaft and shoe outwardly being power operated and being operative with a force overbalancing the force of said yieldable means, and a fixed member within the basket presenting an abutment in the path of inward movement

at a position of the shaft where the shoe is operative to discharge solids from the basket bottom of the shaft to limit such inward movement.

12. In a discharger mechanism for removing solids from a rotating centrifugal basket, a shaft carrying a discharger shoe rigidly secured thereto at one end, means respectively operative upon the shaft to move it and the shoe within the basket from an inner idle position outwardly toward the basket side wall and along such wall to discharge solids therefrom and then inwardly and back to idle position, the means for moving the shaft and shoe inwardly being yieldable and acting continuously with a predetermined force, and the means for moving the said shaft and shoe outwardly being power operated and being operative with a force overbalancing the force of said yieldable means, and a fixed member within the basket presenting an abutment in the path of inward movement at a position of the shaft where the shoe is operative to discharge solids from the basket bottom of the shaft to limit such inward movement, said fixed member comprising a shoe seat transverse to said shaft having a free edge to constitute said abutment, the means for moving the shaft and shoe inwardly acting to dispose the shoe over said seat when it reaches said idle position.

13. In a discharger mechanism for removing solids from a rotatable centrifugal basket, a mounting adapted to be fixed over the basket, a support pivotally secured to said mounting for horizontal swinging movement, a discharger shaft non-rotatably carried by said support but movable axially relative thereto, a discharger shoe rigidly mounted on said shaft and adapted to be moved by it horizontally and vertically within the basket to discharge solids therefrom, power operated means carried by the support for swinging the support and shaft horizontally so as to move the shoe from an inner idle position outwardly toward the basket side wall, yieldable means continuously acting oppositely upon said support for swinging it to move the shoe inwardly whenever said power operated means is inactive, power operated means carried by said support and connected with said shaft for moving the shoe downwardly through such solids and thereafter returning the shaft and shoe upwardly to idle position, and a fixed ledge within the basket and underlying said shoe in said idle position to retain it there in the event of a failure of the power operated returning means.

14. In a discharger mechanism for removing solids from a rotatable centrifugal basket, a mounting member adapted to be fixed over the basket, a housing pivoted to said member for horizontal swinging movement, a discharger shaft carried by said housing in non-rotatable but axially slidable relation thereto, said shaft carrying a discharger shoe and being movable to move the shoe horizontally and vertically within the basket, a fluid-pressure cylinder in said housing adapted for connection with a source of pressure fluid and containing a reciprocable piston protruding from a side of the housing, a fixed abutment positioned to obstruct movement of said piston, the admission of fluid pressure to said cylinder serving to swing said housing away from said abutment so as to move said shoe from an inner idle position to an outer position at the basket side wall, a fluid containing chamber in the housing having a sealed movable wall portion carrying a member protruding from another side of the housing, said chamber having a bleeder outlet, and a fixed abutment engaged by said protruding member, in movement of the housing away from the first mentioned abutment, so as to compress said wall portion against fluid in said chamber and thereby retard such movement as the shoe approaches its outer position.

15. In a discharger mechanism for removing solids from a rotatable centrifugal basket, a mounting member adapted to be fixed over the basket, a housing pivoted to said member for horizontal swinging movement, a discharger shaft carried by said housing in non-rotatable but axially slidable relation thereto, said shaft carrying a discharger shoe and being movable to move the shoe horizontally and vertically within the basket, a fluid-pressure cylinder in said housing adapted for connection with a source of pressure fluid and containing a reciprocable piston protruding from a side of the housing, a fixed abutment positioned to obstruct movement of said piston, the admission of fluid pressure to said cylinder serving to swing said housing away from said abutment so as to move said shoe from an inner idle position to an outer position at the basket side wall, a fluid containing chamber in the housing having a sealed movable wall portion carrying a member protruding from another side of the housing, said chamber have a bleeder outlet, and a fixed abutment engaged by said protruding member, in movement of the housing away from the first mentioned abutment, so as to compress said wall portion against fluid in said chamber and thereby retard such movement as the shoe approaches its outer position, said mounting member comprising an upright pivot pin holding an outer portion of said housing, an inner portion thereof holding said shaft, and said fluid pressure cylinder being formed in an intermediate portion thereof and extending transverse to said pivot pin.

