G. A. ENSIGN & J. C. M. DES ISLETS.

HYDRAULIC PRESS ACCELERATOR.

APPLICATION FILED JUNE 12, 1917.

1,256,451.

Patented Feb. 12, 1918.

3 SHEETS—SHEET 1.

Fig. 1,

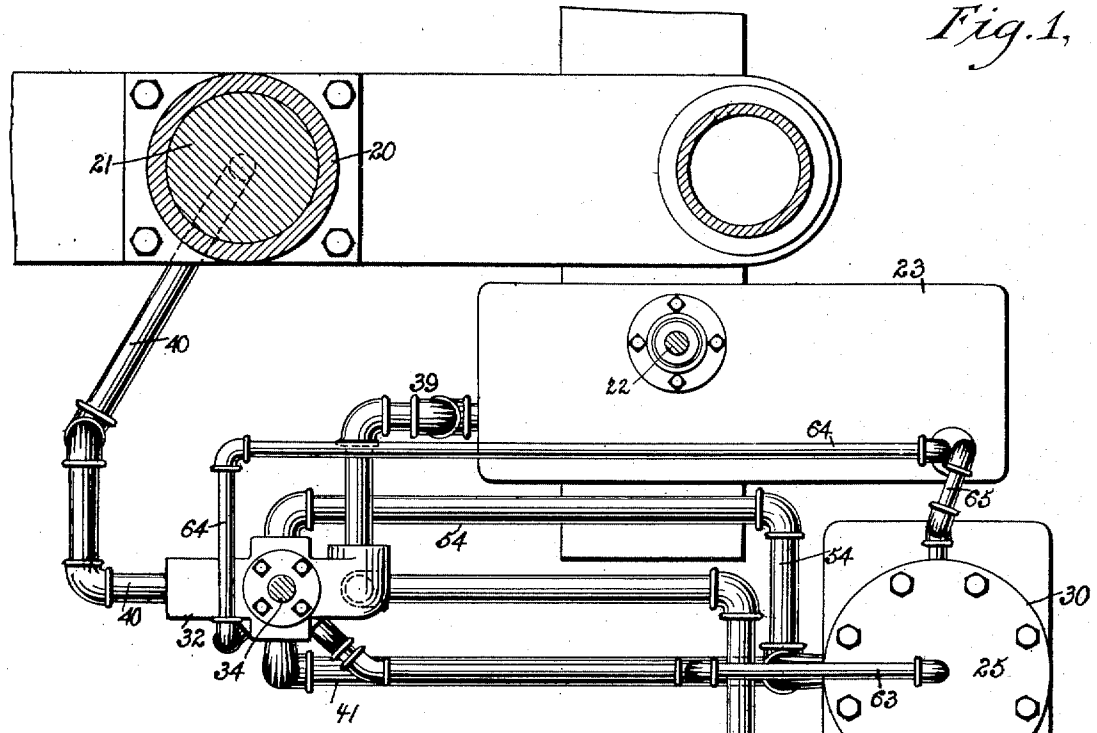
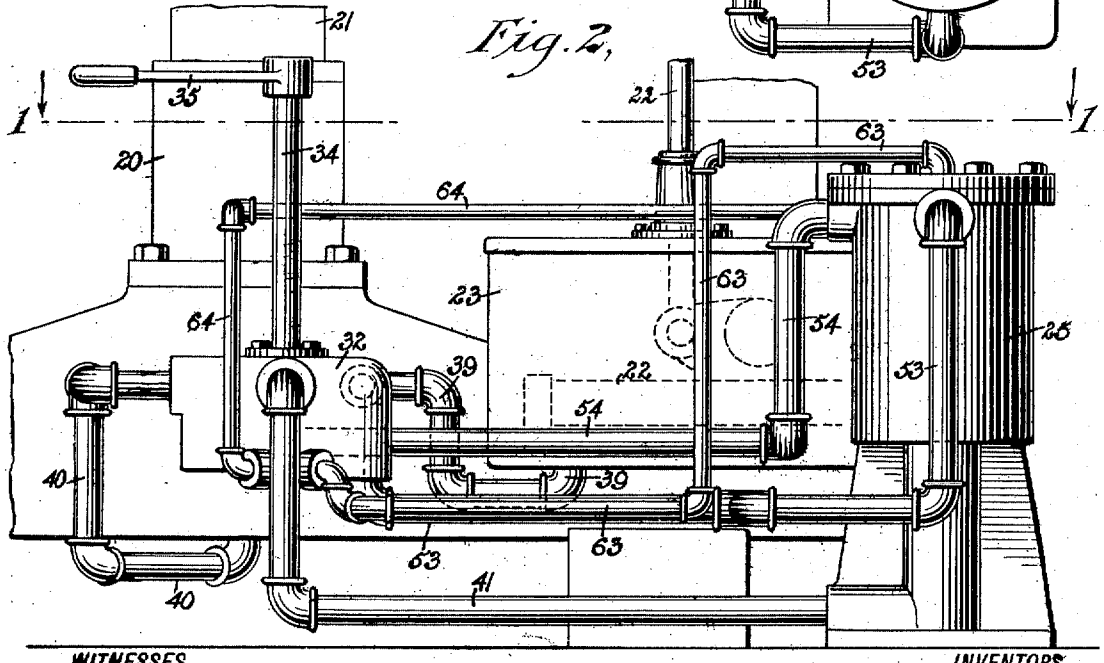


