

March 30, 1954

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2,673,552

CONTROL APPARATUS FOR STEAM-HYDRAULIC FORGING PRESSES

Filed Jan. 12, 1953

3 Sheets-Sheet 1

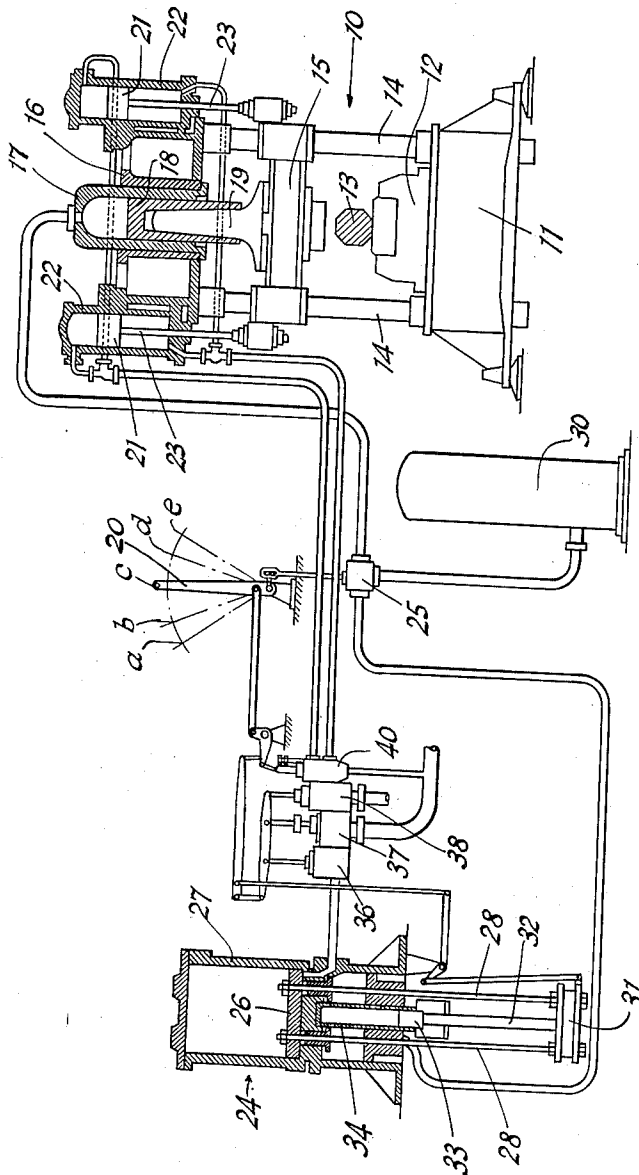


FIG. 1

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3 Sheets-Sheet 2

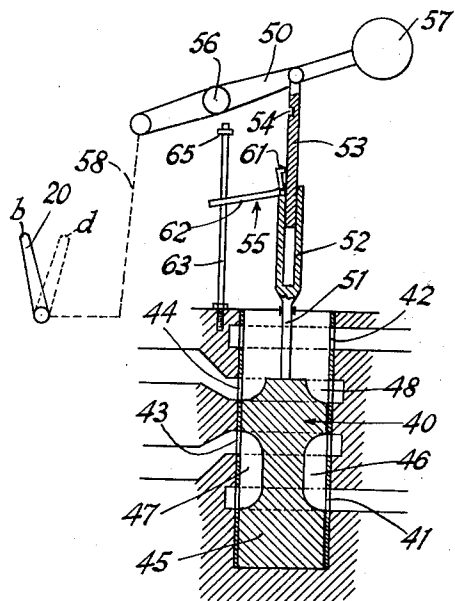


FIG. 2

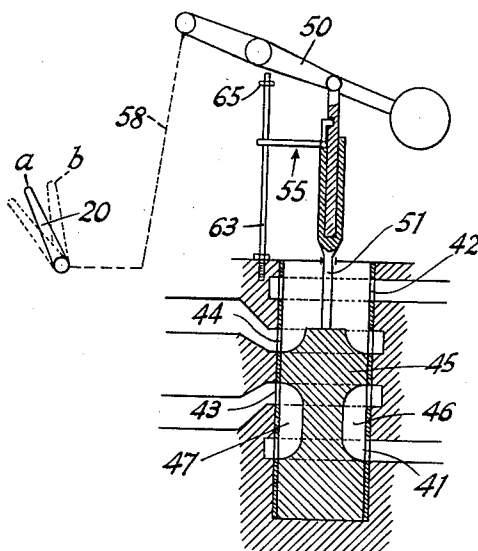


FIG. 3

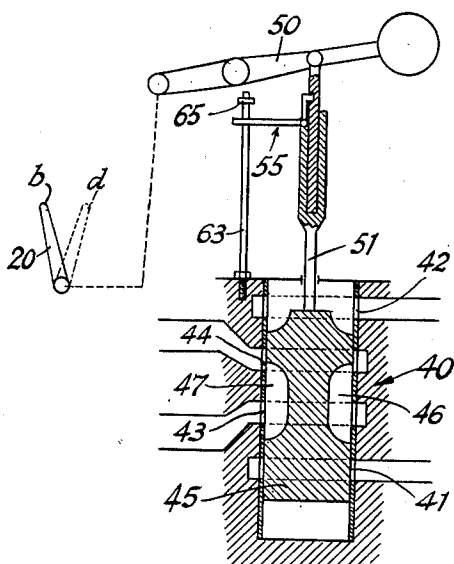


FIG. 4

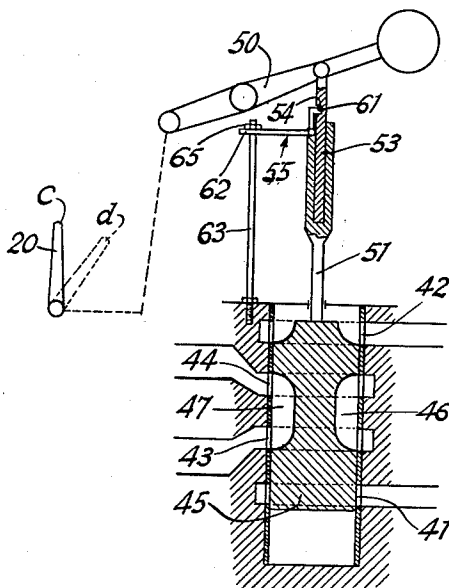


FIG. 5

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3 Sheets-Sheet 3

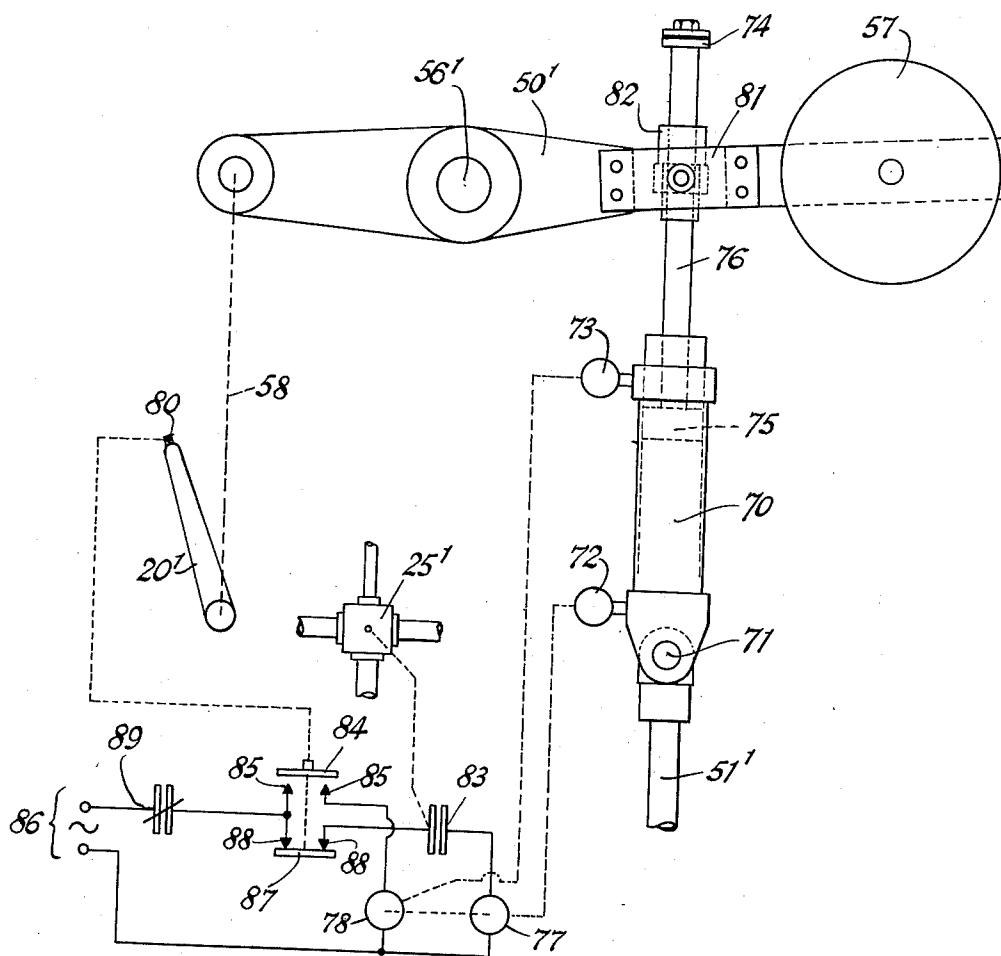


FIG. 6

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CONTROL APPARATUS FOR STEAM-HYDRAULIC FORGING PRESSES

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Application January 12, 1953, Serial No. 330,663

10 Claims. (Cl. 121-38)

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This invention relates to controls for metal working presses and, more particularly, to an improved and more flexible control for steam-hydraulic metal forging presses.

In a known steam-hydraulic forging press to which the invention control is particularly applicable, a vertically movable forging ram or head is moved downwardly toward the work, during a forging or pressing stroke, by a hydraulic actuator supplied with a liquid motive fluid under high pressure. The high pressure liquid, usually water, is delivered