Sept. 2, 1952 H. F. SILVER ET AL 2,608,823

HYDRAULIC CONTROL APPARATUS FOR ADJUSTING AND LOCKING MECHANISM

Original Filed May 28, 1947 4 Sheets-Sheet 1

Fig. 1.

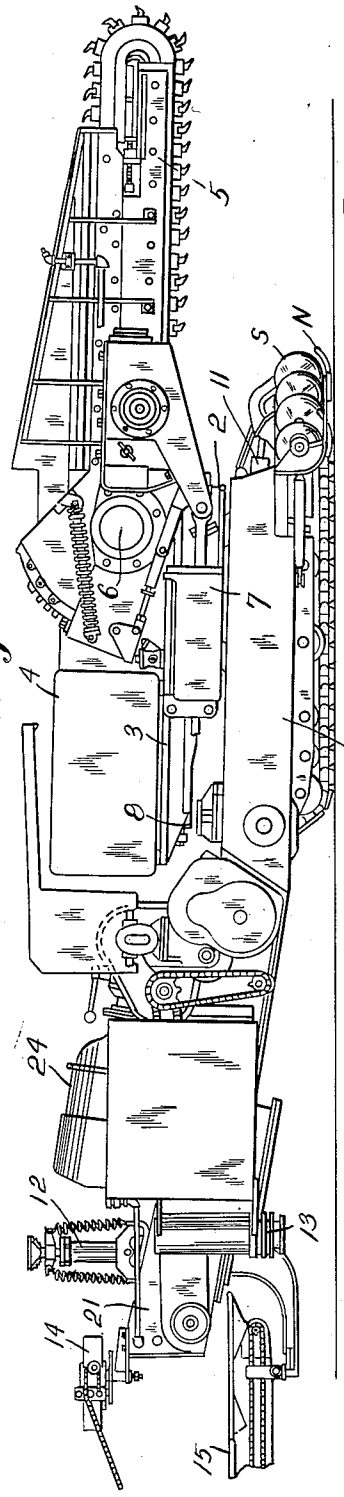
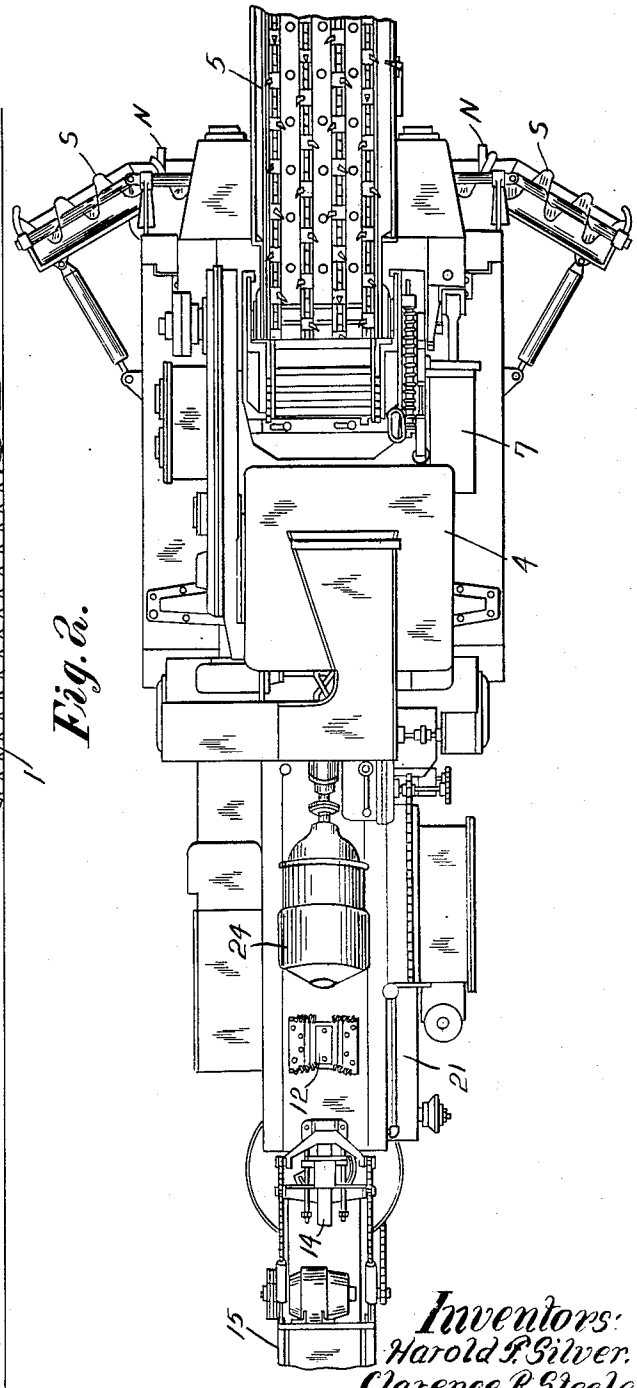


Fig. 2.



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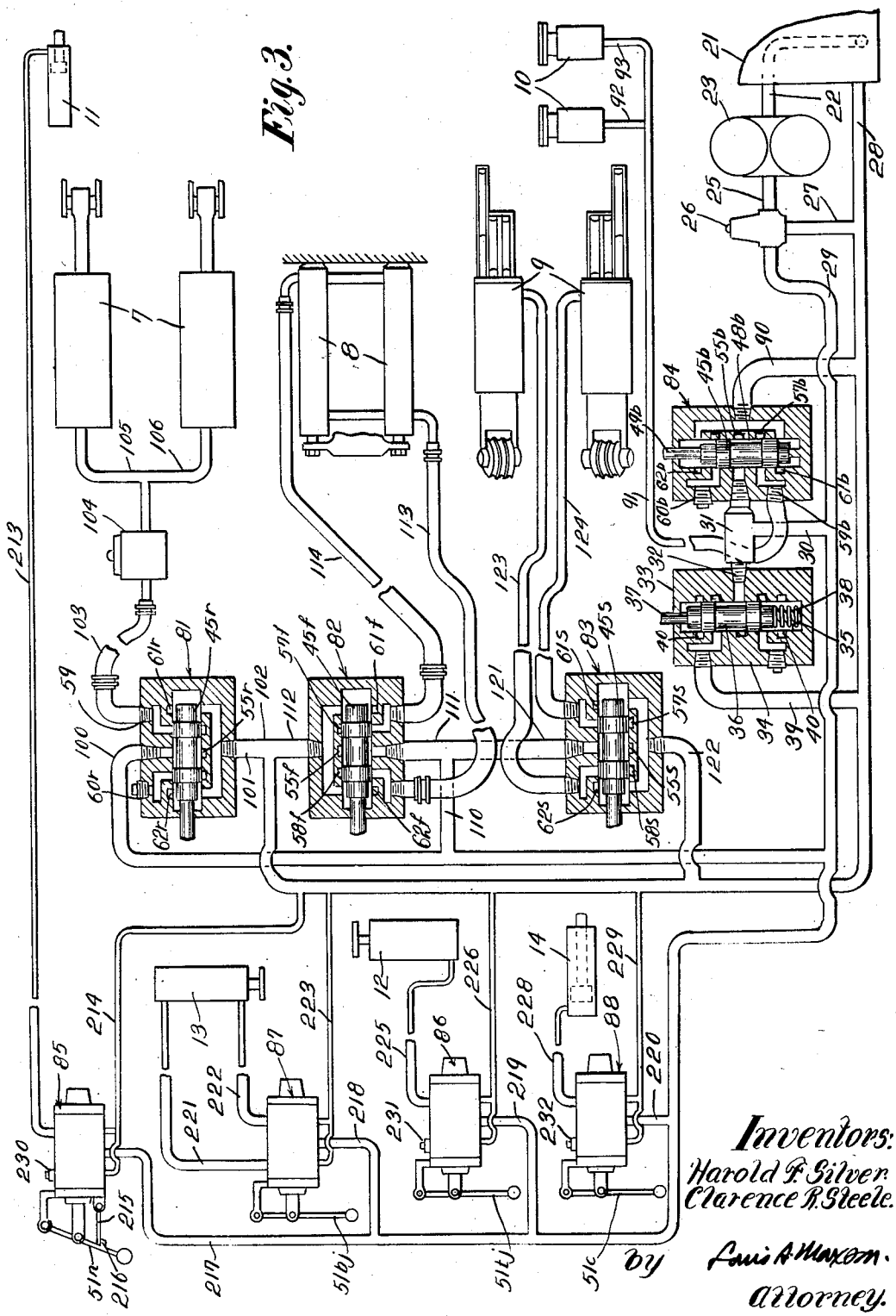
HYDRAULIC CONTROL APPARATUS FOR ADJUSTING AND LOCKING MECHANISM

Original Filed May 28, 1947 4 Sheets-Sheet 2

Fig. 3.



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HYDRAULIC CONTROL APPARATUS FOR ADJUSTING AND LOCKING MECHANISM

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Fig. 4.