Fig. 2,



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Fig. 3,

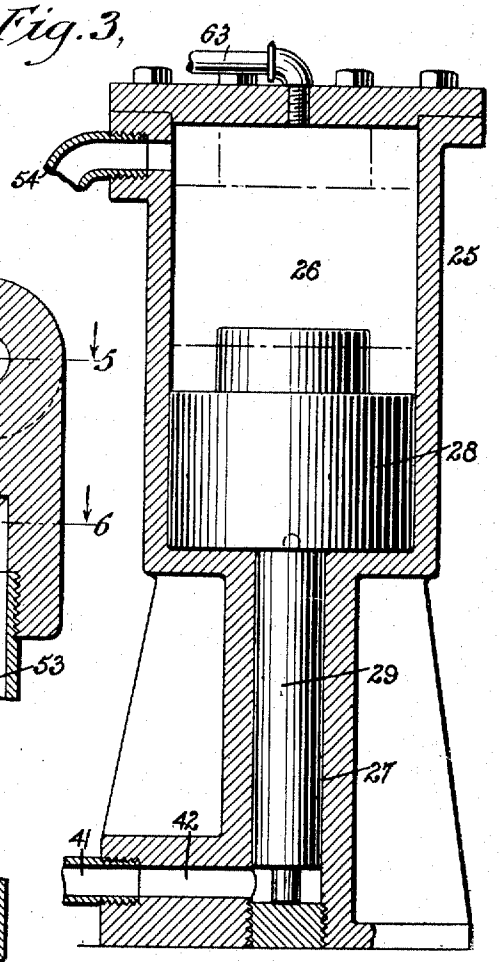


Fig. 4,

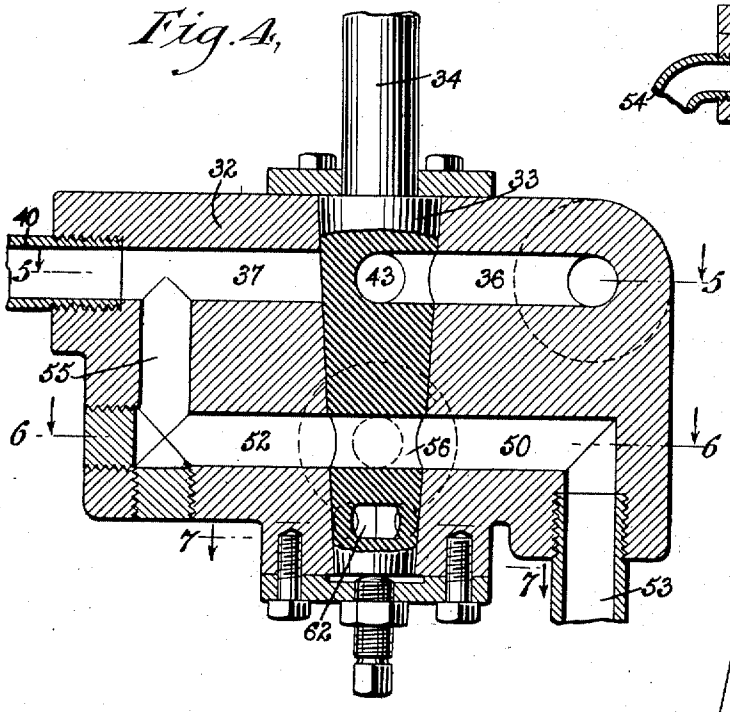


Fig. 5,

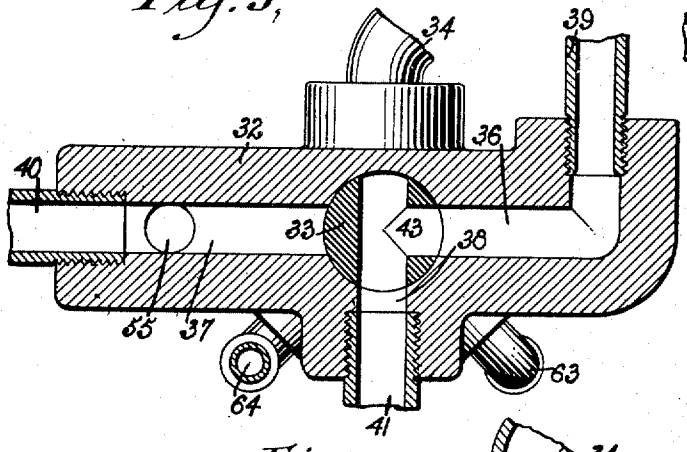


Fig. 7,

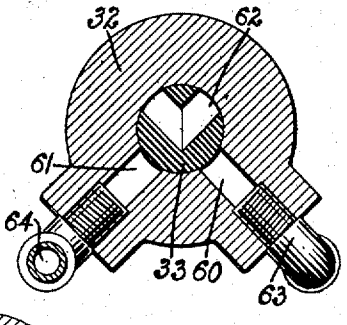
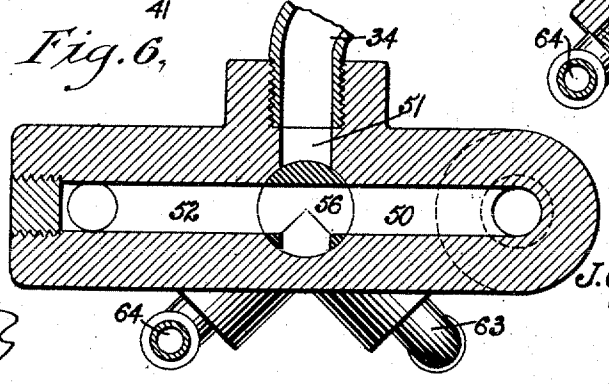


Fig. 6,



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3 SHEETS—SHEET 3.