to the actuator from a steam-operated pressure intensifier through a hydraulic fluid control valve. The latter not only controls delivery of the high pressure water to the actuator but also controls flow of water from the actuator, during lifting of the ram, to a pre-fill tank or accumulator connected, through the control valve, to the pressure intensifier.

The pressing ram is lifted by steam operated pistons acting in upwardly oriented cylinders. During forging of the workpiece, steam is continually admitted beneath these pistons and exhausted from above the pistons. Thus, whenever the hydraulic force urging the pressing ram downwardly is released, the pistons raise the ram toward the starting point of the forging, or downward, stroke.

The ram has only a limited stroke in the forging direction, due to design considerations resulting from the high hydraulic pressures used. Hence, as the workpiece is successively reduced in vertical dimension, the starting point of the forging stroke must be correspondingly lowered to obtain the benefit of the full length of the forging or power stroke.

This re-positioning of the forging stroke starting point is effected by lifting the ram and then equalizing the pressures on both sides of the lifting pistons without supplying pressure liquid to the hydraulic actuator. The ram thus descends by gravity, with the control valve acting merely as a check valve for the actuator and opening, under pressure from the pre-fill tank, to deliver water to the intensifier. When the starting point of the power stroke has thus been re-positioned, the forging operation is resumed.

These operations of the forging ram, as well as those of the pressure intensifier, are under the control of an operator's control lever having two ranges of movement, one of which may be termed the "pressing" range and the other the "ram positioning" range. This control lever is operatively interconnected, through servo mechanisms, with the afore-mentioned hydraulic control valve, with a piston type valve controlling admission and exhaust of steam for the cylinders of the ram lifting pistons, and with valves controlling the steam operated hydraulic pressure intensifier.

The present invention is directed solely to the control of the piston type valve by the oper-

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ator's control lever. This valve, when the control lever is in the pressing range, is not influenced by motion of the control lever and maintains a position connecting the cylinder volume beneath the ram lifting pistons to steam under pressure and the volume above the ram lifting pistons to exhaust. Thus, the steam beneath these pistons is compressed during the hydraulically-effected power stroke of the ram, and acts to lift the pistons and the ram as soon as the hydraulic pressure is released.