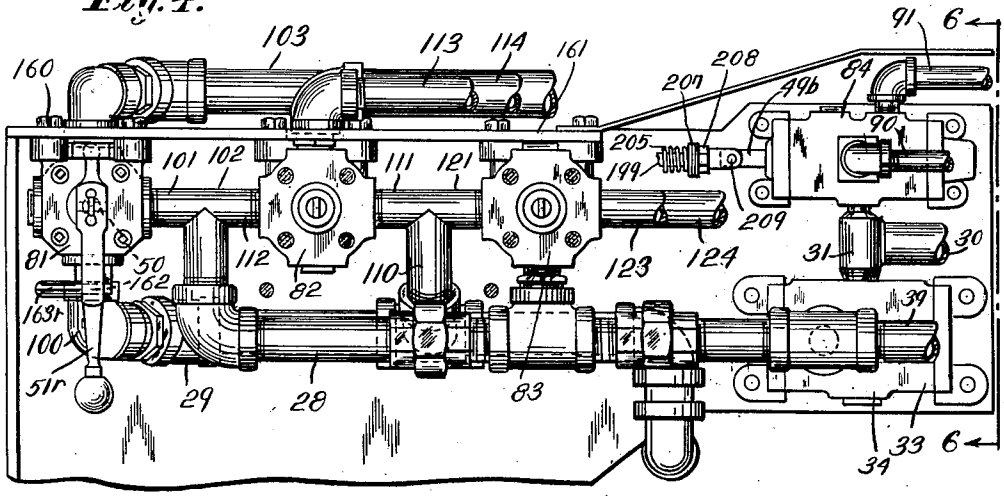


Fig. 5.

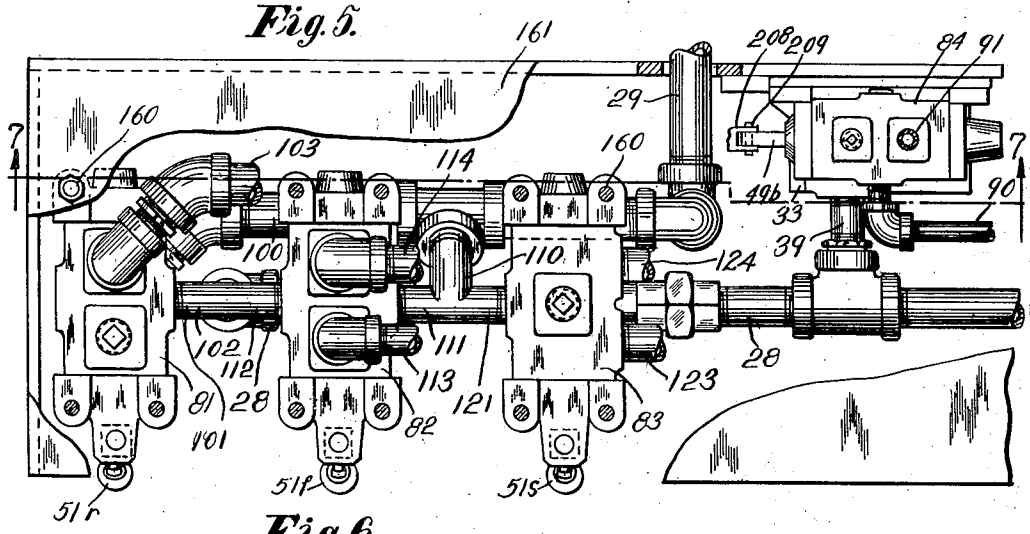
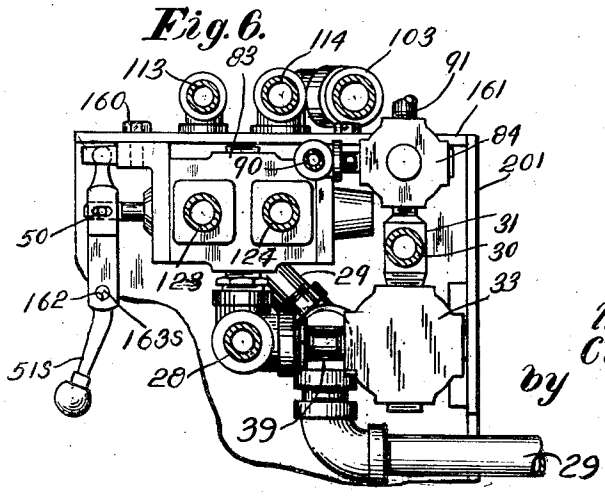


Fig. 6.



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Original Filed May 28, 1947 4 Sheets-Sheet 4

Fig. 7.

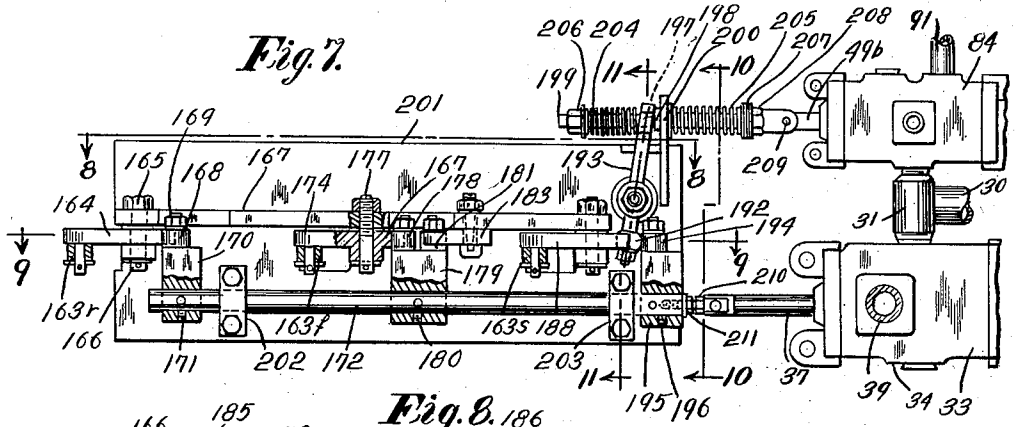


Fig. 8.

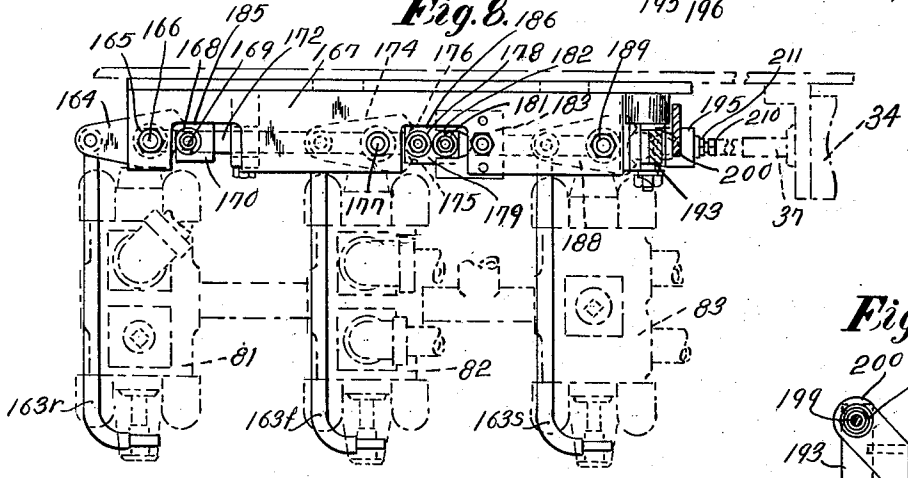


Fig. 10.

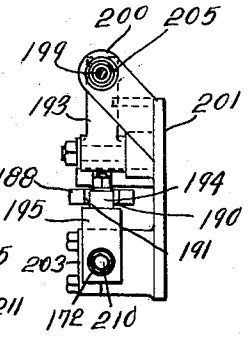


Fig. 9.

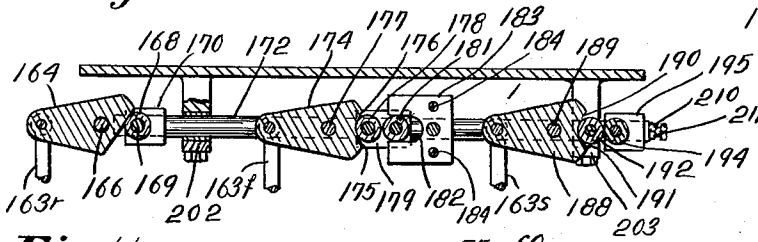
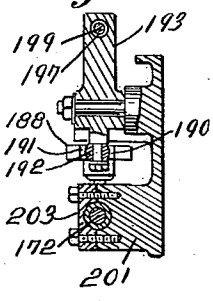


Fig. 11.



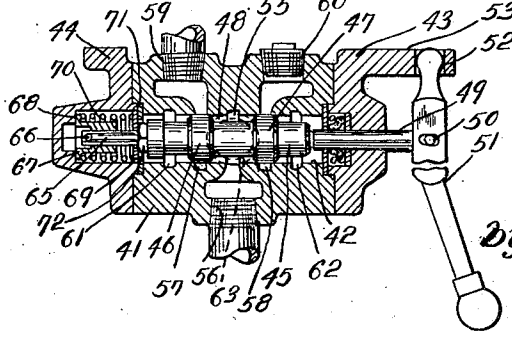


Fig. 12.

