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ADJUSTABLE LIMIT MEANS FOR MINING
DISINTEGRATING MECHANISM

2,756,038

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2 Sheets-Sheet 1

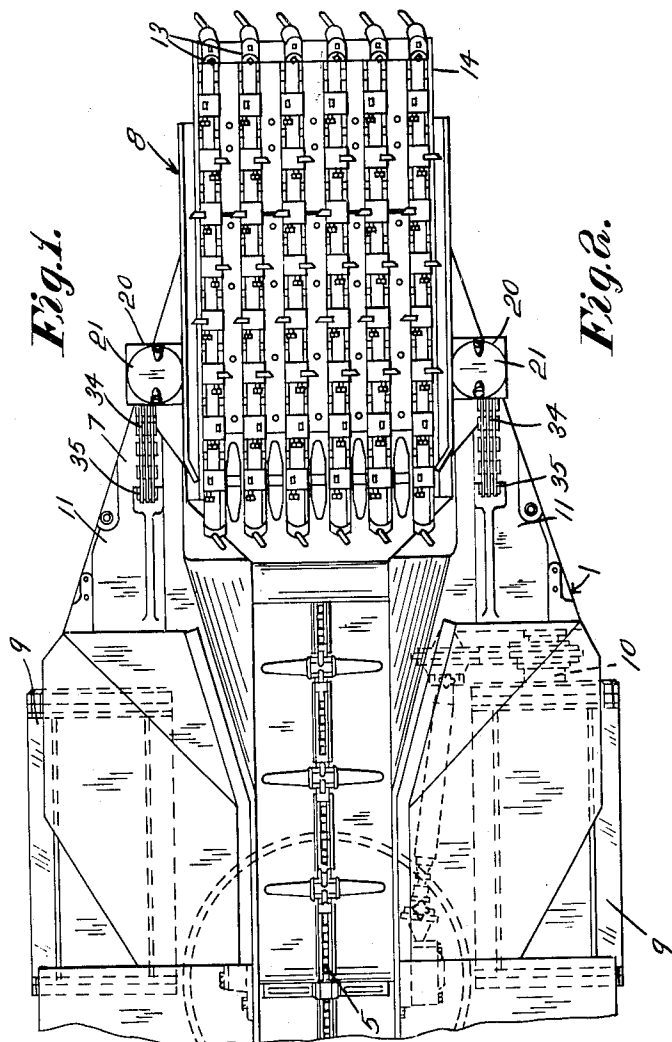


Fig. 1.

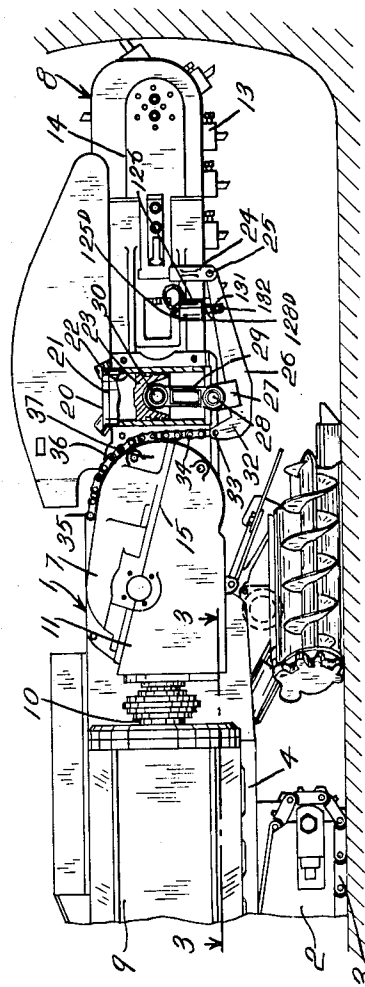


Fig. 2.

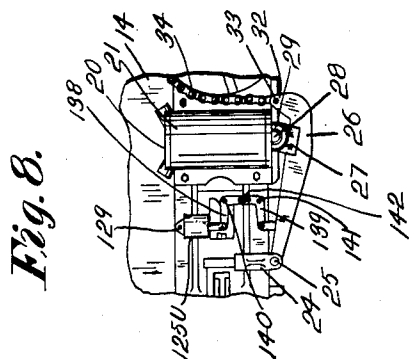


Fig. 8.