To re-position the starting point of the ram power or pressing stroke, the operator must move his control lever through and beyond the ram lifting position of the pressing range and substantially completely to the far limit of the ram positioning range. At substantially the extreme limit of movement of the lever through the positioning range, a releasable latch connects the stem of the piston type valve to an element moved by the control lever, thus operatively interconnecting the lever and the piston type valve.

When the lever is now moved through the positioning range toward the pressing range, the piston valve is moved to interconnect the cylinder volumes above and below the ram lifting pistons, thus equalizing the pressures on both sides of these pistons. The ram can now descend by gravity to the new starting point of the power stroke. The rate of ram movement is controlled by the degree of movement of the piston valve to uncover the pressure equalizing parts.

The fact that the control lever must be moved through both ranges from one extreme position to the other, before re-positioning of the ram can be effected, seriously affects the output of the press due to the time thus consumed in re-positioning the ram. In addition, the continued upward movement of the ram as the lever is moved through the maximum lift position into the ram positioning range and to the piston valve remaining in the ram lifting position during movement of the lever to substantially the extreme limit of the positioning range, results in an unnecessary consumption of steam in useless lifting of the ram beyond the desired starting point of the power stroke.

The present invention is accordingly directed to an improved control of the operative interconnection between the control lever and the piston valve, whereby the latter can be operated by the control lever, to re-position the ram, at any position of the control lever except the "full press" position, and whereby the piston valve is automatically rendered inoperative by the control lever and conditioned to move to its ram lift position whenever the control lever is moved to the "full press" position.

To this end, the effective length of the stem of the piston valve is made variable, preferably by connecting one end of a pressure cylinder to

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the outer end of the stem, this cylinder containing a piston having a piston rod carrying a stop on its outer end. A lever, interconnected by the servo mechanism to the operator's control lever, has a free end carrying a collar slidable along this piston rod. The stroke of the piston rod is so selected that, in the extended position of the rod, the stop will not be engaged by the collar in any position of the control lever but, when the piston rod is retracted, the stop will be engaged by the collar in every position of the control lever or handle except the "full press" position.

This piston rod is normally extended so that the operator's handle can be moved without operating the piston valve controlling the ram lifting pistons. To operate this piston valve to reposition the ram, the operator merely depresses a push button on the control handle. This closes an electric circuit which operates a solenoid valve to admit pressure fluid to the control cylinder retracting the piston rod and maintaining it retracted. The control handle is now effectively connected to operate the position control piston valve, due to engagement of the stop on the piston rod with the collar on the lever.

The "ram positioning" interconnection of the control handle and the piston valve can thus be made at any position of the control handle, except the "full press" position, and the handle need not be moved through "full lift" and the control range before the ram can be repositioned. As the handle is moved to the "full press" position, the hydraulic control valve is opened in the same manner as before to supply liquid under high pressure to the hydraulic actuator. This opening of the hydraulic control valve closes a switch which effects energization of the solenoid valve in a direction to extend the stop-carrying piston rod. The ram position control piston valve can thus move back to its normal ram lift position.

For an understanding of the invention principles, reference is made to the following description and the accompanying drawings. In the drawings:

Fig. 1 is a somewhat schematic elevation view, partly in section, of a steam-hydraulic forging press and controls of the type to which the present invention is applicable;

Figs. 2 through 5 are partially schematic sectional views of the ram position control piston valve, illustrating the usual releasable latch interconnection with the operator's control handle in certain key positions of the latter; and

Fig. 6 is a partially schematic elevation view of the invention control arrangement for the ram position control piston valve, including a schematic illustration of the control circuits.

Referring to Fig. 1 of the drawing, a steam-hydraulic forging press 10 is illustrated as comprising a bed 11 on which is a support 12 for a workpiece 13 such as an ingot or bloom. Extending upwardly from bed 11 are columns 14 which act as guides for a vertically movable pressing ram 15. Ram 15 is moved under high pressure toward bed 11, to forge workpiece 13, by a hydraulic actuator mounted in a superstructure or head structure 16 tied rigidly to bed 11 by columns 14. The hydraulic actuator compresses a cylinder 17 in which is movable a piston 18 receiving the stem 19 of ram 15.