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UNITED STATES PATENT OFFICE

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HYDRAULIC CONTROL APPARATUS FOR ADJUSTING AND LOCKING MECHANISM

Harold F. Silver and Clarence R. Steele, Denver, Colo., assignors to Joy Manufacturing Company, a corporation of Pennsylvania

Continuation of application Serial No. 750,982, May 28, 1947. This application November 28, 1949, Serial No. 129,812

18 Claims. (Cl. 60—52)

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Our invention relates to hydraulic operating and control apparatus, and particularly to such apparatus which is especially, though not exclusively, adapted to the operation and control of mining apparatus.

In the copending application of Harold F. Silver, Serial No. 11,688, filed February 27, 1948 as a continuation-in-part of the Harold F. Silver application Serial No. 750,981 (now abandoned), filed May 28, 1947 for Apparatus and Method for Mining Coal or Other Minerals from the Solid, there is disclosed an apparatus for mining coal or other minerals from the solid, which apparatus includes motor operated vein-disintegrating means in the form of chain circulated cutter bits, so arranged and in such numbers that in the illustrative apparatus shown they are operative to disintegrate, by cutting and/or tearing out, the coal (for example) to a width on the order of a couple of feet and to a depth of perhaps eighteen inches to two feet, and in vertical bands of the height of the room or entry in which mining is progressing. The bits are supported during operation on guiding means which causes them to traverse elongated orbits, and their guiding means is mounted for the swinging of its forward, free end about a horizontal axis, and hydraulic means is provided for swinging the guiding means upwardly by power and permitting its lowering by gravity, and this hydraulic means is controlled by a manually adjustable valve which is movable into positions to supply fluid to the hydraulic swinging means to effect upward swing of the disintegrating means, to vent fluid from such swinging means, and to cut off the connection of such swinging means from both supply and exhaust. A further control means is also provided for automatically cutting off the supply of fluid to such swinging means when the desired elevation is reached, and this control means may be adjusted to cause interruption of fluid supply at different desired elevations.

In the apparatus mentioned, the disintegrating means and its driving motor and its upward swinging means are mounted for forward feed and for retraction by means of double-acting hydraulic means, and valve means is provided for cutting off fluid supply from both ends of said double-acting means, and for supplying fluid to either end while connecting the other end to exhaust. There is further provided a turntable relative to which the disintegrating apparatus is swung vertically and advanced and retracted and which guides the disintegrating means during advance and retraction, and this turntable is provided with hydraulic means for turning it on a vertical axis, so that the disintegrating means may act on the face upon a number of differently angularly positioned sections or bands, and cumulatively, in a relatively small number of attacks upon the face, advance the length of the entry or the depth of the room a distance equal to the horizontal depth of a unit section or band.

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Moreover, to hold the turntable against inadvertent change of horizontal angle, hydraulically controlled braking means is provided, with control means adapted to supply fluid to and to vent it from such hydraulically controlled braking means in such a manner that during the time when horizontal swinging of the turntable is being effected, the braking means can be released, but be applied when no change in lateral angle is desired.

The apparatus mentioned also includes a tilting arrangement, hydraulically operated, for the nose and cleanup devices of the apparatus, including a single-acting cylinder with means for supplying fluid to it to lift the parts whose positions it controls and for connecting the cylinder with exhaust so that the parts which it is adapted to lift may rest of their own weight on the mine bottom.

Again the apparatus includes a double-acting floor jack and a single-acting roof jack, and a single-acting cylinder and piston mechanism for controlling the tilt—height of the delivery end—of a tail conveyor when one is employed, with suitable valves manually controllable to provide for the appropriate fluid supplying and connection to exhaust of the hydraulic control devices.

In such application, however, all of the valve mechanisms disclosed are of a type which operates in midposition of the valve relative to its casing to permit a flow from the pump constituting the source of fluid back to the fluid tank or reservoir, and so constructed that whenever any valve is moved to admit fluid to operate the mechanism it controls, it interrupts such flow and causes a pressure to be built up in the supply line, so that the fluid is delivered, at a pressure determined by a relief valve, to the mechanism which has been connected to supply.

This present application discloses an analogous hydraulic operating and control system, using a type of control valve for each of the several operating mechanisms and the braking mechanism different from the valve units of said Silver sole application, and having a separate bypass control

valve controllable by at least the principal operating valves, and having a brake control valve having a novel control thereof by the horizontal swing control valve. All of the control valves, according to our invention, may control the bypass valve, or only a part of them may so operate, certain manipulations of another valve or other valves providing for the closure of the bypass valve when the development of an operating pressure is desired, and said bypass valve being otherwise left in a position to avoid useless waste of power and to prevent heating of the hydraulic fluid to no purpose.

From what has been said it will be evident that an object of our invention is to provide an improved hydraulic operating and control apparatus. It is another object of our invention to provide an improved operating and control apparatus for a mining apparatus. A further object of our invention is to provide an improved hydraulic operating and control apparatus including one or more primary control valves, and a normally open bypass valve arranged to connect the main pump discharge to the return line and having improved control means governed by said primary control valve or said primary control valves. Another object of our invention is to provide an improved hydraulic operating and control apparatus for an apparatus including mechanisms for effecting certain movements and having associated means for preventing the inadvertent making of such movements, with a coordinated control of such moving and movement-preventing means. A further object of our invention is to provide an improved hydraulic operating and control apparatus including at least one primary operation controlling valve, a bypass valve, and a holding control valve, with coordinated control of said valves so that said primary operation control valve may control both said bypass valve and said holding control valve. Again, an object of our invention is to provide an improved hydraulic operating and control apparatus including a bypass valve, and at least two primary control valves, one always operative to control said bypass valve upon its own operation to deliver fluid to a device controlled thereby, and further operable to develop an operating pressure for distribution by the other primary control valve, which is not so arranged as to exercise itself a control of such bypass valve, as hereinafter described. Other objects and advantages of our invention will hereinafter more fully appear.

In the accompanying drawing, in which there is shown one illustrative form which our invention may assume:

Fig. 1 is a side elevation of a machine of the character which forms a portion of the subject matter of the Harold F. Silver application above mentioned.

Fig. 2 is a plan view of the machine.

Fig. 3 is a diagrammatic view of a hydraulic system in which our invention, in its illustrative form is embodied.

Fig. 4 is a face view, with parts omitted, of a portion of our improved controlling apparatus, showing vertical swing, feeding and retraction, horizontal swing, bypass and brake control valve mechanisms, and various flow connections.

Fig. 5 is a top view of elements shown in Fig. 4.

Fig. 6 is a vertical section on the plane of the line 6—6 of Fig. 4, with parts omitted.

Fig. 7 is a vertical section, with parts broken away, on the plane of the line 7—7 of Fig. 5.

Fig. 8 is a horizontal view as on the plane of the line 8—8 of Fig. 7, with parts shown in construction.

Fig. 9 is a vertical section on the plane of the line 9—9 of Fig. 7.

Fig. 10 is a section on the plane of the line 10—10 of Fig. 7, with parts omitted.

Fig. 11 is a vertical section on the plane of the line 11—11 of Fig. 7, with parts omitted.

Fig. 12 is a central longitudinal vertical section through one of the control valves.

Referring to the drawings, and first to Figs. 1 and 2 thereof, it will be observed that upon a power-driven-crawler supported frame 1 there is mounted a rotatable turntable 2 supporting a reciprocable guide frame 3 carrying a motor 4 constituting the driving means for a disintegrating apparatus 5, which is swingable in vertical planes about a horizontal axis 6 by a pair of single-acting swinging cylinders 7, 7 of which but one is visible in Figs. 1 and 2. The reciprocable guide frame 3 is fed forward and retracted by a pair of feed cylinders 8, 8, one partially visible in Fig. 1 and both shown in Fig. 3; and the turntable is rotatable in opposite directions by a pressure fluid motor such as the selectively effective horizontal swinging cylinders 9, 9, neither visible in Figs. 1 and 2, but both shown in Fig. 3. Brake cylinders 10, 10, not visible in Fig. 1 or 2, but shown in Fig. 3, are provided, as more fully disclosed in said Silver application, for holding said turntable against rotation. A cylinder 11 controls the height of the nose N and of the cleanup scrolls S at the forward end of the base of the machine. A vertical, single-acting jack cylinder 12 is provided to hold down the rear end of the apparatus when desired and to cooperate with a double-acting bottom jack 13 in giving stability to the whole apparatus, said lower jack 13 being operative alone to prevent the front end of the apparatus rising and to hold it down as may be necessary. A single-acting cylinder 14 controls the level of the delivery end of a tail conveyor 15.

All of the foregoing cylinders are adapted to be supplied with hydraulic fluid under control of valve means later more fully described. A reservoir or tank 21 is suitably mounted on the frame 1 and constitutes a source of hydraulic operating fluid. A conduit 22 connects the tank 21 with the intake of a pump 23 which is driven by a motor 24 (Figs. 1 and 2) and which discharges to a discharge line 25. A relief valve 26 having a return connection 27 to a return line 28 leading back into the tank 21 is provided for the purpose of limiting the hydraulic pressure supplied to the various operating cylinders. This relief valve is of the flow-through type and opens only when the desired pressure is exceeded, and normally passes all of the fluid delivered by the pump to a line 29 which constitutes, through various branches, a supply line for the control valves which govern the operation of the cylinders and pairs of cylinders previously mentioned.