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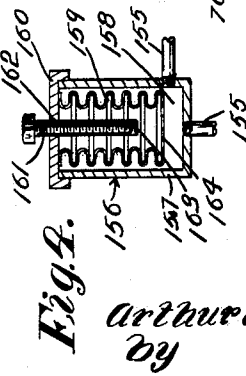
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ADJUSTABLE LIMIT MEANS FOR MINING DISINTEGRATING MECHANISM

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17 Claims. (Cl. 262—29)

This invention relates to mining apparatus and more especially to mining apparatus of the so-called continuous miner type.

One well-known continuous miner comprises a portable base provided with supporting and propelling means and bears upon its base a turntable mechanism upon which there is supported for advance and retraction in radial lines disintegrating mechanism. The disintegrating mechanism includes a series of chains equipped with disintegrating elements, and is disposable in a downwardly inclined position for sumping, is swingable upwardly, after sumping is completed, to tear loose and disintegrate a relatively wide strip of coal or other mineral, and is then movable horizontally rearwardly while in an upwardly inclined position to complete the removal of an upright band of coal (or other mineral) having substantially parallel upper and lower edges. The disintegrating mechanism has associated with it forwardly disposed material-receiving and handling arrangements for delivering the disintegrated material adjacent the center of the turntable, and desirably other conveying arrangements are provided to transport the disintegrated material from the central portions of the turntable to an appropriate point of discharge. The sumping and withdrawing is accomplished by hydraulic cylinder and piston mechanisms, as also is upswing, these hydraulic mechanisms providing for great precision of control. Other miners have walking type supporting and moving means and are sumped and withdrawn by bodily advance and retraction, and have so-called open center bars with side chains and central drums provided with cutter bits, but the method of rectilinear sumping, swinging in vertical planes, and rectilinear retraction are features common to the usual operation of miners of both types.

It is desirable to maintain the bottom and top (the floor and roof) of the working place approximately level, and it is desirable to be able to alter the level of the floor and/or of the roof as the thickness of the seam and/or its inclination vary. It is therefore desirable to provide an arrangement which will permit adjustable control of the limits of the swinging movement of the disintegrating apparatus—not only the lower limit but the upper limit—and to have such arrangements include means which automatically interrupt the movements of the disintegrating apparatus when the latter attains to the desired limit positions chosen for particular operating conditions. It is further desirable to provide adjustment-effecting arrangements equipped with devices enabling quick and easy change of the level of the prospective floor or roof, or both. It is further desirable, in order that it may be used conveniently with apparatus which may not already be provided with such adjuncts or components, to make the apparatus of such a type and character that it may be incorporated in the upswing effecting or downswing controlling means of a miner already in the field, with a minimum of change.

It is an object of my invention to provide an improved mining apparatus having incorporated in it improved

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means for controlling a limit of a vertically swingable coal or other mineral-attacking instrumentality. It is another object of my invention to provide an improved adjustable limit device for a vertical swing mechanism of a continuous miner. It is a further object of my invention to provide improved adjustable limit devices for each of the vertical swinging operations of a continuous miner. It is still another object of the invention to provide an improved hydraulically controlled adjustable limit mechanism for use with the hydraulically swung disintegrating devices of a continuous miner. It is yet a further object of the invention to provide an improved, readily adjustable limit means for controlling the range of the movement of a hydraulic motor actuated disintegrating mechanism. Broadly, it is an object of the invention to provide improved limit means for use with vertically swingable apparatus which it is desirable to have brought to rest upon the attainment of a predetermined position. Other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawings, in which one illustrative embodiment of the invention is shown for purposes of illustration,

Fig. 1 is a plan view, and Fig. 2 is a side elevational view of the forward end of one form of mining apparatus of the continuous miner type.

Fig. 3 is a horizontal sectional view, with parts omitted, on the approximate plane of the line 3—3 of Fig. 2. This view is included principally to show the sumping and withdrawing arrangements.