Ram 15 is forced in the downward or forging direction by the hydraulic actuator 17-18, control of the ram being effected by an operator's control handle or lever 20. Upward movement of

ram 15, and positioning of the starting point of the power or forging stroke, is effected by double acting pistons 21 movable in cylinders 22 mounted in superstructure 14, the pistons having piston rods 23 connected to ram 15.

Hydraulic fluid under high pressure is supplied to actuator 17-18 from a pressure intensifier 24 through a hydraulic control valve 25 mechanically interconnected to control handle 20. Intensifier 24 includes a large diameter, low pressure steam operated piston 26 operating in a cylinder 27 and tied by rods 28 to a head 31 on the outer end of the stem 32 of a small diameter piston 33 operating in a cylinder 34 connected to valve 25. Also connected to this latter valve is a pre-fill tank or accumulator 30.

The operator's control handle is also operatively connected to four steam flow control valves through the medium of suitable servo mechanisms. Three of these valves control the operation of intensifier 24, these being an equalizer valve 36, an exhaust valve 37, and an inlet valve 38. The fourth valve 40 is a piston type valve controlling lifting and positioning of ram 15, and this piston valve is connected for operation by handle 20 through a releasable latch. This latch is released when handle 20 is moved from the solid line position of Fig. 1 clockwise through the pressing range. To re-engage the latch mechanism, in order to re-position the starting point of the forging stroke, lever 20 must be moved counterclockwise through the solid line position of Fig. 1 into the ram positioning range and to substantially the extreme counterclockwise position of this range.

The steam exhaust and inlet valves 37 and 38 are operated, responsive to operation of control lever 20 from the standing or neutral position shown in Fig. 1 clockwise through the pressing range, to admit steam under pressure beneath piston 26 and connect the space above the piston to exhaust. At this time, hydraulic valve 25 is in a position closing off tank 30 and connecting intensifier 24 to hydraulic actuator 17-18. The steam pressure raises piston 26 forcing piston 33 into cylinder 34 and delivering hydraulic fluid under very high pressure through valve 25 to actuator 17-18. At the same time, valve 40 will be in a position admitting steam to the undersides of pistons 21 and connecting the space above these pistons to exhaust. Piston 18 and ram 15 are forced downwardly, to deliver the forging stroke, and compressing the steam beneath pistons 21. This occurs in the extreme clockwise, or "maximum pressing," position of handle 20. At the limit of the forging stroke, handle 20 is moved counterclockwise to a position short of the neutral position of Fig. 1. This closes the steam inlet and exhaust valves 37-38, and opens equalizing valve 36 which equalizes the pressure above and below intensifier steam piston 26. Piston 26 falls, moving piston 33 downwardly in cylinder 34. The steam pressure beneath pistons 21 moves these pistons and ram 15 upwardly to the starting point of the power stroke, the hydraulic fluid flowing from actuator 17-18 through valve 25 into cylinder 34. The forging stroke may be repeated from the same starting point by moving handle 20 clockwise to its limiting position.

The operation of the control system in re-positioning the starting point of the power stroke of ram 15 will be best understood by reference to Figs. 1 through 5. Fig. 2 shows the piston valve 40 in the position it occupies when lever 20 is

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moving through the pressing range. Valve port 41 is connected to steam under pressure, preferably through inlet valve 38, and valve port 42 is connected to exhaust, preferably through exhaust valve 37. Valve port 43 is connected to the space beneath ram lifting pistons 21 and valve port 44 is connected to the space above ram lifting pistons 21. The valve 40 includes a piston 45 having longitudinally extending grooves 46 and 47 in its periphery, these grooves having a length such that they can selectively interconnect ports 41 and 43 or ports 43 and 44. The upper edge of piston valve 45 has a recess 48 and of such dimension that, in the lowermost position of valve 45 (Figs. 2 and 3) port 44 is connected to exhaust port 42. The relation of the parts is such that in such lowermost position of piston valve 45, port 43 is connected to steam inlet port 41.

