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A. F. SINCLAIR

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CONTROL MEANS FOR HYDRAULIC PRESSES AND THE LIKE

Filed Sept. 13, 1934

3 Sheets-Sheet 1

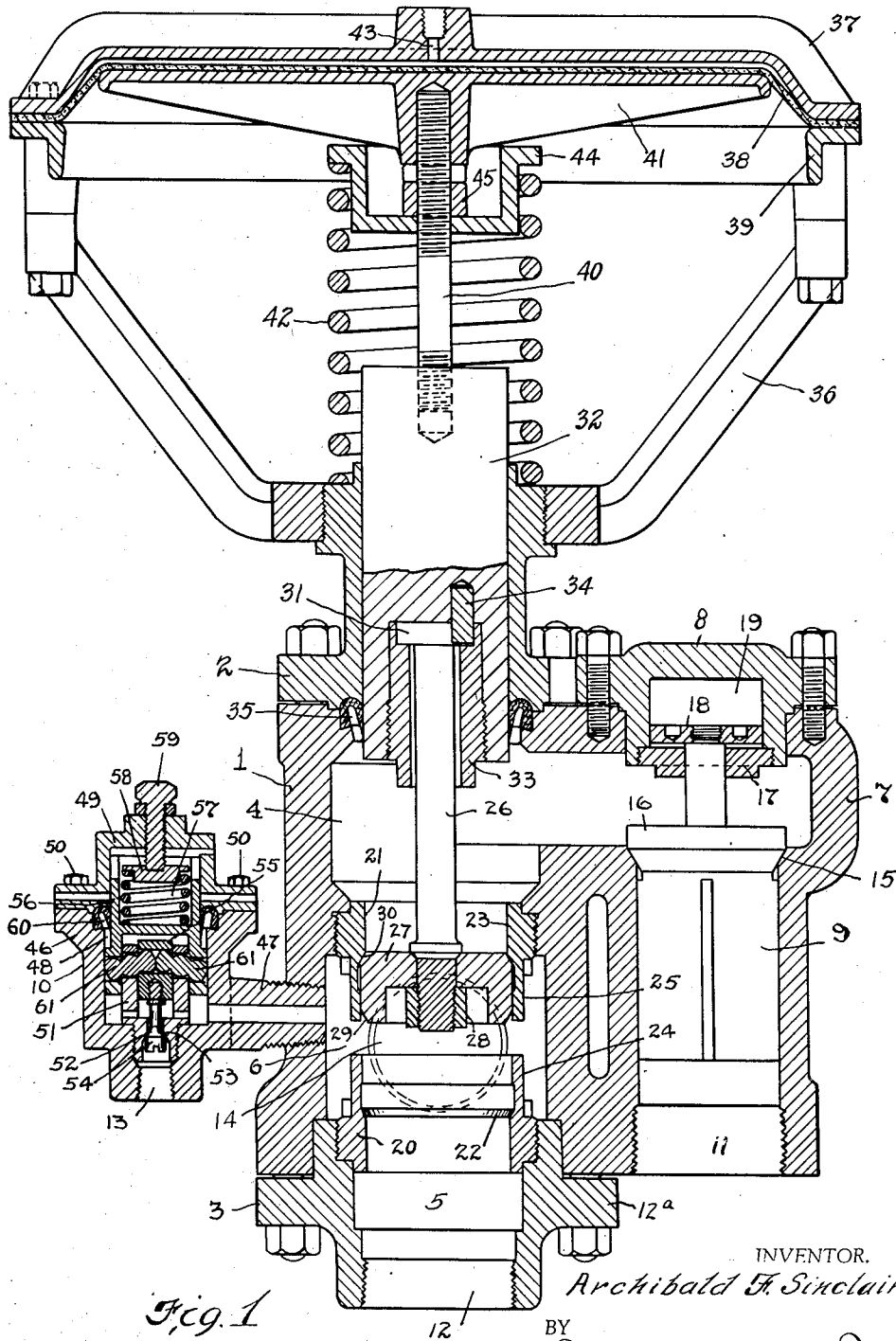


Fig. 1

INVENTOR.
Archibald F. Sinclair
BY
Pay. Oberlin & Pay
ATTORNEYS.

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A. F. SINCLAIR

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3 Sheets-Sheet 2

INVENTOR.
H. Sinclair
C. & Fay
ATTORNEYS

April 18, 1939.