Fig. 4 is a detail central section on an enlarged scale through an adjustable chamber device forming a part of the illustrative embodiment of the invention.

Fig. 5 is a detail vertical sectional view on an enlarged scale through a portion of a mechanism which is provided to effect the automatic return of a control element to neutral position when the device which it controls reaches either of two predetermined positions.

Fig. 6 is a diagrammatic view of a control mechanism in which the invention is embodied in its illustrative form.

Fig. 7 is an enlarged, diagrammatic view, partially in section, of a portion of the apparatus shown in Fig. 6.

Fig. 8 is a detail elevational view of a disintegrating apparatus swinging mechanism.

Referring now to the accompanying drawings, the forward end of a continuous mining apparatus 1 is shown in Figs. 1 and 2. This apparatus includes a suitably supported and movable base 2 herein shown as supported on tractor treads 3. The base is shown as carrying a turntable 4 rotatable about a vertical axis 5 (see Fig. 1) and carrying, reciprocally mounted thereon, a frame 7 carrying a disintegrating mechanism 8, which is herein in the form of a swinging arm structure. The turntable 4 supports a pair of laterally spaced disintegrating mechanism driving motors 9 connected by extensible shaft means 10 with gearing, not shown, in gear housings 11 mounted on and forming a part of the reciprocable frame 7. This gearing drives the disintegrating apparatus 8, which, as shown herein, includes a series (six are shown) of disintegrating chains 13 which are adapted to circulate about a swingable support 14.

The disintegrating mechanism is vertically swingable about a horizontal axis 15 on the frame 7, and may be swung upwardly about the axis 15 by mechanism which includes a pair of single-acting hydraulic cylinder and piston mechanisms 20, 20. Each of these includes a cylinder element 21 secured to one side of the frame structure 14 and having a bore 22. Pistons 23, suitably packed, are reciprocally mounted in the bores 22. Secured to the opposite sides of the frame structure 14 at points nearer its free end than are the cylinder elements 21 are downwardly extending brackets 24 which have pivotally con-

connected to them at 25 the forward ends of rearwardly extending lever elements or reaction members 26. The members 26 carry brackets 27, to which there are pivotally connected by pins 28 the lower ends of connecting rods 29, the upper ends of which are pivotally connected at 30 to the pistons 23, which are reciprocable in the bores 22 of the cylinder elements 21. The rearward ends of the lever elements 26 have upwardly extending short arms 32 to which there are connected at 33 flexible chains 34 which, at their other ends, are secured as at 35 to the upper sides of curved forward ends 36 of a gear casing and frame structure 37 which pivotally supports the disintegrating mechanism and houses the drive for the chains 13 of the latter. The cylinder elements 21 each have a common fluid supply and discharge connection, these being designated 39 for one of the same and 40 for the other (see Fig. 6). When fluid is supplied to the cylinder bores 22 above the pistons 23, the frame structure 14 is swung upwardly, and when fluid is vented from the spaces mentioned the frame structure swings downwardly about the pivot 15, of its own weight. As will later be explained, fluid is supplied to the cylinders 21 simultaneously, and it is also vented from these cylinders simultaneously, there being conduits 42 and 43 extending from a common supply and bent conduit 44 and connected with the common supply and discharge connections 39 and 40. In a manner later to be described, fluid may be supplied to the conduit 44 to effect upswing of the disintegrating mechanism, and vented from the conduit 44 to permit downswing of the disintegrating mechanism, and this supplying and venting is controlled by a manually operable valve device generally designated 46, of which more will be said later.

Before describing the adjustable limit means it may be worth-while briefly to describe the sumping and withdrawing feature of the continuous miner illustrated. As shown in Fig. 3 sumping and withdrawing movements of the disintegrating apparatus will be effected by mechanism including cylinders 51 and 52. These contain pistons 53, 54 connected by piston rods 55 and 56 with brackets 57 attached to the frame 7. The cylinders 51 and 52 and their associated pistons form double-acting motors, and fluid may be supplied to their opposite ends through conduits 59 and 60, supply to the conduit 60 effecting withdrawal movement.

