

June 14, 1932.

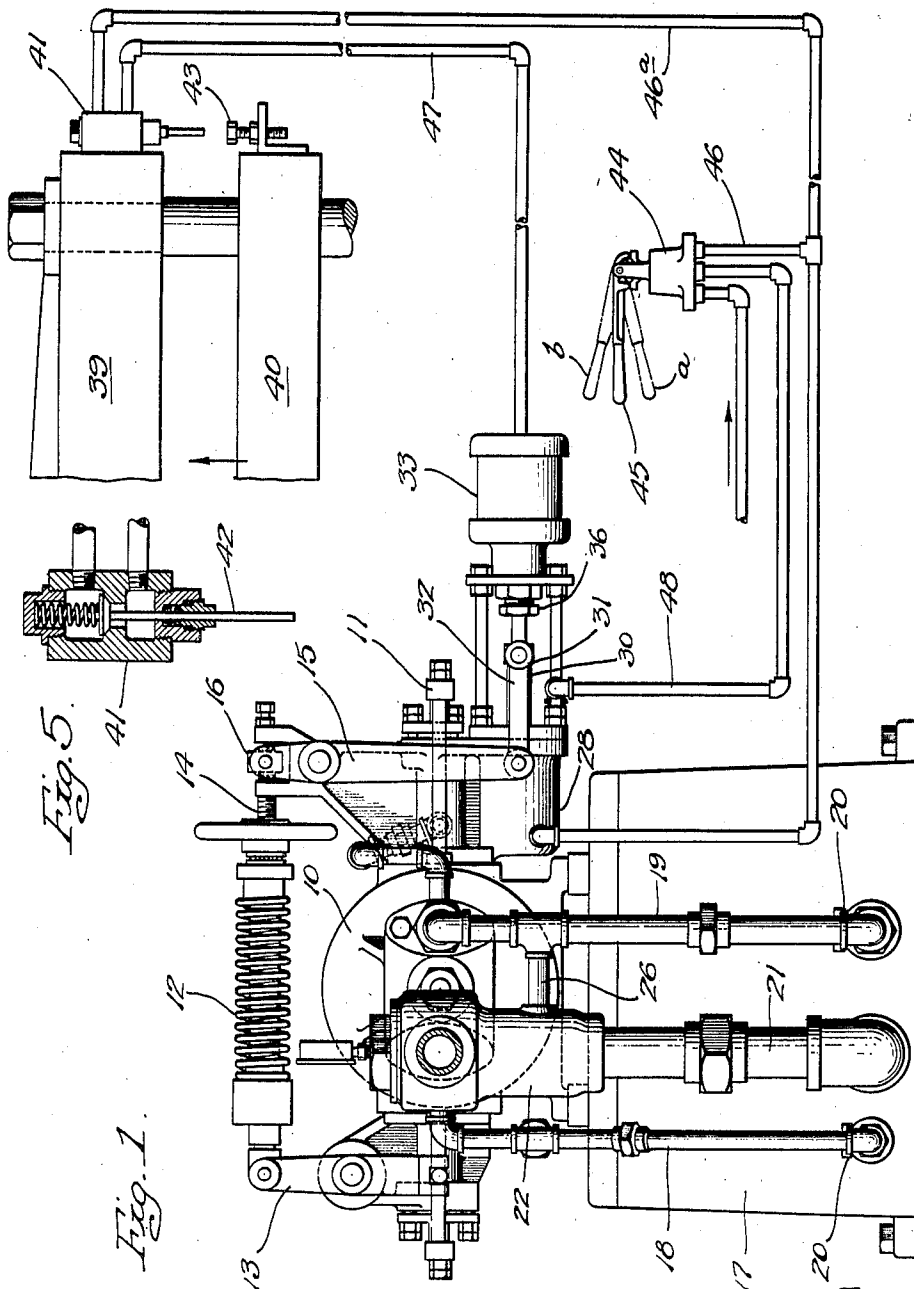
H. W. LANDENBERGER ET AL

1,863,448

CONTROL SYSTEM FOR RAMS

Filed May 29, 1929

2 Sheets-Sheet 1



Inventors:
Harry W. Landenberger,
Harry W. Link,
by their Attorneys:
Hawson & Hawson

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Fig. 2.