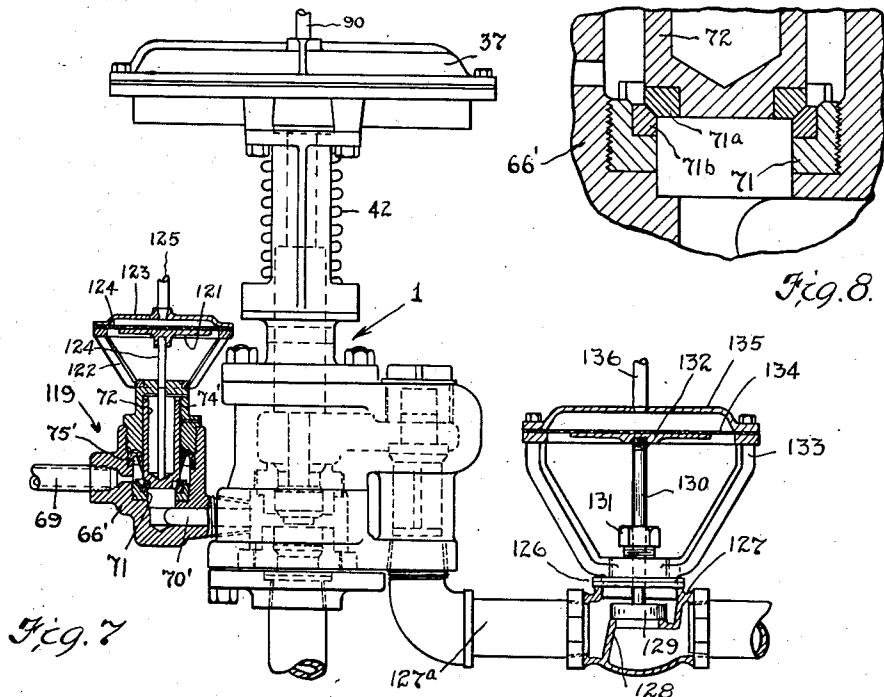
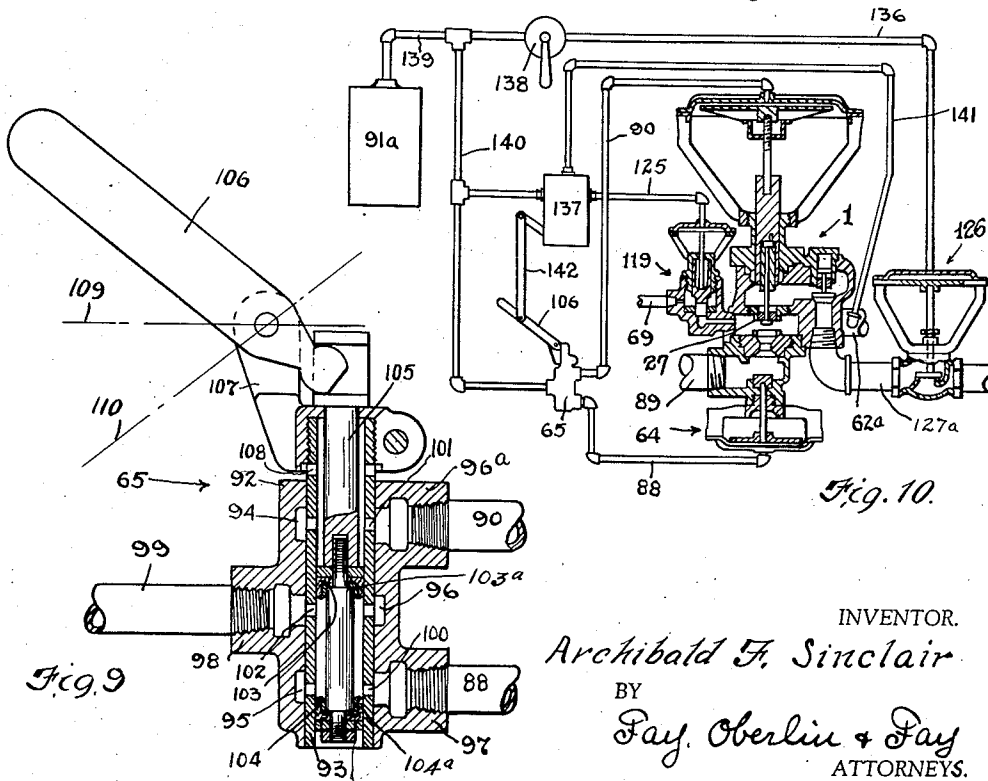
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3 Sheets-Sheet 3



INVENTOR.
Archibald F. Sinclair
BY
Pay. Oberlin & Fay
ATTORNEYS.