As the sumping and withdrawing movements effected by the cylinder and piston mechanisms 51, 53, and 52, 54, and the upswing movement of the mechanism 8 are all hydraulically accomplished a reservoir 62 is provided for hydraulic fluid. This reservoir is connected by a conduit 53 to a pump 64 which discharges to a conduit 65 opening into an end element 66 of a valve box structure of the valve device 46. The valve box structure includes another end element 68 and a pair of intermediate valves boxes 69 and 70. The valve box 69 contains a valve 71, diagrammatically shown, and controlled by an operating handle 72, and controlling the supply of fluid through the conduits 59 and 60 and the venting of fluid from these same conduits and back to the reservoir 62 through a return conduit 73. The conduit 59 is connected by a conduit 75 under the control of a pressure relief valve 76 with a return conduit 77 leading back to the tank or reservoir 62. In like manner the conduit 60 under the control of a pressure relief valve 78 is adapted to permit the return of hydraulic fluid through a conduit 79 and the conduit 77 to the reservoir 62. The purpose of the relief valves 76 and 78 is to prevent excessive pressures being exerted by the sumping and withdrawing mechanism.

It may be noted that the conduit 44 is connected under the control of a pressure relief valve 81 and through a drain conduit 82 with the conduit 73, so that if there should be a roof fall upon the disintegrating mechanism when the latter was in raised position, the disintegrating mechanism could be depressed by the weight upon it, following displacement of fluid from the cylinders 21, 21 through the conduits 42 and 43 and the conduit 44, pres-

sure relief valve 81, return conduit 82 and drain conduit 73. It may be noted that the end element 66 may have a relief valve incorporated in it in a customary manner, though the same is not believed to be necessary to illustrate in the drawing. When the valves in the valve boxes 69 and 70 are in mid-position, fluid is not supplied to any servomotor mechanism and the fluid flows freely from the conduit 65 to the conduit 73 and back to the tank 62 in a well known manner. The valve element 71 is movable downwardly in Fig. 6 to supply fluid to the conduit 60, and is movable upwardly in Fig. 6 to supply fluid to the conduit 59. The valve box 70 contains a valve element 90 having an operating handle 91. On movement of the handle 91 downwardly in Fig. 6 to move the valve element 90 downwardly from mid-position, fluid is vented from the cylinder and piston mechanisms 20, 20 and the disintegrating apparatus 8 is therefore free to swing downwardly. When the valve element 90 is moved upwardly from mid-position in Fig. 6 fluid will be supplied to the cylinder and piston mechanisms 20, 20 to effect upswing of the disintegrating apparatus. Whenever the valve element 90 is brought to mid-position it will automatically interrupt whichever movement, up or down, the disintegrating apparatus may be in process of making.

The foregoing description makes it possible now effectively to consider the adjustable motion limiting devices. These are hydraulically operated and they effect their limiting of movement of the disintegrating apparatus through the bringing of the valve element 90 to its mid or neutral position. Referring to Fig. 5 it will be observed that the operating element 91 has extending laterally from it an arm 95 terminating in oppositely extending portions 96' and 96''. It will be observed that when the operating element 91 is moved downwardly in Fig. 5 the portions 96' and 96'' will be moved downwardly. When the element 91 is moved upwardly from mid-position the portions 96' and 96'' will be moved upwardly from the position shown in Fig. 5. Servo-mechanisms 101 and 102 suitably mounted, as represented by fragments of brackets 103' and 103'', are arranged in such conjunction with the portions 96' and 96'' that they may actuate whichever one of these portions is displaced towards the servo-mechanism which cooperates with it and return thereby the operating element 91 and the valve 90 to neutral or mid-position. Each of the servo-mechanisms includes, as illustrated, a tubular body 105 having a bore 106, in which a hollow guide element 107 is reciprocably guided, this guide element having a nose 108 adapted to engage, in the case of servo-mechanism 101, the portion 96', and in the case of the servo-mechanism 102 the portion 96''. Springs 110 act between the nearer ends of the elements 107 and shoulders 111 and normally maintain the elements 107 as it were "retracted." The elements 107 may be forced towards each other by plungers 112 guided in cylinders 113 and 114 carried by the members 105. The cylinders 113 and 114 and plungers 112 are but representative of any suitable relatively leakage-free expansible chamber devices which may be used for the movement of the elements 107 in a direction to move the valve 90 to mid-position. It may be noted that when the nose portions 108 are spaced from each other their maximum permitted distance, they will be equally spaced from the portions 96' and 96'' when the valve element 90 is in mid-position. The travel of the portions 96' and 96'', as the valve 90 is moved to its different operating positions, is such as to bring these portions into position for engagement by the nose portions 108 so that such nose portions can effect the return of the valve 90 to mid-position. The amount of free movement of the nose portions is only such as will suffice to return the valve 90 to mid-position, and the valve 90 can be moved its full travel in either direction from mid-position without there being obstruction of the movement of the portions 96' or 96'' by the nose portions 108 when the latter are in retracted position. The springs 110 are com-