16. In a discharger mechanism for removing solids from a rotatable centrifugal basket, a mounting member adapted to be fixed over the basket, a housing pivoted to said member for horizontal swinging movement, a discharger shaft carried by said housing in non-rotatable but axially slidable relation thereto, said shaft carrying a discharger shoe and being movable to move the shoe horizontally and vertically within the basket, a fluid-pressure cylinder in said housing adapted for connection with a source of pressure fluid and containing a reciprocable piston protruding from a side of the housing, a fixed abutment positioned to obstruct movement of said piston, the admission of fluid pressure to said cylinder serving to swing said housing away from said abutment so as to move said shoe from an inner idle position to an outer position at the basket side wall, a fluid containing chamber in the housing having a sealed movable wall portion carrying a member protruding from another side of the housing, said chamber having a bleeder outlet, and a fixed abutment engaged by said protruding member, in movement of the housing away from the first mentioned abutment, so as to compress said wall portion against fluid in said chamber and thereby retard such movement as the shoe approaches its outer position, said mounting member comprising an upright pivot pin holding an outer portion of said housing, an inner portion thereof holding said shaft, and said fluid pressure cylinder being formed in an intermediate portion thereof and extending transverse to said pivot pin, said chamber being formed in an intermediate portion of said housing at said other side thereof.

17. In a discharger mechanism for removing solids from a rotatable centrifugal basket, a mounting member adapted to be fixed over the basket, a housing pivoted to said member for horizontal swinging movement, a discharger shaft carried by said housing in non-rotatable but axially slidable relation thereto, said shaft carrying a discharger shoe and being movable to move the shoe horizontally and vertically within the basket, a fluid-pressure cylinder in said housing adapted for connection with a source of pressure fluid and containing a reciprocable piston protruding from a side of the housing, a fixed abutment positioned to obstruct movement of said piston, the admission of fluid pressure to said cylinder serving to swing said housing away from said abutment so as to move said shoe from an inner idle position to an outer position at the basket side wall, a fluid containing chamber in the housing having a sealed movable wall portion carrying a member protruding from another side of the housing, said chamber having a bleeder outlet, and a fixed abutment engaged by said protruding member, in movement of the housing away from the first mentioned

abutment, so as to compress said wall portion against fluid in said chamber and thereby retard such movement as the shoe approaches its outer position, said mounting member comprising an upright pivot pin holding an outer portion of said housing, an inner portion thereof holding said shaft, and said fluid pressure cylinder being formed in an intermediate portion thereof and extending transverse to said pivot pin, the said abutments being integral upright elements of said mounting member and the housing being swingable in a limited arc between the abutments.

18. A discharger for a centrifugal machine having a basket to hold an annular body of solids, the basket being formed with a centrally open top and being rotatable within a fixed casing having a centrally open top overlying the basket top, said mechanism comprising a mounting member adapted to be fixed on the casing top, a housing pivoted on said member to swing in a horizontal path, an upright discharger shaft carried by said housing in axially slidable but non-rotatable relation thereto, the shaft being adapted to extend downward into the basket through said top and carrying on its lower end a discharger shoe for removing solids from the basket, a fluid pressure cylinder in said housing adapted to be connected with a source of pressure fluid and containing a reciprocable piston, a fixed abutment positioned to obstruct movement of said piston so that the admission of pressure fluid to said cylinder swings the housing about its pivot in a direction to move said shoe outwardly to the basket side wall, spring means acting between the housing and said mounting member to urge the housing in the opposite direction for inward movement of the shoe, and a double-acting fluid pressure cylinder carried by the housing and having a piston connected with said shoe for moving it and said shaft vertically within the basket.

19. A discharger for a centrifugal machine having a basket to hold an annular body of solids, the basket being formed with a centrally open top and being rotatable within a fixed casing having a centrally open top overlying the basket top, said mechanism comprising a mounting member adapted to be fixed on the casing top, a housing pivoted on said member to swing in a horizontal path, an upright discharger shaft carried by said housing in axially slidable but non-rotatable relation thereto, the shaft being adapted to extend downward into the basket through said open top and carrying on its lower end a discharger shoe for removing solids from the basket, a fluid pressure cylinder in said housing adapted to be connected with a source of pressure fluid and containing a reciprocable piston, a fixed abutment positioned to obstruct movement of said piston so that the admission of pressure fluid to said cylinder swings the housing about its pivot in a direction to move said shoe outwardly to the basket side wall, spring means acting between the housing and said mounting member to urge the housing in the opposite direction for inward movement of the shoe, and a double-acting fluid pressure cylinder carried by the housing and having a piston connected with said shoe for moving it and said shaft vertically within the basket, the stroke of the last mentioned piston being substantially equal to the internal height of the basket side wall less the height of the discharger shoe.

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