UNITED STATES PATENT OFFICE

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CONTROL MEANS FOR HYDRAULIC PRESSES AND THE LIKE

Archibald F. Sinclair, Cuyahoga Falls, Ohio

Application September 13, 1934, Serial No. 743,873

2 Claims. (Cl. 121—46.5)

This invention relates as indicated to control means for hydraulic presses and the like and more particularly to means whereby such presses may be operated from two independent sources of fluid under different degrees of pressure.

It is among the objects of my invention to provide an apparatus of the character described whereby the fluid supply from two independent sources of fluid under different degrees of pressure may be so controlled that the piston portion of the hydraulic press may be moved into engagement with the head portion thereof under relatively low pressure and after the movable element has been so brought into engagement with the fixed head, fluid from an independent source under high pressure may be automatically cut in to hold said movable element in such position.

It is a further object of my invention to provide control means of the character described whereby the movement of the ram in the press may be arrested at any selected position and held in such position under the control of the operator.

It is a further object of my invention to provide novel means for the energization of the control means for hydraulic presses. Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used. In said annexed drawings:

Fig. 1 is a transverse sectional view of one form of control valve constructed in accordance with the principles of my invention and comprising one unit of my control system; Fig. 2 is a diagrammatic representation of a control circuit for hydraulic presses showing another form of the main control valve; Fig. 3 is a fragmentary sectional view of a valve similar to that illustrated in Figs. 1 and 2 showing, however, a different means for actuating the main valve member therein; Fig. 4 is a view similar to Fig. 3 but showing a slightly different relationship between the parts illustrated in said last-named figure; Figs. 5 and 6 are respectively fragmentary sectional views drawn to an enlarged scale of portions of the apparatus illustrated in Figs. 3 and 4; illus-

trating more particularly the relationship between the main valve stem and its actuating means and support; Fig. 7 is a part side elevational, part sectional view of a valve similar to that illustrated in Figs. 1 and 2 but showing associated therewith auxiliary control valves having a slightly different construction than those shown in the previous figures; Fig. 8 is a fragmentary sectional view drawn to an enlarged scale of the high pressure check valve illustrated at the left in Fig. 7; Fig. 9 is a transverse sectional view of the central air valve shown in the system included in Fig. 2; and Fig. 10 is a diagrammatic representation of a complete control system for hydraulic presses embodying the several features of this invention.

Referring now more specifically to the drawings it is believed advisable in a description of the principles of my invention to first describe the main control valve forming the major portion of such system. While the system is generally illustrated in Figs. 2 and 9, it is believed best, therefore, to first describe the main valve construction as illustrated in Fig. 1, since the principles of such construction or at least the major portion of such construction are included in systems illustrated in the above mentioned figures.

Referring now more specifically to Fig. 1, the valve herein illustrated comprises a body or casing, generally indicated at 1, which along with removable headers 2 and 3, respectively forms a chamber or passage which, for convenience of description, will be referred to as consisting of terminal portions 4 and 5 and a central portion 6. The casing 1 has a lateral extension generally indicated at 7, which, along with a removable header 8, provides an inlet passage 9 for fluid under relatively low pressure.

Associated with the casing 1 and threadably secured thereto is a high pressure line check valve, generally indicated at 10. It may be pointed out that in a specific installation, the valve structure illustrated in Fig. 1 is connected in the control system for a hydraulic press in the following manner: A conduit such as a pipe carrying liquid under 250 pounds pressure is connected at 11. A waste conduit carrying spent fluid away from the press is connected at 12. A conduit carrying fluid under the pressure of two thousand pounds per square inch is connected at 13. The casing 1 is provided with an opening 14 leading into the central portion 6 of the chamber within the casing and into such opening 14 is secured a conduit leading from the valve to

the hydraulic press cylinder with which the valve is associated.

The lateral extension 7 of the main casing 1 is provided with a tapered annular valve seat 15 upon which normally rests a check valve 16. The stem of the check valve 16 extends movably through a retaining ring 17 and at its upper end has a piston member 18 secured thereto. The piston member 18 operates in a cylindrical cavity 19 and thus serves as a dash-pot for the check valve 16.