paratively stiff as will later appear, and for reasons which will shortly be explained. Fluid may be admitted to the cylinder 113 of the servo-motor mechanism 101 through a conduit 121, and through a conduit 122 to the cylinder 114 of the servo-mechanism 102.

The disintegrating mechanism swing controlled devices for supplying fluid to the servo-mechanism cylinders 113 and 114 may now be described. Each includes a fluid displacement apparatus 125. These may be made alike, for economy in number of manufactured parts, or in the interest of simplicity of actuation may be different from each other. Herein they will be illustrated as essentially alike, and each, as shown, includes a cylinder 126, a piston 127, and a piston rod 128. The cylinders 126 may be supported by the frame 14, and herein are shown as pivotally supported by the latter at 129. The piston rods are operatively connected, in the arrangement shown, to the lever elements 26, as there is relative movement between the bar and the lever elements during up and down swing, the angle between these elements increasing during upswing and decreasing during lowering or downswing. As it is desired that one of the fluid displacement apparatuses displace fluid during upswing and the other during downswing the connections between the piston rods 128 and the lever 26 will be appropriately selected. To distinguish between the upswing and downswing controls all of the parts bearing like numerals are distinguished by letters: U for upswing and D for downswing or lowering.

Apparatus 125D, the fluid displacement apparatus which is effective in limiting downswing, has its piston rod 128D connected by an elongated eye portion 131 to a pin 132 on the lever 26 at one side of the apparatus. The use of the eye is to maintain the parts in cooperating relation, having in mind the pivotal mounting at 129. If the device 125D were solidly fixed to the frame 14, the piston rod 128D might simply engage at a proper time an abutment surface on the lever 26.

Apparatus 125U is intended to have its piston 127U displaced upwards as the other lever 26 (there is one at each side of the disintegrating mechanism) moves away from the frame 14, so the piston rod 128U is connected as shown, by a double bell crank mechanism 134 and a depending link 135 ending in an elongated eye 136, with a pin 137 on the other lever, so as to get the desired motion. The double bell crank mechanism comprises bell crank elements 138 and 139 pivotally mounted on one side of the frame 14 on pivots 140 and 141 respectively, and pivotally connected together, with necessary play, at 142. Evidently, with this arrangement the device 125U will displace fluid as the bar or frame 14 is raised. The apparatus 125U and associated parts are shown in Fig. 8.

There have now been described two devices 125U and 125D which when supplied with fluid will take in an increased volume when actuated in one direction and displace it when actuated in the other direction, each displacing fluid when the disintegrating mechanism is moved in a direction opposite to that which will cause the other to displace fluid.

The fluid displaced by the devices 125U and 125D is what makes the servo-mechanisms 101 and 102 selectively operative.

It may be noted that each piston 127 is normally pressed downwardly in its cylinder 126, wherefore each device 125D or 125U normally tends to be as full of fluid as the relative position of its parts permits. Springs 145 normally maintain the pistons as far down in their cylinders as possible, and tend to return them to their bottom positions.