Fig. 8,

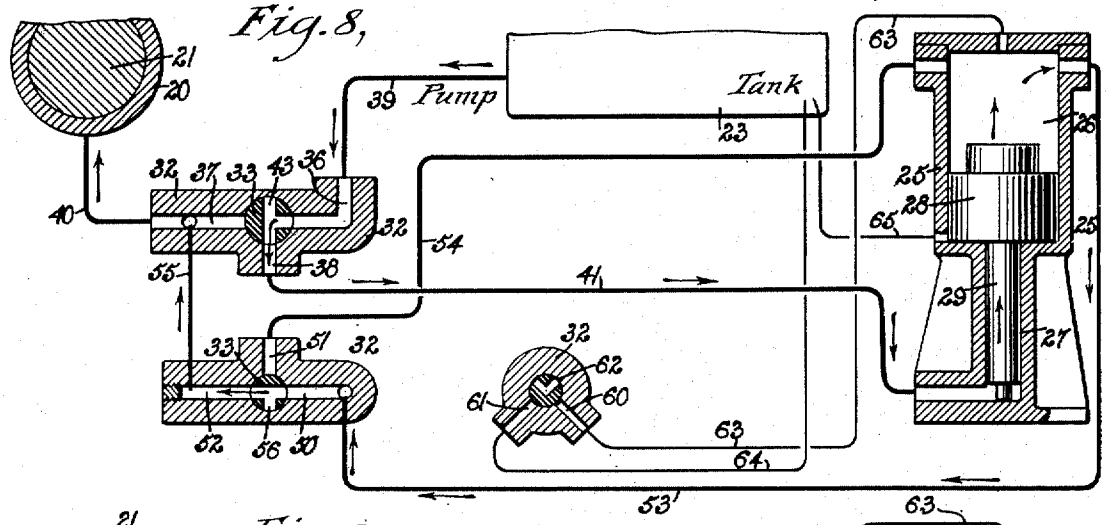


Fig. 9,