The main chamber in the casing 1 is, as previously indicated, divided into three portions, i. e., terminal portions 4 and 5 and the central portion 6. Separating the central and terminal portions are annular valve inserts 20 and 21, the former separating chamber portions 5 and 6 and the latter separating chamber portions 4 and 6. For facility in manufacture both inserts 20 and 21 have been made identical. The insert 20 is provided with a tapered annular valve seat 22 and the insert 21 is provided with a similar valve seat 23, both of such seats facing towards each other. Associated with the seats 22 and 23 and extending axially towards each other therefrom are annular skirts 24 and 25, the function of which will be hereinafter more fully explained.

Extending into the chamber in the casing 1 is a valve stem 26 which has a valve member or block 27 secured at one end by means of the nut 28. The valve block 27 is at opposite sides provided with valve seats 29 and 30 respectively adapted to engage valve seats 22 and 23 and thus alternately close the passage therethrough.

The upper end 31 of the valve stem 26 is secured to a plunger 32 by means of a lock nut 33 and a dowel 34. The opening through which the plunger 32 extends out of the casing 1 is provided with a packing ring, generally indicated at 35 which serves to prevent the escape of fluid from the chamber within the casing 1 past the plunger 32.

The head is provided with a yoked extension 36 which, at its upper end, supports a cup-shaped member generally indicated at 37. A flexible fluid-impervious diaphragm 38, generally of disc-like shape, is secured by means of an annular ring 39 to the member 37.

Secured to the plunger 32 by means of a pin 40 is a presser head 41, which, under the expanding influence of the spring 42 tends to force the diaphragm 38 into engagement with the head 37. The head 37 is provided with a fluid ingress orifice 43 by which fluid under pressure may be introduced to the space between the diaphragm 38 and the head 37 so as to force the presser head 41 downwardly and accordingly move the valve block 27 axially within the chamber in the casing 1. The spring 42 at one end seats against the yoke member 36 and at its other end against a thimble 44 which bears against the presser head 41 through the lock nuts 45 which are employed to secure the stem 40 to the presser head 41.

As previously indicated, the casing 1 has a high pressure line check valve generally indicated at 10 associated therewith. This check valve comprises a casing 46 in which is formed a threaded opening 13 for connection with a conduit carrying fluid under relatively high pressure.

The casing 10 also includes an exteriorly threaded extension 47 which may be screwed into a suitable aperture provided therefor in the casing 1. The casing 46 is provided with a central bore 48, the upper end of which is closed by means of a head 49 removably secured to the casing 46

by means of bolts 50. Secured within the bore 48 is a cylindrical member 51, which has an exteriorly threaded extension 52 of reduced diameter screwed into an enlarged threaded portion of the opening 13.

The extension 52 is provided with a passage therethrough and contains an annular valve seat generally indicated at 53. Extending through the extension 52 is a valve member 54 which, at its upper end, is secured to a yoke 55. Mounted concentrically with the member 51 is a plunger 56 urged downwardly under the influence of a spring 57. The spring 57, at its upper end, seats against a plate 58 which is adjustably secured in any desired position by means of the set screw 59. A packing gland 60 is carried by the casing 46 and singly engages the piston member 56 to prevent the escape of fluid past such piston member. The movable piston member 56, the stationary member 51 and the yoke member 55 are provided with substantially aligned openings wherein are positioned rocker arms 61. These rocker arms are provided with a plurality of longitudinally spaced arcuate projections against which the members 56, 51 and 55 seat.

The operation in use of the valve assembly illustrated in Fig. 1 may be briefly described as follows:—When the press is standing idle, the parts will be in the position illustrated in the drawing, i. e., the closure member 27 will be in engagement with the valve seat 30, closing the passage therethrough. Water under low pressure admitted through the passage 11 by the check valve 16 fills the chamber 4. Such water under pressure tends to force the closure member 27 downwardly, and the stem 32 upwardly out of the casing. While the closure member 27 has the same or a larger diameter than the stem 32 where the latter leaves the casing the closure member will, nevertheless be held on its valve seat by means of the spring 42. The various parts of the valve will, therefore, remain in the position illustrated in Fig. 1 until fluid under pressure is introduced through the passage 43 between the space defined by the diaphragm 38 and a cup-shaped head 41. When the fluid is thus introduced the head 41 will be moved downwardly against the action of spring 42 and the closure member 27 moved from its position in engagement with the seat 30 into engagement with the lower valve seat 22. In its travel from the upper valve seat 30 to the lower valve seat 22, the closure member 27 enters the skirt 24 before it leaves the skirt 25 so that at no time may water from the low pressure source of supply flow directly out of the waste passage 5 which would be the case were no skirt such as 24 provided.