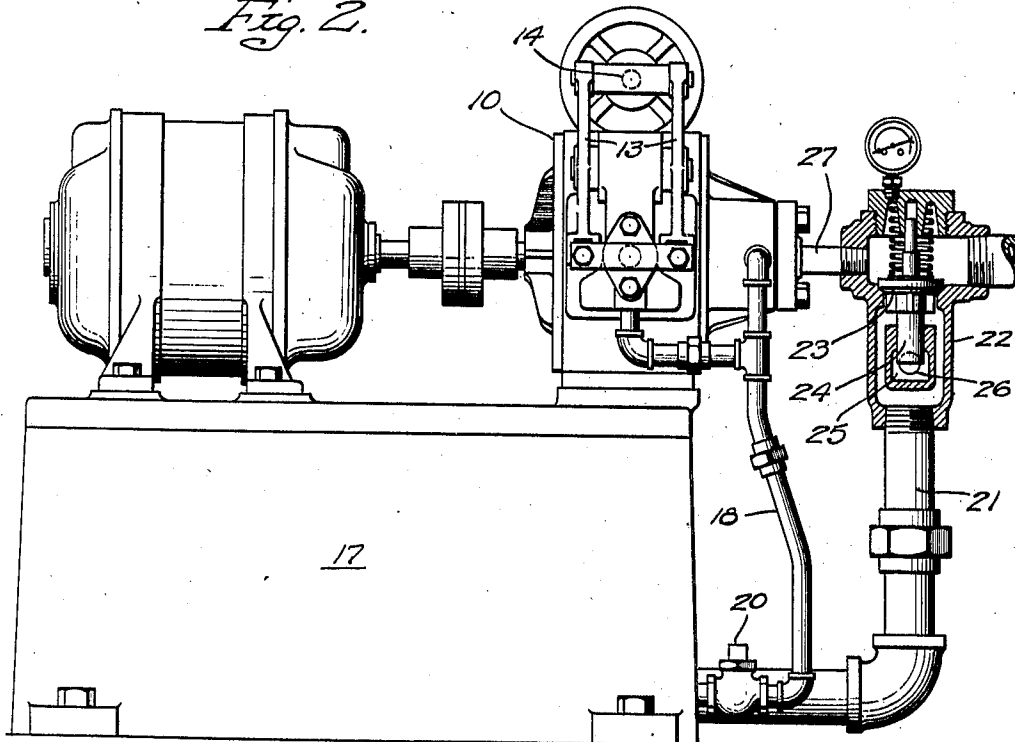


Fig. 3.

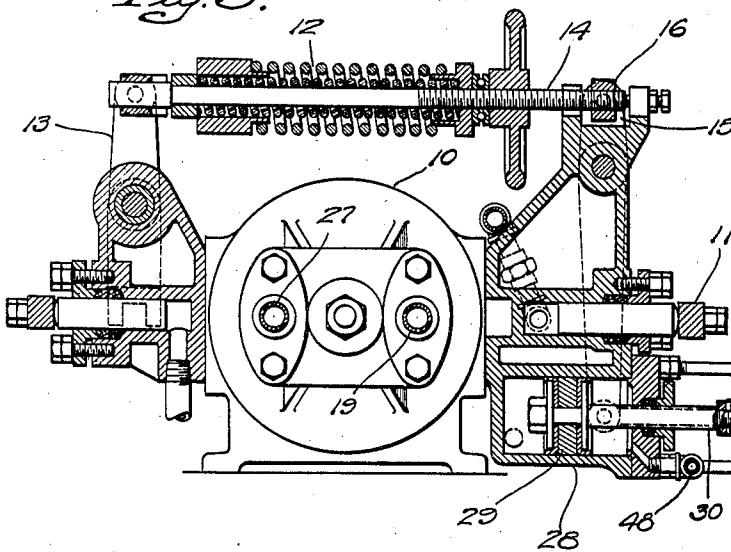
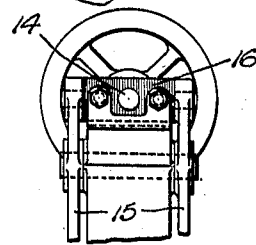


Fig. 4.



Inventors:
Henry W. Landenberger,
Harry W. Link,
by their Attorneys:
Harrison & Harrison

UNITED STATES PATENT OFFICE

HENRY W. LANDENBERGER AND HARRY WESLEY LINK, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO AMERICAN FLUID MOTORS COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

CONTROL SYSTEM FOR RAMS

Application filed May 29, 1929. Serial No. 367,001.

Our invention relates to means for supplying the rams of hydraulic presses with operating fluid and for controlling the supply thereof.

5 In pressing certain substances, particularly brittle substances such as glass, the operation of the ram controlling the movable platen must be very closely regulated, as otherwise considerable breakage occurs. In
10 pressing glass, particularly, it is necessary that the plate be moved very slowly when it brings pressure to bear thereon and an important object of the present invention is to provide means for automatically checking the
15 speed of the ram at this time.