A source of fluid, herein shown as a tank 150 desirably located higher than either of the devices 125U and 125D, is provided as a supply for fluid to the devices 125U and 125D. From the tank 150 a conduit 151, having in it a check valve 152 opening towards the device 125U, ex-

tends to the top of the cylinder 126U. This prevents air binding. If excessively high pressure is caused to exist in the conduit 151 it may be relieved by by-pass connection 153 having a properly set relief valve 154 in it and leading back to the tank 150. The conduit 151 is connected by conduit means 155 with the conduit means 121. The conduit means 155 has connected with it a variable capacity device 156 herein shown as including a chamber forming casing 157 providing a chamber 158 which serves as a connection between spaced portions of the conduit means 155. Within the chamber 158 of the casing 157 there is mounted a bellows device 159. This bellows device may be of any suitable form and is supported by a cover 160 for the casing 157. The top of the bellows is secured to and hermetically sealed relative to the inside surface of the cover 160 and the cover 160 is sealed relative to the casing 157. An adjustable stop 161 is arranged to limit the collapsing movement of the bellows 159 and is threadedly mounted at 162 in the cover 160 and has an end 163 adapted to be engaged by the head 164 of the bellows 159. It will be evident that as fluid is displaced by upward movement of the piston 127U and is forced away from that fluid displacing means through the conduits 151, 155 it cannot return to the tank 150 past the check valve 152, and the relief valve 154 is set too high to permit the displaced fluid to pass through it.

The fluid displacement device 125D is connected with the tank 150 by a conduit 151', which has a relief valve (154') controlled by-pass connection 153' with the tank and which contains a check valve 152'. The conduit 151' is connected by a conduit 155' having between its ends another variable capacity device 156', with the conduit 122 leading to the servo-mechanism for returning the valve 90 to mid-position when the desired lower limit of the disintegrating mechanism is reached.

It will be evident that when either of the pistons 127 is displaced upwardly in its cylinder 126 fluid will be displaced from such cylinder and will be forced in the direction of one of the valve-centering servo-mechanisms. It will produce no movement of the respective servo-mechanism, however, to restore the valve 90 to mid-position until after the connected variable capacity device 156 or 156' has had its collapsible bellows compressed as far as the stop screw 161 permits. It will be evident that by varying the adjustments of the stop screws the points at which the control valve 90 will be returned to central position will be altered. It will be evident that, if desired, the inherent resilience of the collapsible bellows 159 can be augmented by a spring housed within the bellows. The resistances to movement of the relatively moving elements will be made such that the bellows devices 159 will be compressed before there is any valve centering movement of the servo-motor devices 101 and 102, and the setting of the relief valves 154 and 154' will be such that these will not open until a much higher pressure is produced than is necessary to recenter the valve element 90. It will be evident that through the provision of the devices 156 and 156' there may be greater or smaller movements of the piston 127 relative to the cylinder 126 before the valve 90 will be returned from any of its displaced positions to mid-position, and accordingly that the upper and lower points at which the disintegrating mechanism will have its movements stopped are readily variable.

From the description which has been given it will be apparent that I have illustrated devices for limiting the swing of an arm or boom element in either direction, said devices including what amounts to a pump, a servo-motor controlling the movement of said boom or arm, and actuated by fluid supplied by the pump, and means for delaying as desired the actuation of the servo-motor by the fluid delivered by the pump, consisting of means variable in volume at will for receiving the fluid discharged by the pump, at pressures less than sufficient to

operate said servo-motor, until a desired instant for actuation of said servo-motor arrives. There is a mechanism of the character mentioned for limiting each of the opposite movements of the boom or arm. The pumplike devices are respectively adapted, in the construction chosen for purposes of illustration, to be actuated by a thrust produced upon relative movement between certain parts and by a tension or traction exerted by opposite relative movement between said parts. The pump devices are adapted to be automatically self-filling, and the control systems are automatically protected by relief valves set at pressures higher than the pressures necessary to operate the servo-motor, while the pressures necessary to operate the servo-motors exceed the pressures necessary to effect yielding of the adjustable accumulator-like devices which serve as timers for the exercise of the controls.