After the closure member 27 has been moved downwardly into engagement with the lower seat 22, the water from the low pressure source of supply entering through the passage 9 unseats the check valve 16 and flows to the press cylinder through the opening 14 leading from the central portion 6 of the chamber within the valve. As the press cylinder is ascending, the pressure within the central chamber 6 is appreciably lower than the low pressure source of supply. The fluid under high pressure seeking admission to the central chamber 6 through the passage 13 and the passage extending through the member 52 is nevertheless prevented from entering by means of the valve 54. Since the valve seat 53 opens outwardly, the high pressure fluid maintains the valve 54 on its seat and the passage

through the seat 53 closed. In addition to the high pressure fluid acting on the valve 54 maintaining it in closed position, the spring 57 urging the piston 56 downwardly acts through the rocker arm 61 to likewise urge the yoke 55 and the attached valve 54 upwardly against the seat 53.

When now the press plunger reaches the limit of its travel and the pressure within the chamber 6 builds up to substantially the value of the low pressure source of supply, this increase in pressure acting on the lower face of the piston 56 will overcome the action of the spring 57 and the high pressure fluid on the valve 54 so that such valve will be unseated, admitting fluid from the high pressure source of supply to the chamber 6 and consequently through the opening 14 to the press cylinder. As soon as fluid from the high pressure source of supply is admitted to the valve, the check valve 16 will drop closing the passage from the valve to the chamber 9 so that the high pressure fluid will be prevented from backing up into the low pressure line.

The general valve assembly and its associated control mechanism shown in Fig. 2 connected to the press 62 by means of a pipe 62a embodies the same main valve assembly illustrated in Fig. 1 and just described. The only principal difference between the arrangement illustrated in Figs. 1 and 2 are the low pressure check valve generally indicated at 16a, high pressure check valve generally indicated at 63; the waste check valve generally indicated at 64 and the control valve generally indicated at 65. Similar reference characters will, therefore, be employed to designate parts which are identical in both Figs. 1 and 2.

The check valve 16a is of such special construction as to require special consideration at this point. It will be noted that the wall surrounding the low pressure inlet against which the valve 16a seats is provided with a cylindrical bore extending axially downwardly for a short distance until it meets the conical valve seat 15a. This cylindrical bore is of such diameter as to snugly engage the substantially cylindrical portion 16' of the check valve. When the valve is in the seated position, therefore, as illustrated in Fig. 2, the cylindrical bore is closed by means of the cylindrical extension 16'. This construction is particularly provided in order to provide in the operation of the check valve an inherent dash-pot operation; that is, when the check valve 16a drops onto its seat 15a, the entry of the cylindrical portion 16' into the cylindrical bore provided therefor will provide a snubbing action similar to a conventional dash-pot.

The check valve 63 comprises a casing 66 having a threaded extension 67 by means of which the same may be secured to the main valve body. The casing 66 is provided with a central chamber generally indicated at 68 to which fluids from a source of high pressure is admitted by means of a conduit 69 and from which such fluid flows to the main valve chamber through the passage 70 in the extension 67. Positioned within the casing 68 of the check valve is an annular valve seat generally indicated at 71 against which there is urged a closure piston 72 under the influence of springs 73. The piston 72 and the valve seat are each provided with annular inserts 71a and 71b formed of some hard wear-resistant material so that a perfect seat may be maintained without frequent re-facing. The upper end of the chamber 68 is closed by means of a plug 74

into which the closure piston 72 extends. About the closure piston 72 where it enters the plug 74 is a packing gland 75 which prevents the leakage of high pressure fluid upwardly past the piston 72. The upper end of the spring 73 seats against a plate 76 which is maintained in adjusted position by means of a set screw 77.

When the pressure within the chamber 6 of the main valve is lower than substantially the pressure of the low pressure fluid source of supply, the spring 73 will maintain the piston 72 in engagement with the valve seat 71, thereby preventing the fluid under high pressure from the conduit 69 from passing to the chamber 6 through the passage 70. Due to the direction in which the valve 71 faces, the high pressure fluid does not have a tendency to unseat the piston 72. The strength of the spring 73 is such, however, that when the pressure within the chamber 6 and the passage 70 amounts to substantially that of the low pressure fluid supply, the piston 72 will be moved upwardly off from its seat 71 admitting the fluid under high pressure to the chamber 6. It is frequently desirable to arrest at any point the movement of the press cylinder either in its upward or downward travel and to this end, I provide the waste check valve 64. This waste check valve comprises a piston 78 at its upper end provided with a valve seat 79 adapted to engage a valve seat 80 and close the passage therethrough. At this point it may be noted that the casing 81 which carries the waste check valve is substituted in the main valve assembly, as illustrated in Fig. 1, for the lower head 12a which carries the lower main valve thimble 20.