The piston valve 45 has an upwardly extending stem 51 provided with a guide 52 slidably receiving a latch bar 53 having notch 54 near its upper end. The upper end of bar 54 is pivotally connected to a lever 50 pivoted to a fixed point at 56 and carrying a weight 57 on its free end. The other end of the lever is schematically illustrated as connected by servo mechanism 58 to control handle 20. Guide 52 has pivotally mounted thereon a latch 55 having a keeper 61 adapted to engage in notch 54 and a forked operating arm 62 embracing a rod 63 extending upwardly from valve 40 parallel to guide 52. Rod 63 has a stop 65 adjustably mounted on its upper end, and arranged to engage arm 62, during upward movement of latch bar 53, to release keeper 61 from notch 54.

In the position of valve 40 shown in Fig. 2, it is assumed that lever 50 is moved clockwise due to movement of lever 20 from the maximum press position *e* toward the ram positioning range of lever 20. During such movement of handle 20, steam flows from port 41 through grooves 46, 47 to port 43 and thus to the space beneath lifting pistons 21. Ram 15 is thus moved upwardly, as previously described, following the completion of a forging stroke.

It is assumed that it is desired to re-position the starting point of the forging stroke. As counterclockwise movement of handle 20 is continued, through the positions *d*, *c* and *b* of Fig. 1, the hydraulic control valve 25 is opened mechanically when handle 20 reaches position *b*, and connects the pre-fill tank 30 into the hydraulic system. This permits water from the hydraulic system to flow into tank 30 as pistons 21 continue to move ram 15 upwardly. Continued motion of handle 20 through position *b* allows the spring loaded hydraulic control valve 25 to close, stopping upward motion of ram 15. During this time, latch bar 53 associated with valve 40 is moving downwardly in guide 52.

To re-position the starting point of the forging stroke, control handle 20 is moved to position *a*, whereupon latch keeper 61 snaps into notch 54 of latch bar 53, thus connecting piston 45 to lever 50. During such motion, the ram again moves upwardly due to opening of valve 45 which is closed by movement to position *b*. This upward ram movement continues until handle 20 is moved clockwise back beyond position *b*.

Such continued clockwise movement of handle 20 begins to lift piston 45, as illustrated in Fig. 4 so that piston 45 closes port 41, interrupts the connection between ports 42 and 44, and begins to interconnect ports 43 and 44. Inlet steam is now

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shut off from beneath the pistons 21 and steam begins to bleed from beneath the pistons through ports 43, grooves 46, 47, and ports 44 to the space above pistons 21. The resulting gradual equalization of the pressure above and beneath the pistons 21 allows the ram 15 to drop, with valve 25 acting as a check valve as the hydraulic fluid flows out of actuator 17-18. Further movement of handle 20 clockwise toward the power range increases the bleed-off rate as will be noted from Fig. 5, and increases the rate of drop of ram 15. The maximum rate of bleed-off is illustrated in Fig. 5.

After ram 15 engages workpiece 13, movement of handle 20 to position *d* causes sufficient upward movement of bar 53 that arm 62 of latch 55 engages stop 65 on bar 63. This swings latch 55 counterclockwise disengaging keeper 61 from notch 54, and allowing piston 45 to drop back to the position of Fig. 2. The control handle 20 is now in the pressing range and may be moved back and forth therein to raise and lower the ram without again interconnecting valve 40 to itself. In the position of Fig. 2, as explained, the space beneath pistons 21 is connected to steam under pressure and that above the piston to exhaust.

The required movement of handle 20 to substantially the far extreme of the ram positioning range in order to re-position the starting point of the forging stroke results in undue delay and in unnecessary use of steam to lift the ram beyond the desired starting point for the next forging stroke. This delay may be avoided, and the ram starting point re-located at any position of control handle 20, except the maximum press position, by the modified control of this invention as shown in Fig. 6.

Referring to Fig. 6, which shows only the valve stem 51' connected to valve piston 45, a cylinder 70 has a swivel connection 71 to the upper end of stem 51'. A piston 75 operating in cylinder 70 has a piston rod 76 projecting upwardly therefrom. Admission of pressure fluid to either side of piston 75 is controlled by valves 72, 73 which are operable by interlocked solenoids 77, 78. The upper end of rod 76 has a stop 74 adjustably secured thereto.