From the supply line 29 there leads a connection 30 which ends in a T 31, one arm of the head of which is connected at 32 to a valve mechanism 33. This valve mechanism is a bypass valve which is operative to prevent heating of the oil, by allowing the oil to pass freely back to the return line 28, except when fluid under pressure is required to effect operation of one of the control mechanisms, and valve manipulation to effect such operation is performed. The bypass valve mechanism 33, which may be of essentially the same general type as all of the

other valve mechanisms, includes a valve casing 34 having a bore 35 in which a valve element 36 is movable in one direction by a stem 37. A spring 38 normally maintains the valve element 36 in the position shown in Fig. 3—a position in which the connection 39 and T 31 are in communication with a conduit 39 leading back to the return line 28, so that no substantial pressure will exist in the supply line 29. The casing has annular grooves 40, similar to corresponding grooves in other valve mechanisms, but they play no part in the operation of the valve mechanism 33.

Before describing other features, one of the control valve mechanisms may advantageously be described in some detail. These each include (see Fig. 12) a casing 41 having a valve receiving bore 42 therein and having opposite heads 43 and 44. A valve element 45, having spools 46 and 47 spaced by an annular groove 48, is reciprocable in the bore 42. A stem 49 connects the valve through a loose pin and slot connection 50 with an operating lever 51 whose upper end is pivotally mounted at 52 in a projecting bracket 53 shown as formed on the head 43. Centrally of the bore 42 there is a groove 55 with which a threaded bore 56 communicates. This groove acts as a supply groove. Spaced annular grooves 57 and 58 are arranged at opposite sides of the groove 55 and threaded bores 59 and 60 communicate with the grooves 57 and 58 respectively. Depending upon whether the cylinder and piston mechanism controlled is double or single acting, both or one of these bores is connected to the cylinder, either bore not used being plugged. Near the ends of the bores 42 other annular grooves 61 and 62 are provided, and these are connected with each other and with a further internally threaded opening 63. The threaded opening serves for a connection with the return line 28. The valve element 45 is normally maintained in mid position, in which position the spools 46 and 47 completely cut off communication between the grooves 57 and 58 and the supply groove 55 and the exhaust grooves 61 and 62, and in which position no flow from the groove 55 is possible. For holding the valve element 45 normally in its mid position the arrangement shown at the left hand side of Fig. 12 is provided. The valve has secured to it a stem 65 to which there is loosely held, as at 66, a flange-carrying element 67. Between the flange 68 on this element and a plate 69 through which the stem 65 extends, a spring 70 is arranged. This spring normally maintains the plate 69 against a fixed plate 71 secured between the head 44 and the body 41. A nut 72 is adapted to engage the plate 69 to effect compression of the spring when the valve element is moved to the left in Fig. 12, so that a spring pressure to return the valve element to central position will be produced by the leftward displacement of the valve element. When the valve element is moved to the right in Fig. 12 the flange 68 compresses the spring so that the valve element will be moved back to its central position when the handle 51 is released. This general type of valve is used throughout, in the illustrative embodiment of the invention.

In addition to the valve mechanism 33, there are provided the following valve mechanisms:

A valve mechanism 81, including a valve element 45*r*, for controlling the raising cylinders 7;

A valve mechanism 82, including a valve element 45*f*, for controlling the feeding and retraction cylinders 8;

A valve mechanism 83, including a valve element 45*s*, for controlling the swing cylinders 9;

A valve mechanism 84, including a valve element 45*b*, for controlling the brake cylinders 10;

A valve mechanism 85 for controlling the nose-positioning cylinder 11;

A valve mechanism 86 for controlling the top jack 12;

A valve mechanism 87 for controlling the bottom jack 13,

And a valve mechanism 88 for controlling the tail conveyor elevating cylinder 14.

It will be noted that the valve elements included in the valve mechanisms 81, 82, 83 and 84 are identified above by the addition of letters—respectively the letters *r*, *f*, *s* and *b*. As there is occasion to refer to other elements of these valve mechanisms, the same letters will be used to designate the particular parts. If occasion arises for referring to particular elements of the valve mechanisms 85, 86, 87 and 88, their particular elements will be, in such case, identified by the supplemental letters *n*, *tj*, *bj* and *c*.

Before describing the relation of the valve mechanisms 81 etc. to the system, it may be renoted that the bypass valve mechanism 33, when the valve element 36 thereof (which element corresponds to the elements 45 in structure) is in its upper position, operates to permit a free flow-through of fluid from the pump discharge line 29 back through the connection 39 to the return line 28; and accordingly the pump 23 does not operate against any substantial back pressure. When, however, the valve element 36 is forced downwardly against the action of the spring 38 into its lower position, then all flow through the connection 39 will be interrupted and a pressure will build up in the pump discharge line 29 to such a value as is determined by the setting of the relief valve 26, and an operating pressure adequate for the various functions to be performed will be made available. With reference to the spring 38, it may be said that this is but representative of various suitable arrangements but normally maintaining the valve element 36 in a position to permit free flow from the pump discharge line to the return line.

Before describing the valve mechanisms 81, 82, 83, we may describe the valve mechanism 84, which serves to control the supply and venting of fluid relative to the brake cylinders 10, doing this because of the fact that the T 31 heretofore mentioned also constitutes the supply element for the valve mechanism 84, and because it will be more convenient to have this device described first, for reasons which will later appear. It will be observed that the right hand arm of the head of the T 31 communicates with the central groove 55*b* and that the grooves 61*b* and 62*b* are connected back to the return line 28 by a conduit 90. The threaded opening 60*b* is plugged, while the threaded opening 59*b* has a conduit 91 connecting it, through branch connections 92 and 93, to the bottoms of the brake cylinders 10. Accordingly, referring to Fig. 3, it will be observed that in the lower position of the valve 45*b* there is a connection from the supply line 29 through connection 30, the T head 31, the groove 55*b*, the groove 48*b* in the valve 45*b*, the groove 57*b* and the conduit 91 and branch conduits 92 and 93, to the brake cylinders 10, 10 so that, when the pump discharge line is under

pressure, the fluid therein may apply a holding force to the turntable 2 and prevent the latter from rotating. When the valve 45b is moved upwardly in Fig. 3—actually in a different absolute direction, as will later appear—the brake cylinders 10 may be vented by the connection of the conduit 91 with the exhaust groove 61b and a resultant venting of fluid to the return line through the conduit 90.

Further, before going on to the description of the structure and mode of operation of the valve mechanisms 81, 82, 83 etc. it may be mentioned that the valve mechanisms 33 and 84 are arranged on parallel axes, with the valve mechanism 84 arranged above the valve mechanism 33. The normal position of the valve 45b as just explained is such as to permit connection of the supply line 29 in communication with the brake cylinders, but there will be no pressure built up in the brake cylinders unless the valve element 36 is moved to its lower position by the application of the requisite thrust on the valve stem 37. The valve 45b is shown in Fig. 3 as connecting the supply line 29 with the brake cylinders, but if the bypass valve 36 is not in its lower position there will be no pressure to apply the turntable brakes. If this bypass valve 36 be closed without a change in position of the brake control valve 45b, the brakes will be applied and will hold the turntable element 2 against turning. This is desirable during sumping and withdrawing and during upward swing under power of the disintegrating apparatus 5, and we provide, as later described, arrangements, effective whenever fluid is supplied to the raising cylinders 7, or to the feeding and retraction cylinders 8, for closing the bypass valve without changing the position of the brake control valve 45b from that in which the supply line is connected to the brake cylinders. It is, moreover, desirable, notwithstanding the fact that the bypass valve 36 must be closed to secure needed working pressures, that when there is to be fluid supplied to either of the cylinders 9 to swing the turntable there shall be a shifting of the brake control valve 45b to vent the brake cylinders to the return line 28, and so means for doing this is included—means which shifts the valve 45b to its upper position in Fig. 3 when the swing control valve mechanism later described in detail supplies fluid to either of the cylinders 9.

For the purpose of controlling the supply of fluid to the cylinders 7 and thus raising the disintegrating apparatus, i. e., swinging it upward, the valve mechanism 81 is provided. This has a connection 100 from the supply line 29 to its central groove 55r. One arm 101 of a T-shaped connection 102 serves to connect the exhaust grooves 61r and 62r with the return line 28. The opening 69r of the valve mechanism 81 is plugged, while a conduit 103 threaded into the threaded opening 59 leads past a special automatic valve mechanism 104 to branch conduits 105, 106 leading to the raising cylinders 7. The valve mechanism 104 is per se a conventional one, and is effective when actuated to interrupt fluid flow through the conduit 103 toward the cylinders 7, without preventing return flow from these cylinders when the valve 45r is moved to connect the conduit 103 with the vent connection 101. The automatic control of this valve is described in the application of Harold F. Silver above mentioned and need not be repeated at this point, it being sufficient to state that upon the attainment by the forward end of the disintegrating apparatus 5 to a desired height the valve mechanism 104 shuts off the flow of fluid to the cylinders 7 even though the valve 45r still connects the conduits 100 and 103, and that when the valve 45r is moved to connect the conduit 103 with the return line 28 the fluid is permitted to flow at a suitable rate from the cylinders 7 past the valve mechanism 104 and back to the reservoir 21. In Fig. 3 the valve 45r is shown in closed position, and, as shown in Fig. 4, the operating lever 51r may be moved to effect opening by the valve 45r of communication between the conduits 100 and 103, to interrupt such communication, and to vent the conduit 103 back to the tank.