The arrangement may obviously have either half thereof employed without the other as desired, and the whole is simple, positive in operation, adjustable with precision, and results in not only a stopping of the element whose movements are to be limited at precise points desired, but to lock the adjusted element in its selected limit positions, for the valve 90 in mid-position is adapted to seal pressure within the cylinders 21, subject however, to the automatic control exercised by the pressure relief valve 81 in the event of a roof fall, or the like.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim is:

1. In combination, a support, an arm structure pivotally supported on and swingable relative to said support, hydraulic mechanism for effecting such swinging, valve means for controlling the operation of such hydraulic mechanism including a valve device, means for moving said valve device to effect swinging of said arm structure by said hydraulic mechanism, and means for moving said valve device to interrupt swinging when said arm structure reaches a desired position including a fluid displacement device actuated upon swinging of said arm structure, a variable capacity chamber, and a fluid operable servo-mechanism for effecting the last mentioned movement of said valve device, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

2. In combination, a support, an arm structure pivotally supported on and swingable relative to said support, hydraulic mechanism for effecting such swinging, valve means for controlling the operation of such hydraulic mechanism including a valve device, means for moving said valve device to effect swinging of said arm structure by said hydraulic mechanism, and means for moving said valve device to interrupt swinging when said arm structure reaches a desired position including a fluid displacement device actuated upon swinging of said arm structure, a variable capacity chamber, and a fluid operable servo-mechanism for reflecting the last mentioned movement of said valve device, and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other, said variable capacity chamber having a limitedly movable wall yieldable for the full distance available to it at a pressure below that required to initiate operation of said servo-motor.

3. In combination, a support, an arm structure pivotally supported on and swingable relative to said support,

hydraulic mechanism for effecting such swinging, valve means for controlling the operation of such hydraulic mechanism including a valve device, means for moving said valve device to effect swinging of said arm structure by said hydraulic mechanism, and means for moving said valve device to interrupt swinging when said arm structure reaches a desired position including a fluid displacement device actuated upon swinging of said arm structure, a variable capacity chamber, and a fluid operable servo-mechanism for effecting the last mentioned movement of said valve device, and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other, said variable capacity chamber having a movable bounding wall and means for limiting its movement to different predetermined distances.

4. In combination, a support, an arm structure pivotally supported on and swingable relative to said support, hydraulic mechanism for effecting such swinging, valve means for supplying pressure to effect the operation of such hydraulic mechanism including a valve device, means for moving said valve device to effect fluid supply to cause swinging of said arm structure by said hydraulic mechanism, and means for moving said valve device to interrupt fluid supply when said arm structure reaches a desired position including a fluid displacement device actuated upon swinging of said arm structure, a variable capacity chamber, and a fluid operable servo-mechanism for effecting the last mentioned movement of said valve device, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

5. In combination, a support, an arm structure pivotally supported on and swingable relative to said support, hydraulic mechanism for effecting such swinging, valve means for controlling the operation of such hydraulic mechanism including a valve device movable to vent fluid from said mechanism to permit swinging thereof, means for moving said valve device to fluid venting position, and means for moving said valve device to interrupt venting when said arm structure reaches a desired position including a fluid displacement device actuated upon swinging of said arm structure, a variable capacity chamber, and a fluid operable servo-mechanism for effecting the last mentioned movement of said valve device, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

6. In combination, a support, an arm structure pivotally supported on and swingable relative to said support, hydraulic mechanism for effecting such swinging, valve means for controlling the operation of such hydraulic mechanism including a valve device having a mid-position in which said hydraulic mechanism is cut off from both supply and exhaust, and mutually opposite positions in which said mechanism is connected for fluid supply and for fluid exhaust respectively, means for moving said valve device to either of its mutually opposite positions, and means for moving said valve device to mid-position when said arm structure reaches either a desired upper or a desired lower position including, individual to each control, a fluid displacement device actuated upon swinging of said arm structure in one direction, a variable capacity chamber, and a fluid operable servo-mechanism for effecting the last mentioned movement of said valve device, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said

fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

7. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber, a fluid displacement device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by the relative movement between said frame and said lever.

8. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling venting of operating fluid from said cylinder and piston mechanism including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber, a fluid displacement device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by the relative movement between said frame and said lever.

9. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply and venting of operating fluid relative to said cylinder and piston mechanism including, individual to each control, a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber, a fluid displacement device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by one of the relative movements between said frame and said lever.

10. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber, a device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by that relative movement between said frame and said lever which reduces the mean spacing between them.

11. In a continuous mining apparatus, a support, a dis-

integrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber, a device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by that relative movement between said frame and said lever which increases the mean spacing between them.

12. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply and venting of operating fluid relative to said cylinder and piston mechanism including devices carried by said disintegrating apparatus supporting frame and comprising pumps actuated one by the increase and the other by the decrease of the mean distance between said pivotally mounted disintegrating apparatus supporting frame and said lever and further including fluid receiving chambers of optionally variable capacity preset before actuation of means for controlling is initiated, one in communication with the discharge of each of said pumps.

13. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a valve movable from a closed to an open position to effect power swinging of said disintegrating apparatus and means for automatically returning said valve to its closed position including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply, and in communication with said chamber, a device for generating a valve moving force carried by said disintegrating apparatus supporting frame and comprising a pump actuated by relative movement effected by power between said frame and said lever.

14. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a valve movable from a closed to a venting position to effect gravity swinging of said disintegrating apparatus and means for automatically returning said valve to its closed position including a fluid receiving chamber of optionally variable capacity preset before the initiation of such supply and, in communication with said chamber,

a device for generating a valve moving force carried by said disintegrating apparatus supporting frame and comprising a pump actuated by the relative movement between said frame and said lever which occurs during gravity swinging of said disintegrating apparatus supporting frame.

15. In a continuous mining apparatus, a support, a disintegrating apparatus having a supporting frame pivotally mounted on said support to swing in vertical planes, power operated mechanism for swinging said disintegrating apparatus supporting frame about its pivot including at least one lever pivotally connected to said disintegrating apparatus supporting frame and connected also to said support and hydraulic cylinder and piston mechanism acting between said lever and said disintegrating apparatus supporting frame, and means for controlling the supply of operating fluid to said cylinder and piston mechanism including a valve movable from a closed to an open position to effect swinging of said disintegrating apparatus supporting frame and means for automatically returning said valve to its closed position including a valve moving servo-motor, a device carried by said disintegrating apparatus supporting frame and comprising a pump actuated by relative movement between said frame and said lever for supplying fluid under pressure for the actuation of said servo-motor and means for delaying the actuation of said servo-motor by fluid so supplied including chamber-forming means for receiving and maintaining, at a pressure less than is required for the actuation of said servo-motor, fluid initially supplied by said device.

16. In combination, a support, an arm structure supported on and movable relative to said support, hydraulically controlled mechanism for controlling such relative movement, valve means for controlling the operation of such hydraulically controlled mechanism including a valve device open during the occurrence of such relative movement, and means for moving said valve device to interrupt such relative movement when said arm structure reaches a desired position including a fluid displacement device actuated upon movement of said arm structure relative to said support, a variable capacity chamber, and

a fluid operable servo-mechanism for effecting closure of said valve device, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

17. In combination, a support, an arm structure supported on and movable relative to said support, hydraulically controlled mechanism for controlling such relative movement, valve means for controlling the operation of such hydraulically controlled mechanism including a valve device movable between open and closed positions and occupying one of said positions during the occurrence of such relative movement, and means for moving said valve device to interrupt such relative movement when said arm structure reaches a desired position including a fluid displacement device actuated upon movement of said arm structure relative to said support, a variable capacity chamber, and a fluid operable servo-mechanism for effecting movement of said valve device to the other of its positions aforesaid, said variable capacity chamber having a wall movable to vary its volume and yieldable at a pressure below that requisite to initiate operation of said fluid operable servo-mechanism and means for connecting said fluid displacement device, said variable capacity chamber and said servo-mechanism all in communication with each other.

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