A further and more specific object of the invention is to provide, in combination the hydraulic press and a pump for supplying fluid to actuate the movable platen of the
20 press, of a means for automatically reducing the fluid delivery when the platen reaches a predetermined point.

A further and more specific object of the invention is the provision of a fluid-supplying means for hydraulic presses consisting of a variable-stroke pump together with automatic means for varying the stroke of the pump when the ram has reached a predetermined point to decrease the amount of fluid
25 supplied to the press.

A still further object of the invention is to provide, in combination with a hydraulic press, a reversible, variable-stroke pump for supplying fluid thereto and a means for automatically varying the stroke of the pump when the movable platen of the press approaches the fixed platen thereof to a predetermined degree, together with a means employing the discharge of the pump when reversed to open the line between the pump and the press and to permit the return of the actuating fluid to a supply reservoir for the pump.

A still further object of the invention is to provide a construction permitting the control of the pump both in its reversal and in the automatic reduction of the discharge thereof to be regulated by any pressure medium.

These and other objects we obtain by the

construction shown in the accompanying drawings wherein, for the purpose of illustration, we have shown a preferred embodiment of our invention and wherein:

Fig. 1 is an end elevation showing pumping apparatus and a control therefor constructed in accordance with our invention connected with a press;

Fig. 2 is a side elevation of the pumping apparatus, a portion of the discharge line being shown in section;

Fig. 3 is a detail sectional view through the fluid pressure control apparatus and portions of the variable-stroke mechanism of the pump;

Fig. 4 is a fragmentary elevation of the stroke-control mechanism; and

Fig. 5 is a sectional view through the check valve controlling the automatic reduction stroke.

Referring now more particularly to the drawings, numeral 10 generally designates a reversible variable-stroke pump. This pump is at present illustrated as of the type described in the patent to Hele-Shaw and Martineau No. 1,250,170, dated Dec. 18, 1917, for rotary pump or motor. Pumps of this character are well-known and in common use and need no description other than a statement that both the reversal and output for effective stroke of pump is varied by longitudinally shifting a yoke 11, which yoke controls the eccentricity of a piston carrier with relation to a cylinder carrier with which it is associated. The discharge of said pumps is usually controlled by an automatic control mechanism generally designated at 12 consisting of a spring means resisting movement of the yoke in one direction or the other and having engagement with the yoke through a lever 13. The means for adjusting the pressure of the spring includes a threaded shaft 14 and, in accordance with our invention, we provide a lever mechanism consisting of a pair of bevelled levers 15 pivotally supporting therebetween a yoke 16 which is held against longitudinal movement upon the shaft.

The pump has associated therewith a sump 17, at present illustrated as forming a base

therefor and the casing of the pump is connected with the sump by lines 18 and 19 alternately operating as intake lines for the pump and each having arranged therein a check valve 20 closed toward the pump. A conduit 21 is employed to connect this sump with the ram cylinder of the press (not herein shown) and in this line is arranged a check valve 22. The casing of this valve has arranged therein a check valve 23 seating toward the sump and having its stem 24 extended into a chamber 25 which is sealed against fluid passing through conduit 21 and in communication with the line 19, as indicated at 26. The casing beyond the check valve 23 from the sump has communication with the pump line 18, as at 27.

Associated with the pump 10, and at present shown secured thereto, is a cylinder 28 with a piston 29 therein. The rod 30 of this piston is connected through a yoke 31 and links 32 with the levers 15. Supported from and in axial alignment with the cylinder 28 is a second cylinder 33 having a piston 34 of greater diameter than piston 29 and having the rod 35 thereof projecting through the end wall opposing cylinder 28. Adjustable in this end wall is a stop 36 engaging a collar or enlargement 37 of rod 35 when piston 34 has moved toward the cylinder 28 a distance determined by said stop.

The stationary and movable press platens are respectively indicated at 39 and 40 and the platen 39 has associated therewith a check-valve structure 41. The stem 42 of the valve element of this valve projects downwardly toward the movable platen 40 and this movable platen is preferably provided with an adjustable stop 43 for engagement with the stem of the valve so that when the movable platen 40 has approached the platen 39 to a determined point, the check valve 41 will open.

A control valve 44 is provided including an operating element 45 movable from a neutral position, indicated in solid lines in Fig. 1, to pressing or discharge positions, indicated at *a* and *b*, respectively. When in the position *a*, pressure is supplied through the conduit 46 to the inner end of cylinder 28 and through a branch 46*a* of this conduit to the intake chamber of the check valve 41. The exhaust chamber of this check valve is connected through a conduit 47 with the outer end of cylinder 33. When in the position *b*, pressure is supplied to the outer end of cylinder 28 through a conduit 48.