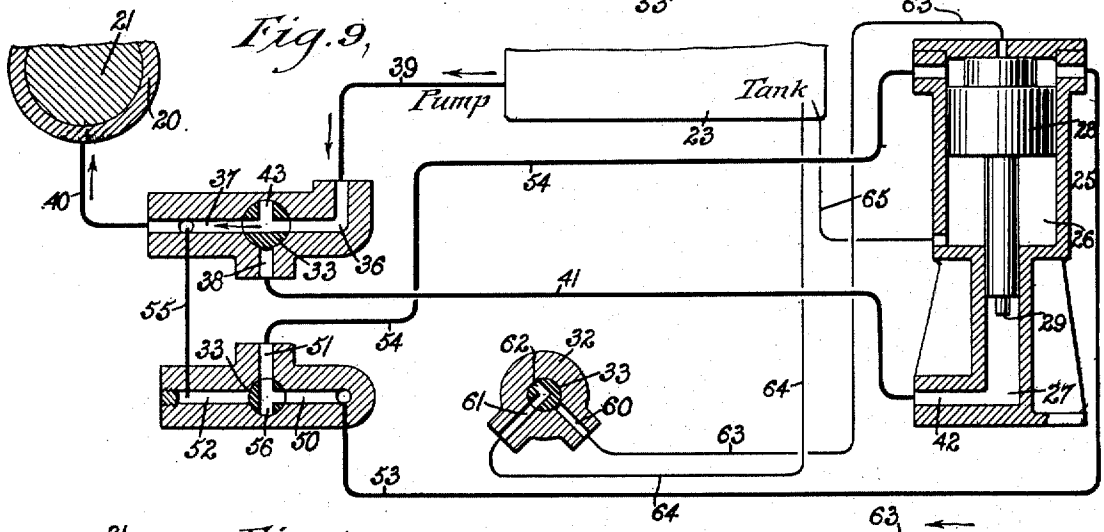
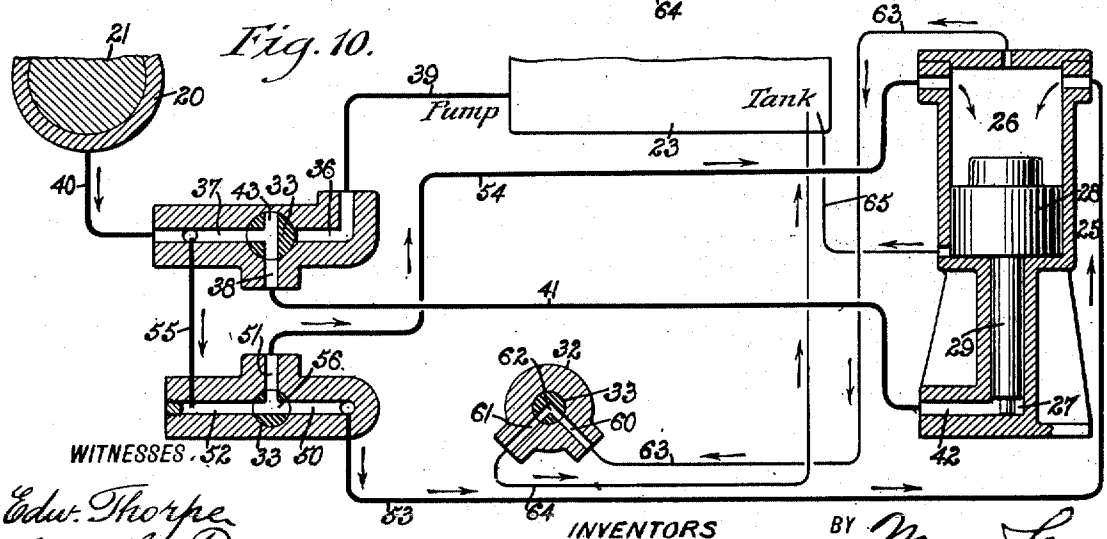