Lever 50 is replaced by a modified lever 50' pivotally mounted to a fixed point at 56' and interconnected by servo mechanism 58 to the control handle 20'.

Intermediate point 56' and weight 57, a bracket 81 on lever 51' is pivotally connected to a collar 82 slidable on rod 76. The relation of parts is so chosen that, in the extended position of rod 76, lever 20' will remain ineffective to operate valve 45 throughout the entire operating range of the control lever; and in the retracted position of rod 76, stop 74 will remain engaged with collar 82 in every position of control handle 20' except the maximum pressing position.

Operation of piston 75 is under the conjoint control of a push button 80 on the end of lever 20' and hydraulic control valve 25'. This valve is modified from valve 25 so that when valve 25' closes under its spring loading, it closes a switch 83. Push button 80 has a first bridging member 84 arranged, when the push button is depressed, to momentarily close contacts 85 to connect solenoid 78 across a suitable source of voltage 86. The push button has a second bridging member 87 which normally engages contacts 88 connected, in series with switch 83 and solenoid 77, across source 86. A main control switch 89 is also provided in the circuit, and is normally closed when

the steam-hydraulic press is in operation. To re-position the ram at any position of control handle 20, the operator merely depresses button 30. This cuts the switch 83 out of circuit by opening contacts 88, and energizes solenoid 78 through closing of contacts 85. Solenoid 78 is interlocked with solenoid 77 so that valve 73 is opened to pressure and valve 72 is opened to exhaust. The valves remain in such position until the next operation of solenoid 77. This retracts piston 75 into cylinder 70 so that stop 74 engages collar 82 and stem 51' of valve piston 45 is effectively connected for operation by control handle 20'. When the ram 15 has been lowered on to the workpiece and the hydraulic system has been filled, hydraulic control valve 25' closes in the same manner as previously. This closing of valve 25' closes switch 83 which completes the energizing circuit for solenoid 77. Solenoid 77 interlocked with solenoid 78 now opens valve 72 to pressure and opens valve 73 to exhaust to extend rod 76. The piston valve 45 is thus effectively disconnected from control handle 20' so that ram 15 is in the normal power stroke operating position.

Thus, the press operation is greatly speeded up as there is no necessity for moving handle 20' completely through the ram positioning range in order to re-position the ram starting point. The ram starting point may be re-positioned at any point in the range of operation of handle 20', except in the maximum press position. Furthermore, no unnecessary lifting of the ram results, as is the case with the arrangement shown in Figs. 1 through 5.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides

to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; mechanism selectively operable to extend and retract said stem; and a control element on said handle selectively operable to condition said mechanism to fully retract said stem to engage said stop with said slider.

2. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; mechanism selectively operable to extend and retract said stem; a control element on said handle selectively operable in any position of said handle to condition said mechanism to fully retract said stem to engage said stop with said slider; and means operable by said control valve, responsive to movement of the control handle to the "press" position, to condition said mechanism to fully extend said stem.

3. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram

positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; mechanism selectively operable to extend and retract said stem; a control element on said handle selectively operable in any position of said handle to condition said mechanism to fully retract said stem to engage said stop with said slider; means operable by said control valve, responsive to movement of the control handle to the "press" position, to condition said mechanism to fully extend said stem; and an interlock device operable conjointly with said control element to render said last-named means ineffective.

4. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a cylinder connected to said piston valve; a piston operable in said cylinder and having a stem projecting therebeyond; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; and a control element on

said handle selectively operable to admit pressure fluid to said valve cylinder to retract said valve piston and stem to engage said stop with said slider.

5. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a cylinder connected to said piston valve; a piston operable in said cylinder and having a stem projecting therebeyond; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; a control element on said handle selectively operable to admit pressure fluid to said valve cylinder to retract said valve piston and stem to engage said stop with said slider; and means operable by said control valve, responsive to movement of the control handle to the "press" position, to admit pressure fluid to said valve cylinder to fully extend said valve piston and stem.