The piston 78 is supported in and guided by a cylindrical opening in the lower end of the casing 81, which opening is closed by means of the nut 82. A piston arm 83 is connected to the piston 78 and at its lower end is connected to a pressure head 84. A frame generally indicated at 85 and including a cup-shaped head 86 supports a diaphragm 87 against which the pressure head 84 bears. The frame 85 may be secured to the nut 82 or more particularly the casing 81, in any suitable manner as shown. Connected with the head 86 is a fluid supply pipe 88 through which fluid under pressure may be introduced to the space defined by diaphragm 87 and the head 86 to force the pressure head 84 upwardly and thus move the piston 78 upwardly until it engages the valve seat 80 and closes the passage therethrough.

The conduit 89 connected to the casing 80 will carry away the waste water from the valve.

In Fig. 2, as shown, a conduit 90 is connected with the head 37 of the main valve for introducing fluid under pressure to the space defined between the diaphragm 38 and the head 37 so that when fluid is thus introduced to such space, the closure member 27 may be manipulated in the manner explained in connection with the description of Fig. 1.

The conduits 88 and 90 shown in Fig. 2 are connected through the control valve generally indicated at 65 to a compressed air tank 91. The construction of the valve 65 will be more clearly apparent by having reference to Fig. 9.

As illustrated in Fig. 9, the valve 65 comprises a casing 92 having a central bore extending entirely therethrough and within which there is positioned a cylindrical lining 93. The central bore of the casing 92 is enlarged in three axially spaced areas denoted at 94, 95 and 96 respectively. The casing 92 in the areas of the en-

largements 94 and 95 is provided with apertured bosses 96 and 97 respectively. The bosses are internally threaded so as to receive the ends of the conduits 90 and 88 as shown in Fig. 2. The casing 92 is likewise provided with an apertured boss 98 opposite the enlargement 96 in the bore and into such last-named apertured boss there is screwed a pipe 99 connecting the valve 65 with the air tank 91.

10 The sleeve or lining member 93 is provided with a series of axially spaced apertures 100, 101 and 102, respectively, affording communication between the conduits 88, 90 and 99 and the interior of the sleeve 93.

15 Within the sleeve 93 there is slidably mounted a valve including two spaced cupped washers 103 and 104 formed of some suitable flexible gasket material such as leather, rubber, etc. Associated with each of the cups or gaskets 103 and 104 respectively are cup shaped metallic securing means 103a and 104a. These securing cups extend axially and radially over the edges of the flexible cups 103 and 104 so as to prevent the latter from moving into the openings 101, 102 and 103 while being moved past the same. The diameter of the valve between the spaced cups is less than the diameter of the sleeve 93 so that when the parts are in the position illustrated in Fig. 9, the air from the pipe 99 may flow through the valve 65 to the pipe 88. The valve within the lining 93 is connected by means of a suitable rod 105 to a manipulating handle 106, the latter being pivotally supported by means of a bracket 107 carried by the upper extension of the sleeve 93. The sleeve 93 is also provided with apertures therethrough at 108 whereby any fluid under pressure in the conduit 90 may escape to the outer atmosphere when the parts are in the position illustrated in Fig. 9.

40 The various elements of the valve 65 are so proportioned that when the handle 106 is moved from the position illustrated in the drawings to the position generally indicated by the line 109, the gasket 104 will have moved upwardly to a position between the openings 100 and 102 and the gasket 103 will be in a position between the openings 101 and 102. When the handle 106 is, therefore, in the position indicated by the line 109, the air from the pipe 99 will be prevented from flowing to either pipe 88 or 90 and both of such last-named pipes will be in communication with the atmosphere. If now the handle is moved downwardly to the position indicated by the line 110, the gasket 104 will be in a position between the openings 100 and 102 and the gasket 103 will have moved upwardly into a position between the openings 101 and 108. When the handle 106 is, therefore, in this last-named position, the air tank 91 will be connected through the conduit 90 to the space between the diaphragm 38 and the head 37 of the main valve.