In operation of the apparatus just described, the pump is put on full-stroke by moving the control element 45 to the position *a*, thus introducing pressure to the inner end of cylinder 28 and shifting the piston 29 and yoke 31 to the right in Fig. 1. In the movement of the piston 29, the end of the rod thereof contacts with the rod 35 of

piston 34, so that this piston is moved simultaneously therewith. At this time, line 19 is operating as a suction line and the line 18 as a discharge line and fluid is being delivered in maximum quantities by the pump 10. As the ram 40 elevates and reaches a predetermined point, the check valve 41 is opened, permitting pressure from line 46 to pass therethrough to the outer end of cylinder 33. Since piston 34 has a greater area than piston 29 the result is that both pistons are moved to the left and the control levers 15 accordingly shifted to a position approximating the neutral position illustrated in Fig. 1, but somewhat to the right thereof. This results in the discharge of the pump being cut down, the extent to which this occurs being regulated by the position of stop 36. Ram 40 now moves very slowly until it reaches its final pressing position and pump 10 will only serve to supply sufficient fluid to maintain the desired pressure against the elements pressed between the platens. After holding the pressure for the desired length of time, the operator moves the handle 45 to the position *b*, thereby introducing pressure to the outer end of cylinder 28 and causing the yoke and lower ends of the control levers 15 to move to the left in Fig. 1 and thus reverse the direction of discharge of the pump. Line 18 now acts as a suction line, while line 19 operates as a discharge line and the pressure built up in this line acting beneath the stem 24 of the check valve 23 lifts this check valve from its seat, permitting the fluid in the ram cylinder and line 21 to return to the sump 17.

It will be obvious that while control apparatus has been illustrated as applied to a particular type of pump, it might readily be combined with other types without in any manner departing from the spirit of our invention and since it is otherwise capable of a considerable range of change and modification, we do not limit ourselves to the specific arrangement or structure illustrated except as hereinafter claimed.

We claim:

1. In combination with a hydraulic press having a movable platen, a variable-stroke pump supplying fluid to actuate the platen in its working stroke, a shiftable member controlling the stroke of the pump and movable from full-stroke to neutral positions, pressure actuated means engaging said member to shift it to the full-stroke position, pressure actuated means engaging the member to shift it toward its neutral position and adapted to overcome the first-named pressure-actuated means, and means operated by the movable platen after a predetermined movement in its working stroke for automatically introducing pressure to the last-named actuating means.

2. In combination with a hydraulic press

having a movable platen, a variable-stroke pump supplying fluid to actuate the platen in its working stroke, a shiftable member controlling the stroke of the pump and movable
 5 from full stroke to neutral positions, a cylinder, a piston therein having a rod, a connection between said rod and the shiftable member, means for introducing pressure to either end of said cylinder, a second cylinder
 10 associated with the first-named cylinder and likewise having a piston, a rod for said piston adapted to engage the connection between said member and the first-named rod to shift the member toward its
 15 neutral position against the action from the first named piston and means operated by the movable platen after a predetermined movement in its working stroke for automatically introducing pressure to the last-named cylinder.
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3. In combination with a hydraulic press having a shiftable platen, means for supplying fluid pressure to the press to shift said platen, including a variable-output pump,
 25 a member shiftable to increase or decrease the output of the pump, fluid pressure operated means for shifting said member to increase the output of the pump, a second fluid pressure operated means adapted to overcome
 30 the first-named pressure operated means and shift said member to decrease the output of the pump and means for supplying pressure to said second pressure operated means including a valve operated by the platen
 35 press after a predetermined travel thereof in its working stroke.

4. In combination with a hydraulic press having a shiftable platen, means for supplying fluid pressure to the press to lift said
 40 platen, including a variable-output pump, a member shiftable to increase or decrease the output of the pump, fluid pressure operated means for shifting said member to increase the output of the pump, a second fluid pressure-operated means adapted to overcome
 45 the first-named pressure operated means and shift said member to decrease the output of the pump, means for supplying pressure to said second pressure operated means including
 50 a valve operated by the platen of the press after a predetermined travel thereof in its working stroke and means adjustable to vary the distance through which the platen moves prior to operation of said valve.