The valve mechanism 82 controls the flow of fluid relative to the sumping and withdrawing cylinders 8, and is adapted to cut these cylinders off from communication with supply and exhaust, to supply fluid to one end of each of these cylinders (the forward end) to effect sumping, and to supply fluid to the other end of each of these cylinders (the rear end thereof) to effect retraction. Of course forward and rearward feeding operation is also possible for adjusting purposes as well as for actual disintegrating operation. The valve mechanism 82 receives fluid from the line 29 through a conduit 110 and through one branch 111 of this conduit which opens into the central groove 55f. The other arm 112 of the T connection 102 serves to connect the end grooves 61f and 62f with the return line 28. The annular groove 58f is connected by a conduit 113 with the rearward ends of the cylinders 8, and the supply of fluid through this conduit will effect retraction of the disintegrating apparatus 5. The annular groove 57f is connected by a conduit 114 to the forward ends of the cylinders 8, and fluid supply through the conduit 114 effects sumping or forward movement of the disintegrating apparatus 5. It will be noted that the rearward ends of the cylinders 8 are connected in communication with each other, and that the forward ends of these cylinders are connected in communication with each other. The valve 45f is shown in mid position in Fig. 3, and when thrust inwardly it will effect a supply of fluid to the conduit 114, while connecting the conduit 113 with the return line 28, and thus effect forward feed or sumping, while, when the valve 45f is pulled outwardly, it will supply fluid through the conduit 113 and vent fluid through the conduit 114 to effect retraction of the disintegrating apparatus 5. In contrast to the cylinders 7, it will be noted that the cylinders 8 are double acting.

To supply fluid alternatively to the single-acting cylinders 9, which are operative to effect rotation in opposite directions of the turntable 2, and to effect venting of fluid from either of these cylinders while fluid is being supplied to the other, is the function of the valve mechanism 83. The other branch 121 of the conduit 110 supplies fluid to the annular groove 55s of the valve mechanism 83. The exhaust grooves 62s and 61s are connected through a conduit 122 back to the return line 28. The groove 58s is connected by a conduit 123 to that one of the cylinders 9 which is shown higher in Fig. 3. A conduit 124 connects the annular groove 57s with the other of the cylinders 9. It will be clear that when the valve 45s is thrust inwardly from the mid position shown in Fig. 3, fluid will be supplied through the conduit 124 to the cylinder 9 which appears lower in Fig. 3, to effect turntable rotation in one direction, while the conduit 123 then vents fluid

through the connection 122 back to the return line 28. Pulling of the valve 45s outwardly—to the left in Fig. 3—will result in supply of fluid through the conduit 123 to the cylinder 9 which appears nearer the top of Fig. 3, and will concurrently vent through the conduit 124 the other of said cylinders 9 by way of the conduit 122 back to the return line 28. It will thus be evident that the valve 45s may be moved to positions to supply fluid to either of the cylinders 9 while venting the other, and to a further position cutting off fluid supply from both cylinders and also interrupting simultaneously both connections with the return line.

In the mechanism illustrated and shortly to be described, provision is made for the operating mechanism of each of the valves 45r, 45f, and 45s, when such operating mechanism moves its respective valve to a fluid supply-effecting position, to cause movement of the valve 36 to closed position and thus result in the building up of an operating pressure in the line 29. Provision is also made whereby movement of the valve 45s in either direction from its mid position may move the valve 45b to cut off supply to the brake cylinders 10 and to vent these cylinders, so that when swing is to be effected by one or the other of the cylinders 9 the turntable will not be braked against rotation.

The valve mechanisms 85, 86, 87 and 88 might be arranged and connected, if desired, so that th operating levers 51n, 51tj, 51bj, 51c might all control the bypass valve 36, but this is not necessary, since these valve mechanisms are like those which have been described, each adapted, if only moved to central position from a fluid supplying position, to trap fluid in their respective devices 11, 12, 13 and 14, and since, moreover, when the supply of fluid under pressure to any of the devices 11, 12, 13 and 14 is necessary, one of the valves 45r, 45f or 45s will either be in a position causing the building up of the necessary pressure in the main supply line, or the valve 45f may be moved, to avoid or end free interconnection of the supply line 29 with the return line 28, in a direction to tend to cause the supply of further fluid to the end of the cylinders 8 which are already filled with fluid, so that, though the valve 45f, by its movement, then causes closure of the valve 36, there will be produced no movement of the mechanism which the valve 45f controls, because that mechanism has already reached its limit of motion. Thus, to repeat, it is within the scope of our invention as defined in certain of the appended claims, to hook up the controls of the valve mechanisms 85, 86 and 88 the same as the control of the valve mechanism 81 later described, and thus to control the valve 36, and to connect up the control of the valve mechanism 87 similarly to the control of the valve mechanism 82, but the control system described, in which the valve mechanism 85 is operative to control only fluid supply and venting from the cylinder 11, the valve mechanism 86 is operative to control only fluid supply and venting with respect to the cylinder 12, the valve mechanism 88 is operative to control only the supply and venting of fluid relative to the cylinder 14, and the valve mechanism 87 is operative to control the supply and venting of fluid with respect to the opposite ends of the cylinder of the jack 13, is entirely adequate, and renders the control system more flexible and more simple in its arrangement of parts.

The valve devices 81, 82 and 83 are arranged parallel to each other with their axes in a common plane—a horizontal plane, as shown in Figs. 4 and 5. They may be secured in desired relation to each other by bolting them, as at 160, to a horizontal upper plate 161. Each has a manually operable control lever 51, and the pin and slot connection 50 of this control lever, with the stem of the valve which it operates, may be provided with some lost motion in order that there may be some initial delay in movement of the valves 45r, 45f and 45s until the valve or valves indirectly controlled by their movement have been moved to the desired degree. Each operating lever 51 is traversed, at a point outwardly of its connection with the valve stem which it actuates, by an opening 162 in which a bent rod is received. The bent rod associated with the valve mechanism 81 may be identified as 163r; the one associated with the valve mechanism 82 as 163f, and the one associated with the valve mechanism 83 as 163s. Each of these rods is pivotally connected with a cam, the cam associated with the rod 163r being a single-faced cam 164 mounted at 165 on a stud 166 projecting downwardly from a horizontal plate 167; said cam being adapted to cooperate with a roller 168 journaled on a stud 169 carried by a block 170 which is secured, as at 171, to a horizontal, longitudinally movable thrust rod 172. The cam associated with the valve mechanism 82 is designated 174 and is of the double type, having surfaces 175 and 176 each adapted, on appropriate swinging of the cam about a stud or pivot 177 carried by the plate 167, to move a roller 178 mounted on a block 179 secured at 180 to the rod 172. The block 179 carries another roller 181, which is received within an elongated notch 182 formed in a plate 183 secured, as at 184, to the plate 167. It may be noted that the plate 167 is notched out, as at 185 and 186, to provide spaces within which the roller 168, and the rollers 178 and 181, may respectively move. The coaction of the roller 181 with the notch 182 keeps the rod 172 from rotating under the action of the cams. The bent rod 163s actuates a cam 188 pivotally mounted at 189, in a manner similar to the other cams, on the horizontal plate 167. The cam 188 is also a double cam and has oppositely disposed cam surfaces 190 and 191, and these surfaces are adapted to cooperate with a roller 192, which is mounted on the lower end of a horizontally pivoted lever 193 and which engages a roller 194 rotatably mounted on a block 195 secured, as at 196, to the thrust rod 172. The roller 192 has a relatively spherical periphery so that angular movement of the lever 193 will not materially change its effective diameter. The upper arm of the lever 193 is drilled, as at 197, and is normally held in engagement with a stop collar 198 fixed on a rod 199, which extends through the hole 197. The rod 199 extends through an opening in a perforated guide and support plate 200, which is secured to a plate 201 by which the plate 167 is carried. Guide bearings 202 and 203 for the rod 172 are also secured to the plate 201 below the plate 167. The rod 199 carries upon it a pair of springs 204 and 205, the former received between the upper arm of the lever 193 and an adjustable nut and washer arrangement 206 carried at the left hand end of the rod 199 in Fig. 7. This spring is placed under a certain initial tension and at all times tends to maintain the drilled upper end of the lever 193 against the collar 198. The spring 205 acts between the perforated guide plate 200 and, as shown, a series

of washers 207 which rest against a connecting element 208 shown secured to the right hand end of the rod 199 in Fig. 7. This connecting element 208 is pivotally connected at 209 to the stem 49b of the valve 45b. It will be evident that the spring 205 will normally maintain the collar 198 against the plate 200 and thus predetermine the position of the valve 45b, holding it normally in the position shown in Fig. 3. When the lever 193 is rocked counter-clockwise in Fig. 7 it will act through the spring 204, which is under somewhat greater compression than the spring 205, to move the rod 199 to the left and bring the valve 45b into a position to interrupt the supply of fluid through the conduit 91 to the brake cylinders 10 and to vent fluid from the brake cylinders 10 by way of conduits 92, 93 and 91, the grooves 57b and 61b and the connection 99, back to the tank. By changing the position of the nut and washer arrangement 206 and by varying the number of washers 207, the tensions of the springs 204 and 205 may be adjusted.