6. A control for a steam-hydraulic press of the type comprising a vertically movable pressing ram, a hydraulic actuator operable to move said ram in the pressing direction, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a hydraulic fluid control valve controlling flow of hydraulic fluid under pressure to and from said actuator, a piston valve controlling admission to and exhaust from said cylinders, and an operator's control handle operatively interconnected with said control valve and movable through a pressing range and a ram positioning range, said handle having a "press" position in the pressing range in which said control valve is operable to admit hydraulic fluid under pressure to said actuator, and a "lift" position in the pressing range in which said control valve is operable to exhaust hydraulic fluid from said actuator; said control comprising a cylinder

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connected to said piston valve; a piston operable in said cylinder and having a stem projecting therebeyond; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; said piston valve, in its innermost position, connecting the undersides of the piston means to pressure and the upper sides to exhaust whereby said piston means will lift said ram when the control handle is in the "lift" position; said piston valve, when moved outwardly, interconnecting the spaces above and beneath said piston means to equalize the pressures thereon to provide for lowering of said ram by gravity; a control element on said handle selectively operable to admit pressure fluid to said valve cylinder to retract said valve piston and stem to engage said stop with said slider; means operable by said control valve, responsive to movement of the control handle to the "press" position, to admit pressure fluid to said valve cylinder to fully extend said valve piston and stem; and an interlock device operable conjointly with said control element to render said last-named means ineffective.

7. A control as claimed in claim 6 in which the admission of fluid to said valve cylinder is controlled by a pair of interlocked solenoid valves, said control element is a push button controlling energization of one solenoid valve, said last-named means is a switch controlling energization of the other solenoid valve, and said interlock device is a circuit closure of said push button in series with said switch and the source of elective potential.

8. In a steam-hydraulic press of the type comprising a hydraulically actuated vertically movable pressing ram, a control valve controlling application of hydraulic pressure to said ram, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a piston valve controlling application of pressure to said piston means and having a retracted position applying pressure beneath said piston means and an extended position equalizing pressure above and beneath said piston means, and means, including an operator's control handle movable through a pressing range and a ram positioning range; a ram retracting and positioning control comprising, in combination, a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; mechanism selectively operable to extend and retract said stem; and a control element on said handle selectively operable to condition said mechanism to fully retract said stem to engage said stop with said slider.

9. In a steam-hydraulic press of the type comprising a hydraulically actuated vertically movable pressing ram, a control valve controlling application of hydraulic pressure to said ram, piston means connected to said ram and op-

erating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a piston valve controlling application of pressure to said piston means and having a retracted position applying pressure beneath said piston means and an extended position equalizing pressure above and beneath said piston means, and means, including an operator's control handle movable through a pressing range having a "press" position and a ram positioning range; a ram retracting and positioning control comprising, in combination, a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider when said stem is extended and engageable by said slider to move said stem outwardly when said stem is retracted; mechanism selectively operable to extend and retract said stem; a control element on said handle selectively operable in any position of said handle to condition said mechanism to fully retract said stem to engage said stop with said slider; and means operable by said control valve, responsive to movement of the control handle to the "press" position, to condition said mechanism to fully extend said stem.

10. In a steam-hydraulic press of the type comprising a hydraulically actuated vertically movable pressing ram, a control valve controlling application of hydraulic pressure to said ram, piston means connected to said ram and operating in cylinders connectible to a source of elastic fluid under pressure, said piston means being operable to retract said ram and control its position for the start of the pressure stroke, a piston valve controlling application of pressure to said piston means and having a retracted position applying pressure beneath said piston means and an extended position equalizing pressure above and beneath said piston means, and means, including an operator's control handle movable through a pressing range having a "press" position and a ram positioning range; a ram retracting and positioning control comprising, in combination, a longitudinally extendable and retractable stem connected to said piston valve; a stop on the outer end of said stem; a slider movable along said stem by said handle during movement of the latter in either range; said stop being beyond the path of movement of said slider to move said stem outwardly when said stem is retracted; mechanism selectively operable to extend and retract said stem; a control element on said handle selectively operable in any position of said handle to condition said mechanism to fully retract said stem to engage said stop with said slider; means operable by said control valve, responsive to movement of the control handle to the "press" position, to condition said mechanism to fully extend said stem; and an interlock device operable conjointly with said control element to render said last-named means ineffective.

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