In the light of the foregoing, it will be noted that when the handle is in the full line position illustrated in Fig. 9, the piston 78 will be forced upwardly into engagement with the valve seat 80 closing the passage therethrough and since the conduit 90 is not connected to the air tank but instead to the opening 108 vented to the atmosphere, the spring 42 will maintain the closure member 27 in the position illustrated in Figs. 1 and 2. When the handle 106 is in the "up" position, therefore, any fluid within the press cylinder will be trapped therein so that the piston of the press will be held in the position which it

occupied at the time the handle 106 was moved to the "up" position.

Assume now that the handle 106 is moved to the intermediate position, i. e., that represented by the line 109 and as illustrated in Fig. 2. Both conduits 88 and 90 will now be vented to the atmosphere so that the valve will be entirely de-energized and the parts will occupy the position illustrated in Fig. 2.

Assuming now that the handle 106 is moved to the "down" position, as denoted by the line 110 in Fig. 9. The pipe 90 will then be connected to the air tank 91 and the pipe 88 will be vented to the outside atmosphere, the piston 78 will remain in the position as illustrated in Fig. 2, but the closure member 27 will move downwardly from engagement with the seat 30 into engagement with the seat 22. The valve will, therefore, connect the press with the low pressure source of fluid; and the press will remain so connected until the piston reaches the limit of its travel, whereupon the pressure within the chamber 6 will build up to a point sufficient so that fluid from the high pressure source of supply will be admitted to the press in the manner previously explained.

Instead of employing fluid pressure means for moving the closure member 27 from the valve seat 30 into engagement with the valve seat 22, as illustrated in Figs. 1 and 2, I may use mechanical means as illustrated in Figs. 3 to 6 for accomplishing this purpose. In Figs. 3 and 4 only so much of the main valve assembly as need be shown for an understanding of this modification has been illustrated and like reference characters will be employed to designate the parts of the main valve assembly illustrated in Fig. 1 which are shown in Figs. 3 and 4. In Figs. 3 and 4 the closure member 27 is shown connected to an actuating stem 111 which, at its upper end, extends into a movable plunger 112. The plunger 112 extends out of the chamber 4 and a gasket 113 is employed to prevent leakage of the fluid from the valve chamber past the plunger. The stem 111 is secured in the plunger 112 by means of a nut 114 which, as most clearly illustrated in Fig. 6, is, at its upper end, provided with a recess 115. The stem 111 is provided with an enlarged head 116 so that a limited amount of relative axial movement between the stem 111 and the plunger 112 may take place in the manner and for the purpose hereinafter more fully explained.

Any suitable means such as a cam 117 carried by shaft 118 may be employed to move the plunger 112 downwardly from the position illustrated in Fig. 4 to the position illustrated in Fig. 3. At this point, it should be noted that the diameter of the plunger 112 where it passes out of the casing of the valve is greater than the effective diameter of the closure member 27, so that the fluid under pressure in the chamber 4 tends to maintain the parts in the position illustrated in Fig. 4 until the cam 117 moves the same into the position illustrated in Fig. 3.

When the shaft 118 is rotated causing the cam 117 to force the plunger 112 downwardly in the manner illustrated in Fig. 3, the parts are so proportioned that the closure member 27 moves into engagement with the valve seat 22 shortly before the plunger 112 reaches the limit of its travel under the influence of the cam. After the closure member has thus become seated, further movement of the plunger 112 is permitted by the head 116 of the rod 112 moving upwardly in the space 115, as illustrated in Fig. 5. When the cam 117

is, therefore, in the position illustrated in Fig. 3, the plunger 112 is held in such a position that it exerts no axial force upon the stem 111. The pressure within the chamber 6 will then maintain the closure member 27 in engagement with the valve seat 22.

The employment of the means illustrated in Figs. 3 to 6, both inclusive, for actuating the closure member 27 makes it possible to control a plurality of valves from a single shaft such as 118. This is particularly advantageous when a bank of presses is operated from a single control station.