Reverting to the thrust rod 172, it will be observed that it has at its right hand end in Fig. 9 an adjustable contact screw 210 provided with a lock nut 211, and the head of the screw 210 is adapted to exert a thrust on the end of the valve stem 37 when the thrust rod 172 is moved to the right in Figs. 7 and 9. The rod 172 is held against movement to the left in Figs. 7 and 9 by the cams, and the end of the screw 210, through its engagement with the valve stem 37, determines the position of the bypass valve 36. When any of the cams 164, 174 and 188 is locked about its pivot in a direction which will attend movement of the valve with which it is associated to effect fluid supply, the rod 172 will be moved to the right in Fig. 7 and will push the stem 37 to the right in that figure and move the bypass valve 36 to shut off the free passage of fluid between the pump line 29 and the return line 28. The cams 164 and 174 act directly on rollers which occupy fixed positions relative to the rod 172. The cam 188 obviously acts directly on the roller 192, and through that roller upon the roller 194, which through its mounting on the block 195 is operative to move the valve stem 37. Thus the cam 188, on movement from its mid position, both actuates the brake valve 45b and the bypass valve, venting the brake cylinders, and effecting closure of the bypass between the supply line 29 and the return line 28 so that an operating pressure will be built up.

Before summarizing the mode of operation of the structure described, it may be mentioned that the forward end of the cylinder 11 is connected by a conduit 213 with the valve mechanism 85, and that said valve mechanism is connected by a conduit 214 with the return line 28. In order to distinguish the return line from the supply line to the mechanism controlled by the valve mechanism 85, the internal, dual connections of the return line are diagrammatically shown outside the representation of the valve mechanism 85, and also this same practice is followed with respect to the valve mechanisms 86, 87 and 88. The operating lever 51n associated with the valve mechanism 85 is desirably maintained in a position to connect the forward end of the cylinder 11 with the return line, thus allowing the nose structure N and the scrolls S to rest of their own weight upon the mine bottom. Suitable releasable detent means, herein illustrated as a pivotally supported lever 215 engageable with a stop 216 on the lever 51n, may be provided, if desired, normally to hold the valve of the valve mechanism 85 in the position mentioned. A supply connection 217 from the pump discharge line 29 is adapted to supply fluid to the valve mechanism 85, a supply connection 218 from the supply line 29 leads to the valve mechanism 87, a supply connection 219 leads from said supply line 29 to the valve mechanism 86 and a supply connection 220 leads from said supply line 29 to the valve mechanism 88. The valve mechanism 87 has a pair of fluid supply and venting connections 221 and 222 leading to the opposite ends of the bottom jack 13 for supplying fluid to force the jack into operative relation to the mine bottom and to retract the jack. The return line connection from the valve mechanism 87 is shown at 223. A single supply and return connection 225 connects the valve mechanism 88 with the bottom of the roof jack cylinder 12. The return connection from the valve mechanism 86 to the return line 28 is shown at 226. A single fluid supply and return connection 228 connects the valve mechanism 88 with the tail conveyor raising cylinder 14. A return connection 229 connects the valve mechanism 88 with the return line 28. The unused threaded bores 60 on the valve mechanisms 85, 86 and 88 are plugged by the plugs 230, 231 and 232.

With the parts all as shown in Fig. 3, the nose N and scrolls S may lift and lower with changes in the level of the mine bottom, and all of the other mechanisms will be having no power applied to them, though fluid may be trapped in the cylinders 7, in both ends of each of the cylinders 8, in both of the cylinders 9, in both ends of the floor jack 13, below the piston in the roof jack cylinder 12, and in the tail conveyor lift cylinder 14. There will be no substantial pressure in the pump discharge line 29, and the brake cylinders 10, 10 will be under only the low pressure which exists in the pump discharge line. Now, if the operator operates the handle 51r associated with the valve mechanism 81 by pushing the same inward to admit fluid to the cylinders 7, 7, he will simultaneously exert a thrust on rod 163r and swing the cam 164, and the latter will push the thrust rod 172 and cause it to exert a pressure on the valve stem 37 and move the bypass valve 36 to a position to cut off communication between the conduits 29 and 28, and accordingly there will be built up an operating pressure, which will act in the cylinders 10, 10 to hold the turntable 2 firmly against turning; but there will be no movement transmitted to the brake valve, and so the brakes will be applied while the disintegrating apparatus 5 is swung upward by the pressure fluid flowing into the cylinders 7, 7. When the desired elevation of the free end of the apparatus 5 has been attained, the valve mechanism 194 will interrupt the raising action, and the valve 45r may be returned to mid position.

In like manner, if the operating lever 51f associated with the sumping and withdrawing valve mechanism 82 is actuated in either direction, the rod 163f will actuate the cam 174 and so bring about a movement of the thrust rod 172 so as to position the valve 36 to effect the development of the requisite operating pressure in the line 29. Here again the brake control valve 45b would not be moved. If, however, the operator moves the lever 51s associated with the valve mechanism 83 in either direction, the cam 188 will act upon the roller 192 and effect swinging of the lever 193 to move the valve stem 49b to shift the valve 45b to a position to cut off the supply of fluid to and

to vent the brake cylinders 10, 10; and accordingly the turntable will be released for free swinging movement. The roller 192 will act through the roller 194 mounted upon the block 195 on the thrust rod 172 and move the stem 37 of the bypass valve 36 to position that valve in such a manner as to build up pressure in the line 29, and accordingly fluid will flow to whichever one of the swing cylinders 9, 9 has been selected, by the direction of movement of the valve 45s, for the admission of fluid while the other is being vented.

A word more as to the control by the lever 51s associated with the valve mechanism 83: When, after the turntable has been brought to the desired angular position, the valve 45s is moved back to central position and the bypass valve 36 has been allowed to open, it will be appreciated that the brake valve 45b will also be returned to its position in which the brake cylinders will have their lower ends connected with the pump discharge line 29. And, while the turntable brakes will not then be applied, they will obviously immediately be applied if either the valve mechanism 81 or the valve mechanism 82 be actuated to cause the supply of operating fluid to the cylinders which they respectively control. If it be desirable to actuate any of the devices 11, 12, 13 or 14 while the bypass valve is closed due to the position of one of the valves 45r, 45f or 45s, the required pressure will obviously be available. If such actuation be desired when each of the valves 45r, 45f and 45s is in mid position, the operator can, by moving the valve 45f back to the position from which it was moved to central position, effect reclosure of the bypass valve without inconvenient consequences, because the cylinders 8, 8 are usually left at the end of their travel when their control valve is centered, and so a return to the last previous open position of the valve 45f will not cause further operation by said cylinders. The same would be possible by moving the valve 45r forwardly when the disintegrating mechanism is in the upper position at which valve 104 is closed.

From the foregoing description it will be evident that we have provided a very effective control apparatus, one which permits avoiding heating of the hydraulic fluid needlessly, one which enables all of the necessary controls, one which effects holding brake applications when necessary and release of such brakes when swing is to be effected, and one which is simple, rugged, and convenient to use.

This is a continuation of application, Serial No. 750,982, filed May 28, 1947 (now abandoned).

While we have in this application specifically described one form which our invention may assume in practice, and indicated a possible modification thereof, it will be understood that this form and possible modification are disclosed for purposes of illustration only 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 we claim as new and desire to secure by Letters Patent is:

1. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions, cylinder and piston mechanism for changing the position of said element, means for holding said element in different positions to which it is moved including another cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the postiion of said element when the source of fluid under pressure is disconnected from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid, a valve mechanism for said second cylinder and piston mechanism including a control valve and means for normally maintaining the latter in a position to connect said second cylinder and piston mechanism with said source of fluid under pressure to effect the holding of said element in a fixed position when the source of fluid is disconnected from said drain line, and means operated by said operating means, when the latter is moved to actuate said second valve to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to cause said second cylinder and piston mechanism to occupy a position in which it does not hold said element against movement, each of said cylinder and piston mechanisms having conduit means controlled by its respective valve mechanism for connecting it independently of the valve mechanism of the other with the source of fluid under pressure and said operative connections between said valve operating means and said by-pass valve actuated by said valve operating means at a point ahead of the operative connection of said valve operating means with said control valve mechanism.

2. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions, cylinder and piston mechanism for changing the position of said element, means for holding said element in different positions to which it is moved including another cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said element when the source of fluid under pressure is disconnected from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as

aforesaid, a valve mechanism for said second cylinder and piston mechanism including a control valve and means for normally maintaining the latter in a position to connect said source of fluid under pressure with said second cylinder and piston mechanism to effect the holding of said element in a fixed position when the source of fluid is disconnected from said drain line, and means operated by said operating means, when the latter is moved to actuate said second valve to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to disconnect said source of fluid under pressure from said second cylinder and piston mechanism and connect the latter to said drain line, each of said cylinder and piston mechanisms having conduit means controlled by its respective valve mechanism for connecting it independently of the valve mechanism of the other with the source of fluid under pressure and said operative connections between said valve operating means and said by-pass valve actuated by said valve operating means at a point ahead of the operative connection of said valve operating means with said control valve mechanism.

3. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions, cylinder and piston mechanism for changing the position of said element in opposite directions, means for holding said element in different positions to which it is moved including another cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position selectively in opposite directions to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said element when the source of fluid under pressure is disconnected from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid in the desired one of said opposite directions, a valve mechanism for said second cylinder and piston mechanism including a control valve and means for normally maintaining the latter in a position to connect said second cylinder and piston mechanism with said source of fluid under pressure to effect the holding of said element in a fixed position when the source of fluid is disconnected from said drain line, and means operated by said operating means, when the latter is moved to actuate said second valve in either direction from said normal position to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to cause said second cylinder and piston mechanism to occupy a position in which it does not hold said element against movement, each of said cylinder and piston mechanisms having conduit means controlled by its respective valve mechanism for connecting it independently of the valve mechanism of the other with the source of fluid under pressure and said operative connections between said valve operating means and said by-pass valve actuated by said valve operating means at a point ahead of the operative connection of said valve operating means with said control valve mechanism.

4. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions, cylinder and piston mechanism for changing the position of said element in opposite directions, means for holding said element in different positions to which it is moved including another cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position selectively in opposite directions to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said element when the source of fluid under pressure is disconnected from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid in the desired one of said opposite directions, a valve mechanism for said second cylinder and piston mechanism including a control valve and means for normally maintaining the latter in a position to connect said source of fluid under pressure with said second cylinder and piston mechanism to effect the holding of said element in a fixed position when the source of fluid is disconnected from said drain line, and means operated by said operating means, when the latter is moved to actuate said second valve in either direction from said normal position to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to disconnect said source of fluid under pressure from said second cylinder and piston mechanism and connect the latter to said drain line, each of said cylinder and piston mechanisms having conduit means controlled by its respective valve mechanism for connecting it independently of the valve mechanism of the other with the source of fluid under pressure and said operative connections between said valve operating means and said by-pass valve actuated by said valve operating means at a point ahead of the operative connection of said valve operating means with said control valve mechanism.

5. In combination, an element supported for adjustment, hydraulic means for effecting adjustment thereof, hydraulically controlled means for holding said element in different adjusted positions, and a hydraulic system for controlling the adjustment and holding of said element by said means including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a

valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for holding said element in different adjusted positions movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said holding means is operative by pump discharge line pressure to hold said element when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of said hydraulic adjustment effecting means with said lines, operating means for said valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, an actuating member movable by said latter element, and a second member movable by said actuating member to effect movement of said bypass valve to closed position and to change the position of said valve for controlling said hydraulically controlled holding means to cause the latter, by connection with said return line, to release said first mentioned element.

6. In combination, an element supported for adjustment, hydraulic means for effecting adjustment thereof, hydraulically controlled means for holding said element in different adjusted positions, and a hydraulic system for controlling the adjustment and holding of said element by said means including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for holding said element in different adjusted positions movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said holding means is operative by pump discharge line pressure to hold said element when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of said hydraulic adjustment effecting means with said lines, operating means for said valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, a cam movable by said latter element, and a lever movable by said cam to effect movement of said bypass valve to closed position and to change the position of said valve for controlling said hydraulically controlled holding means to cause the latter to release said first mentioned element.

7. In combination, an element supported for adjustment, hydraulic means for effecting adjustment thereof in opposite directions, hydraulically controlled means for holding said element in different adjusted positions, and a hydraulic system for controlling the adjustment and holding of said element by said means including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for holding said element in different adjusted positions movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said holding means is operative by pump discharge line pressure to hold said element when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of said hydraulic adjustment effecting means with said lines, to effect opposite adjustments of said element, operating means for said last mentioned valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, a double-acting cam movable by said latter element, and a lever pivoted between its ends and movable by said cam to effect movement, by one of its ends, of said bypass valve to closed position and, by the other of its ends, to change the position of said valve for controlling said hydraulically controlled holding means to cause the latter to release said first mentioned element.

8. In a valve mechanism for controlling a hydraulically operated apparatus including a pressure fluid motor operated swinging apparatus, a pressure fluid operated locking apparatus operable on operating fluid supplied thereto to effect locking, and a pump for supplying operating fluid for said motor and for said locking apparatus, in combination, a normally open valve for relieving said pump of back pressure, means movable to effect closing of said valve, a valve for controlling said motor, a normally open valve for controlling said locking apparatus, means for moving said second mentioned valve to effect swinging operation of said swinging apparatus, means movable to close said third mentioned valve to interrupt operating fluid supply from said pump to said pressure fluid operated locking apparatus, and means moved by movement of said second mentioned valve moving means to effect swinging operation to effect actuation of said means movable to effect closing of said first mentioned valve and said means movable to close said third mentioned valve to effect closure of both of said first and third mentioned valves.

9. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions and having another element supported thereon and movable into different positions with respect thereto, cylinder and piston mechanism for changing the position of said first mentioned element, means for holding said first mentioned element in different positions to which it is moved including another cylinder and piston mechanism, means for moving said second element into different positions relative to said first mentioned element and including a third cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and

having operating means and movable by its operating means from a normal position to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said first element when the source of fluid under pressure is disconnected by said bypass valve from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid, a valve mechanism for said second cylinder and piston mechanism for connecting it selectively with said source of fluid under pressure and said drain line, including a control valve distinct from said bypass valve and means for normally maintaining such control valve in a position to connect said second cylinder and piston mechanism to effect the holding of said first element in a fixed position, means operated by said operating means, when the latter is moved to actuate said second valve to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to cause said second cylinder and piston mechanism to occupy a position in which it does not hold said first element against movement, a control valve mechanism for said third cylinder and piston mechanism including a fourth valve, distinct from each of the other three and having operating means by which it is movable from a normal position to effect movement of said second element relative to said first element, said last mentioned operating means having operative connections with said bypass valve only, in addition to its operative connection with said fourth valve, for moving said bypass valve to closed position, when said fourth valve is moved to cause movement of said second element relative to the first element and while said third valve remains in its position to effect holding of said first mentioned element in a fixed position.

10. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions and having another element supported thereon and movable into different positions with respect thereto, cylinder and piston mechanism for changing the position of said first mentioned element, means for holding said first mentioned element in different positions to which it is moved including another cylinder and piston mechanism, means for moving said second element into different positions relative to said first mentioned element and including a third cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said first element when the source of fluid under pressure is disconnected by said bypass valve from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid, a valve mechanism for said second cylinder and piston mechanism for connecting it selectively with said source of fluid under pressure and said drain line, including a control valve distinct from said bypass valve and means for normally maintaining such control valve in a position to connect said second cylinder and piston mechanism to effect the holding of said first element in a fixed position, means operated by said operating means, when the latter is moved to actuate said second valve to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to disconnect said source of fluid under pressure from said second cylinder and piston mechanism and connect the latter to said drain line, a control valve mechanism for said third cylinder and piston mechanism including a fourth valve, distinct from each of the other three and having operating means by which it is movable from a normal position to effect movement of said second element relative to said first element, said last mentioned operating means having operative connections with said bypass valve only, in addition to its operative connection with said fourth valve, for moving said bypass valve to closed position, when said fourth valve is moved to cause movement of said second element relative to the first element and while said third valve remains in its position to effect holding of said first mentioned element in a fixed position.

11. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions and having another element supported thereon and movable into different positions with respect thereto, cylinder and piston mechanism for changing the position of said first mentioned element, means for holding said first mentioned element in different positions to which it is moved including another cylinder and piston mechanism, means for moving said second element into different positions relative to said first mentioned element and including a third cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position selectively in opposite directions to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said first element when the source of fluid under pressure is disconnected by said bypass valve from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid, a valve mechanism for said second cylinder and piston mechanism for connecting it selectively with said source of fluid under pressure and said drain line, including a control valve distinct from said bypass valve and

means for normally maintaining such control valve in a position to connect said second cylinder and piston mechanism to effect the holding of said first element in a fixed position, means operated by said operating means, when the latter is moved to actuate said second valve in either direction from said normal position to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to cause said second cylinder and piston mechanism to occupy a position in which it does not hold said first element against movement, a control valve mechanism for said third cylinder and piston mechanism including a fourth valve, distinct from each of the other three and having operating means by which it is movable from a normal position to effect movement of said second element relative to said first element, said last mentioned operating means having operative connections with said bypass valve only, in addition to its operative connection with said fourth valve, for moving said bypass valve to closed position, when said fourth valve is moved to cause movement of said second element relative to the first element and while said third valve remains in its position to effect holding of said first mentioned element in a fixed position.