Fig. 10.



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UNITED STATES PATENT OFFICE.

GEORGE A. ENSIGN AND JOHN C. M. DES ISLETS, OF DEFIANCE, OHIO, ASSIGNORS TO DEFIANCE MACHINE WORKS, OF DEFIANCE, OHIO, A CORPORATION OF OHIO.

HYDRAULIC-PRESS ACCELERATOR.

1,256,451. Specification of Letters Patent. Patented Feb. 12, 1918.

Application filed June 12, 1917. Serial No. 174,227.

To all whom it may concern:

Be it known that we, GEORGE A. ENSIGN and JOHN C. M. DES ISLETS, both citizens of the United States, and residents of Defiance, in the county of Defiance and State of Ohio, have invented a new and Improved Hydraulic-Press Accelerator, of which the following is a full, clear, and exact description.

The invention relates to hydraulic presses such, for instance, as shown and described in the Letters Patent of the United States, No. 728,628, granted to Charles Seymour, on May 19, 1903.

The object of the invention is to provide a new and improved hydraulic press accelerator arranged to increase the output of the hydraulic press by providing a rapid advance of the hydraulic press piston toward the work until the compression stage is reached, by subsequently advancing the said piston under the direct full pressure of the pump until the desired compression is reached, and by finally returning the piston speedily to normal inactive or starting position. Another object is to cushion the hydraulic press piston during the last stage of its return movement. Another object is to enable the attendant of the hydraulic press to control the movement of the piston by the simple manipulation of a single operating lever.

In order to accomplish the desired result, use is made of an accelerator directing an amount of liquid against the piston of the hydraulic press in excess of that pumped by the pump to quickly move the piston during the period of its initial stroke.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the accelerator as applied to the hydraulic press, parts of which are shown in section;

Fig. 2 is a side elevation of the same;

Fig. 3 is an enlarged sectional side elevation of the cylinder and piston of the accelerator;

Fig. 4 is an enlarged sectional side elevation of the manually controlled valve for controlling the flow of the liquid from the pump to the accelerator to the hydraulic press cylinder and from the latter back to the accelerator and pump;

Fig. 5 is a sectional plan view of the same on the line 5—5 of Fig. 4;

Fig. 6 is a similar view of the same on the line 6—6 of Fig. 4;

Fig. 7 is a similar view of the same on the line 7—7 of Fig. 4;

Fig. 8 is a diagrammatic view of the hydraulic press and the accelerator with the parts in starting position to rapidly advance the piston in the hydraulic press cylinder;

Fig. 9 is a similar view of the same with the parts in position during the compression period; and

Fig. 10 is a similar view of the same with the parts in corresponding position for the return of the hydraulic press piston.

In hydraulic presses of the type referred to and in which considerable movement is given to the piston prior to the latter reaching the actual compression stage relative to the work in hand considerable time is lost during the advancing and returning movements of the piston owing to the slow flow of the liquid into and out of the cylinder of the press. Because of the consequent slow movement of the piston the output of the hydraulic press in a given time is necessarily restricted. To overcome this defect and provide a quick action of the hydraulic press and a corresponding increase in the output is the main object of the accelerator presently to be described in detail.