5. The combination with a pressure-actuated member, of a variable discharge pump adapted to supply pressure to actuate said
 55 member, means for regulating the discharge of said pump, a fluid motor operatively connected with said regulating means, a second fluid motor of greater power also operatively connected with said regulating means and adapted to operate the latter in opposition
 60 to the first-named motor, means for applying pressure to the first-named motor to effect

a predetermined regulation of the pump discharge, and means actuated by a predetermined movement of the pressure-actuated member for admitting fluid pressure to the
 65 second of said motors to effect a predetermined readjustment of said regulating means.

6. The combination with a fluid-impelled member, of a variable discharge pump adapted to supply pressure to actuate said member,
 70 means for regulating the discharge of said pump, a fluid motor operatively connected with said regulating means and operative to actuate said adjusting means to increase the pump discharge, a second fluid motor operative upon the regulating means in opposition
 75 to the first-named motor and adapted to decrease the pump discharge, a source of fluid pressure associated with both of said motors, means for controlling the connection of both of said motors with said source, and a valve
 80 constituting an additional control for the connection between said source and the second motor and adapted to be actuated by movement of the fluid impelled member.

7. The combination with a fluid-propelled
 85 member, of a variable discharge pump adapted to supply fluid pressure to actuate said member, means for regulating the discharge of said pump, a fluid motor operatively connected with said regulating means for increasing
 90 said discharge, a second fluid motor connected to said regulating means and operative in opposition to the first-named motor to decrease the pump discharge means for admitting fluid pressure to the first-named motor
 95 and for subsequently admitting fluid pressure to the second motor, and adjustable means for limiting the operation of the second motor with respect to the regulating means.

8. The combination with a fluid-propelled
 100 member, of a variable discharge pump adapted to supply fluid pressure to actuate said member, means for regulating the rate of discharge of said pump, a fluid motor connected with said regulating means and operative to increase the said rate of discharge, a second
 105 fluid motor connected to said regulating means and operative in opposition to the first-named motor to decrease the said rate of discharge, and means for admitting fluid pressure to the first-named motor and for subsequently admitting pressure to the second motor to thereby effect an increase and subsequent decrease in the rate of discharge of said pump.
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9. The combination with a fluid-propelled member, of a variable discharge pump adapted to supply pressure to actuate said member,
 115 means for regulating the rate of discharge of said pump, a fluid motor operative on said regulating means to effect a predetermined rate of discharge actuating the said driven member, a second fluid motor of greater capacity than the first-named motor and operative in opposition to said first motor to de-
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- crease the rate of discharge of the pump, a manually-controlled valve for connecting both of said motors with a source of fluid energy, and a second valve normally preventing flow of the actuating fluid to the second-named motor and actuated to admit said fluid to the motor by a predetermined movement of the fluid-propelled member.
10. The combination with a fluid-propelled member, of a variable discharge pump for actuating said member, means for regulating the rate of discharge of said pump from a zero discharge to a predetermined maximum, a reversible fluid motor for actuating the regulating means between the neutral and maximum positions, a second fluid motor operative in opposition to the first-named motor to predeterminedly reduce the said rate of discharge, manual means for controlling the flow of fluid to both of said motors, a supplemental valve normally preventing flow of actuating fluid to the second-named motor, and means associated with the fluid propelled member for opening said valve following a predetermined movement of said member.
11. The combination with pressure-actuated member, of a reversible and variable discharge pump for actuating said member, means for regulating the direction and rate of discharge of said pump including a reversible fluid motor, and manual means for controlling the actuation of said motor, and a second motor also connected with said regulating means for predeterminedly readjusting the rate of discharge of said pump in opposition to the operation of the first-named motor, and a control valve for said second motor operatively associated with the pressure-actuated member.
12. In combination with an hydraulic press having a movable platen, of a variable output reversible discharge pump operatively connected with the press, a member shiftable to increase and decrease the output of the pump and to effect said reversal, fluid pressure operated means for shifting said member to one position wherein the said platen is advanced and to a second position effecting a retraction of said platen, and means controlled by the said platen and overcoming the fluid pressure operated means for shifting said member from the first-named position to a third position decreasing the output of the pump in the platen-advancing operation.
13. In combination with an hydraulic press having a shiftable platen, of means for supplying fluid pressure to shift the platen including a variable output reversible discharge pump, a member shiftable to increase and decrease the output of the pump and to effect said reversal, fluid pressure operated means for shifting said member to one position effecting an advance movement of said platen and to a second position effecting a retraction of said platen, and a second fluid pressure operated means controlled by said platen and overcoming the first-named fluid pressure operated means for shifting said member from the first position to a third position reducing the pump output in the platen-advancing operation.
- HENRY W. LANDENBERGER.
HARRY W. LINK.

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