12. In combination, in a controlling apparatus for a system including an element to be moved to different positions and to be held in such positions and having another element supported thereon and movable into different positions with respect thereto, cylinder and piston mechanism for changing the position of said first mentioned element, means for holding said first mentioned element in different positions to which it is moved including another cylinder and piston mechanism, means for moving said second element into different positions relative to said first mentioned element and including a third cylinder and piston mechanism, a source of fluid under pressure, and a drain line, normally open bypass means, including a normally open bypass valve, for connecting the source of fluid under pressure with the drain line, a control valve mechanism for said first cylinder and piston mechanism including a valve structurally distinct from and movable bodily relative to said bypass valve and having operating means and movable by its operating means from a normal position selectively in opposite directions to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism to cause such cylinder and piston mechanism to change the position of said first element when the source of fluid under pressure is disconnected by said bypass valve from said drain line, operative connections between said valve operating means and said normally open bypass valve for closing the latter when said second valve is moved to connect said source of fluid under pressure and said drain line to said first cylinder and piston mechanism as aforesaid, a valve mechanism for said second cylinder and piston mechanism for connecting it selectively with said source of fluid under pressure and said drain line, including a control valve distinct from said bypass valve and means for normally maintaining such control valve in a position to connect said second cylinder and piston mechanism to effect the holding of said first element in a fixed position, means operated by said operating means, when the latter is moved to actuate said second valve in either direction from said normal position to supply fluid to the cylinder and piston mechanism which it controls, for moving said third mentioned valve to disconnect said source of fluid under pressure from said second cylinder and piston mechanism and connect the latter to said drain line, a control valve mechanism for said third cylinder and piston mechanism including a fourth valve, distinct from each of the other three and having operating means by which it is movable from a normal position to effect movement of said second element relative to said first element, said last mentioned operating means having operative connections with said bypass valve only, in addition to its operative connection with said fourth valve, for moving said bypass valve to closed position, when said fourth valve is moved to cause movement of said second element relative to the first element and while said third valve remains in its position to effect holding of said first mentioned element in a fixed position.

13. In combination, an element supported for adjustment, a plurality of hydraulic means for effecting different adjustments thereof, hydraulically controlled means for maintaining adjustments effected by one of said plurality of hydraulic means, and a hydraulic system for controlling the effecting and maintaining of adjustments as aforesaid including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for maintaining adjustment movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said adjustment maintaining means is operative to maintain adjustment when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of one of said plurality of hydraulic adjustment effecting means with said lines, operating means for said valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, an actuating member movable by said latter element and a second member movable by said actuating member to effect movement of said bypass valve to closed position and to change the position of said valve for controlling said hydraulically controlled adjustment maintaining means so that the latter will not maintain adjustment of said element, and a valve for controlling the connection of another one of said plurality of hydraulic adjustment effecting means with said lines, operating means for said last mentioned valve, an element movable with said last mentioned valve as it is moved to effect connection of said last mentioned adjustment effecting means with said pump discharge line, an actuating member movable by said last mentioned element and a second member movable by said last mentioned actuating member to effect movement of said bypass valve to closed position.

14. In combination, an element supported for adjustment, a plurality of hydraulic means for effecting different adjustments thereof, hydraulically controlled means for maintaining adjust-

ments effected by one of said plurality of hydraulic means, and a hydraulic system for controlling the effecting and maintaining of adjustments as aforesaid including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for maintaining adjustment movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said adjustment maintaining means is operative to maintain adjustment when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of one of said plurality of hydraulic adjustment effecting means with said lines, operating means for said valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, a cam movable by said latter element and a lever movable by said cam to effect movement of said bypass valve to closed position and to change the position of said valve for controlling said hydraulically controlled adjustment maintaining means so that the latter will not maintain adjustment of said element, and a valve for controlling the connection of another one of said plurality of hydraulic adjustment effecting means with said lines, operating means for said last mentioned valve, an element movable with said last mentioned valve as it is moved to effect connection of said last mentioned adjustment effecting means with said pump discharge line, an actuating member movable by said last mentioned element and a second member movable by said last mentioned actuating member to effect movement of said bypass valve to closed position.

15. In combination, an element supported for adjustment, a plurality of hydraulic means for effecting different adjustments thereof, hydraulically controlled means for maintaining adjustments effected by one of said plurality of hydraulic means, and a hydraulic system for controlling the effecting and maintaining of adjustments as aforesaid including a pump for supplying a hydraulic fluid, a reservoir from which said pump is connected to draw fluid, a pump discharge line, a return line to said reservoir, a valve controlled bypass connection between said lines having a valve therein movable between positions respectively opening and closing said bypass connection, means for normally holding said valve in a position to open said bypass connection, a valve for controlling said hydraulically controlled means for maintaining adjustment movable to change the connections of said means with said lines and having means associated with it for normally holding it in a position in which said adjustment maintaining means is operative to maintain adjustment when the fluid in said pump discharge line is under a pressure corresponding to the closed position of said bypass valve, a valve for controlling the connection of one of said plurality of hydraulic adjustment effecting means with said lines to effect opposite adjustments of said element, operating means for said valve, an element movable with said valve as it is moved to effect connection of said adjustment effecting means with said pump discharge line, a double-acting cam movable by said latter element and a lever pivoted between its ends and movable by said cam to effect movement, by one of its ends, of said bypass valve to closed position and, by the other of its ends, to change the position of said valve for controlling said hydraulically controlled adjustment maintaining means so that the latter will not maintain adjustment of said element, and a valve for controlling the connection of another one of said plurality of hydraulic adjustment effecting means with said lines, operating means for said last mentioned valve, an element movable with said last mentioned valve as it is moved to effect connection of said last mentioned adjustment effecting means with said pump discharge line, an actuating member movable by said last mentioned element and a second member movable by said last mentioned actuating member to effect movement of said bypass valve to closed position.

16. In combination, in a controlling mechanism for a system including a pressure fluid motor operated swinging apparatus, a pressure fluid operated locking apparatus, a pressure fluid motor moving apparatus, and a pump for supplying operating fluid for said motors and for said locking apparatus, a normally open valve for relieving said pump of back pressure, means movable to effect closing of said valve, a valve for controlling said first motor, a normally open valve for controlling said locking apparatus, means for moving said second mentioned valve to effect swinging operation of said swinging apparatus, means movable to close said third mentioned valve, means moved by movement of said second mentioned valve moving means to effect swinging operation to effect actuation of said means movable to effect closing of said first mentioned valve and said means movable to close said third mentioned valve to effect closure of said first and third mentioned valves, a valve for controlling said second motor, means for moving said last mentioned valve to effect operation of said second motor to effect movement, and means moved by movement of said last mentioned valve moving means to effect movement by said second mentioned motor to effect closing of said first mentioned valve.

17. In combination, in an operating and controlling system for an apparatus including an element to be moved into different positions, hydraulic cylinder and piston means for moving it from one position to another, means for releasably holding it in its different positions including another hydraulic cylinder and piston means, and another element mounted on said first element and having hydraulic cylinder and piston means for moving it relative to said first element, a pump, a reservoir for hydraulic fluid, said pump connected to draw hydraulic fluid from said reservoir and having a discharge line, a line for returning fluid to said reservoir, means normally preventing the building up of pressure in said pump discharge line including a normally open bypass valve, a control valve movable to control the connection of said first hydraulic cylinder and piston means with said lines, another control valve movable to control the connection of said second hydraulic cylinder and piston means with said lines, still another control valve movable to control the connection of said third hydraulic cylinder and piston means with said lines, operating means for said first

control valve for moving it to effect a connection between said first hydraulic cylinder and piston means and said pump discharge line and said return line, means operated by said operating means for moving said second control valve from a normal position to a position in which it precludes holding of said first element stationary by said releasable holding means and for moving said bypass valve to closed position, operating means for said third control valve for moving it to effect a connection between said third hydraulic cylinder and piston means and said pump discharge line for effecting movement of said second element relative to the first, and means operated by said last mentioned operating means for closing said bypass valve while leaving said second mentioned control valve in its normal position.

18. In combination, in an operating and controlling system for an apparatus including an element to be moved into different positions, hydraulic cylinder and piston means for moving it from one position to another, means for releasably holding it in its different positions including another hydraulic cylinder and piston means, and another element mounted on said first element and having a plurality of hydraulic cylinder and piston means for moving it differently relative to said first element, a pump, a reservoir for hydraulic fluid, said pump connected to draw hydraulic fluid from said reservoir and having a discharge line, a line for returning fluid to said reservoir, means normally preventing the building up of pressure in said pump discharge line including a normally open bypass valve, a control valve movable to control the connection of said first hydraulic cylinder and piston means with said lines, another control valve movable to control the connection of said second hydraulic cylinder and piston means with said lines, still other control valves movable to control the connection of said plurality of hydraulic cylinder and piston means individually with said lines, operating means for said first control valve for moving it to effect a connection between said first hydraulic cylinder and piston mechanism and said pump discharge line and said return line, means operated by said operating means for moving said second control valve from a normal position to a position in which it precludes holding of said first element stationary by said releasable holding means and for moving said bypass valve to closed position, individual operating means for each of said still other control valves for moving them to effect a connection between the ones of said plurality of hydraulic cylinder and piston means which they respectively control and said lines for effecting movement of said second element relative to the first, and means operated by each of said last mentioned operating means for closing said bypass valve while leaving said second mentioned control valve in its normal position.

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