It will be noted that in the form of main valve assembly as illustrated in Figs. 1 and 2, the high pressure supply check valve associated therewith has been functionally responsive upon the building up of pressure within the main valve chamber to immediately and automatically cut in the high pressure fluid as soon as the press piston reaches the limit of its travel. It is frequently desirable when curing certain rubber products to have the early stages of the cure proceed while the press is held closed by low pressure and to cut in the high pressure only during the latter stages of the cure. To this end, I provide a high pressure check valve such as is illustrated at 119 in Fig. 7. The check valve 119 is, in many respects, similar to the check valve 63 and, therefore, like reference characters will be employed to designate like parts. The principal difference between the check valve 63 and 119 is that the latter, instead of employing a spring to maintain the piston 72 in engagement with the valve seat 71, utilizes a connecting rod 120 at its lower end secured to the piston 72 and at its upper end secured to a pressure head 121. The plug 74' carries a frame generally indicated at 122 which supports a cup-shaped head 123 and a diaphragm 124. Connected to the head 123 is an air pipe 125 by which air may be introduced to the space between the diaphragm 124 and the head 123 to force the piston 72 downwardly into engagement with the seat 71 and to close the passage there-through. When the high pressure line check valve such as 119 is employed, the piston 72 may be maintained on its seat for any desired length of time after the press is closed and such piston may be moved off of its seat at any time during the cure to admit the high pressure fluid to the press cylinder.

For certain types of operation as hereinafter more fully explained, it may be desirable to include in the main valve assembly an independently controllable check valve such as 126 whereby the flow of low pressure fluid to the main valve and more particularly to the press may be controlled independently of the main closure member 27. The valve 126, as illustrated in Fig. 7, comprises a body generally indicated at 127 connected in the low pressure supply pipe 127a within which there is a partition 128 having a passage therethrough which may be closed by the plate 129. The plate 129 is connected to a stem 130 which passes out of the valve body through the packing gland 131 and to the upper end of which there is secured a pressure head 132. A frame generally indicated at 133 supported by the body 127 carries a diaphragm 134 and a cup-shaped head 135. A pipe 136 is connected to the head 133 so that air or other suitable fluid under pressure may be introduced to the space between the diaphragm 134 and the head 135 to force the plate 129 into engagement with the partition 128 and thus close off the flow

of fluid from the low pressure source of supply.

In Fig. 10 there is diagrammatically represented a complete control system for hydraulic presses embodying the several previously described features of my invention. The main valve 1, the high pressure line check valve 119, the waste valve 64 and the low pressure inlet valve 126 and the control valve 65 which have all been described in detail are merely diagrammatically represented.

In addition to the conduits 88 and 90 connected to the control valve 65, as previously explained, there are included a time delay control valve 137, a hand-operated valve 138, a conduit 139, a branch conduit 140 and a conduit 141, all connected as clearly shown in the drawings, so that air or suitable fluid under pressure from the container or tank 91a may be utilized in the manner presently to be explained in variously manipulating the valve assembly so that a proper control may be had over the press.

At this point it may be well to note that the conduit 127a is connected to a source of low fluid pressure; the conduit 69 is connected to a source of high fluid pressure; conduit 62a is connected to the press and the conduit 89 is connected to a waste.

The time delay control valve 137 is connected by means of a link 142 to the lever 106 and such valve is so constructed that at the expiration of a predetermined time interval after either the handle 106 is raised to the upper position or after the pressure in the conduit 62a builds up to a predetermined value, i. e., approximately to that of the pressure within the conduit 127a, such time delay control valve will close off the air supply to the pipe 125, i. e., the check valve 119, and vent such valve to the atmosphere so that communication is established between the high pressure fluid supply and the press.

The valve 138 which is preferably hand-operated is employed for the purpose of controlling the low pressure supply valve 126.

From the foregoing it will be apparent that the operator, by a simple manipulation of the handle 106 and/or the valve 138, may control the operation of the press in any desired manner.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the apparatus herein disclosed, provided the means stated in any of the following claims, or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A control valve for fluid-operated presses and the like comprising a casing having a chamber therein and provided with passages by which said chamber may be connected with a source of relatively low fluid pressure, a drain, a source of relatively high fluid pressure and a press cylinder, axially spaced annular valve seats facing toward each other in said chamber, a movable closure member adapted to alternately engage said valve seats and close the passage there-through, and another closure member movable independently of said first-named closure member and adapted to engage and close the passage through one of said valve seats.

2. Control means for fluid operated presses and the like including a valve comprising a casing having a chamber therein and provided with passages by which said chamber may be connected with a source of relatively low fluid pressure, a drain, a source of relatively high fluid

pressure and a press cylinder, axially spaced annular valve seats in said chamber, a movable closure member adapted to alternately engage said valve seats and close the passage there-
5 through, another closure member movable independently of said first named closure member

and adapted to engage and close the passage through one of said valve seats, and means for selectively independently and simultaneously moving said closure members.

ARCHIBALD F. SINCLAIR.