In the cylinder 20 of the hydraulic press reciprocates a piston 21, and a pump 22 arranged within a casing 23 is used to pump oil or other liquid into the lower end of the cylinder 20 to raise the piston 21 therein. Adjacent the casing 23 is arranged an accelerator cylinder 25 provided with two bores 26 and 27 in which reciprocate the pistons 28 and 29. During the initial upward movement of the hydraulic press piston 21 in its cylinder 20, the liquid is pumped by way of the accelerator to the cylinder 20, and during the compression stage the liquid is pumped directly by the pump 22 into the cylinder 20. For this

purpose use is made of a triple valve provided with a valve body 32 in which is mounted to turn a triple valve plug 33 provided on the outer end of its stem 34 with a handle 35 under the control of the operator for turning the valve plug 33, as hereinafter more fully described. The valve body 32 is provided in its upper portion with channels 36, 37 and 38 disposed in the same horizontal plane and of which the outer end of the channel 36 is connected by a pipe 39 with the pump 22. The outer end of the channel 37 is connected by a pipe 40 with the bottom of the hydraulic press cylinder 20. The channel 38 is connected by a pipe 41 with a passage 42 leading to the bottom of the bore 27 of the accelerator cylinder 25. The valve plug 33 is provided in its upper portion with a three-way port 43 to connect the channel 36 with the channel 38 (see Fig. 8) and to close the channels 36 and 38 to the channel 37 to force the liquid pumped by the pump into the lower end of the small bore 27 of the accelerator cylinder 25 with a view to raise the pistons 29 and 28 therein. When the valve plug 33 is turned into the position shown in Fig. 9 then the channel 38 is closed and the channels 36 and 37 are connected with each other to direct the liquid pumped by the pump 22 directly into the hydraulic press cylinder 20 to utilize the pressure of the pump direct during the final or compression stage. When the valve plug 33 is turned into the position shown in Fig. 10 then the channels 37 and 38 are connected with each other while the channel 36 is closed.

The valve body 32 is further provided with channels 50, 51 and 52 disposed in the same horizontal plane parallel with the plane in which the channels 36, 37 and 38 are located. The channels 50 and 51 are connected by pipes 53 and 54 with the upper portion of the bore 26 of the accelerator cylinder 25. The channel 52 is connected by a branch channel 55 with the channel 37, as plainly shown in Fig. 4. The valve plug 33 is provided with a three-way port 56 and when the valve plug is in the position shown in Fig. 8 then the channel 51 is closed while the channels 50 and 52 are connected with each other to allow the liquid on top of the piston 28 in the bore 26 of the accelerator cylinder 25 to pass by way of the branch channel 55 and the pipe 40 into the lower end of the hydraulic press cylinder 20. When the valve plug 33 is turned into the position shown in Fig. 9 then the channel 52 is closed and the channels 50 and 51 are connected with each other and the accelerator cylinder 25 is cut off from the hydraulic press cylinder 20. When the valve plug 33 is turned into the position shown in Fig. 10 then the channels 50, 51 and 52 are connected with each other to allow the liquid to flow from the hydraulic press cylinder 20 back into the upper portion of the bore 26 of the accelerator cylinder 25.

The lower portion of the valve body 32 (see Fig. 7) is provided with two channels 60, 61 adapted to be connected with each other or disconnected by a port 62 formed in the valve plug 33. The channel 60 is connected by a pipe 63 with the top of the bore 26 of the accelerator cylinder 25, and the channel 61 is connected by a pipe 64 with the pump casing 23, which latter is also connected by a vent pipe 65 with the bottom of the large bore 26 of the accelerator piston 25. When the valve plug 33 is in the position shown in Figs. 8 and 9 then both channels 60 and 61 are disconnected from each other, but when the valve plug is turned into the position shown in Fig. 10 then the said channels 60 and 61 are both connected with each other to connect the top of the bore 26 of the accelerator cylinder 25 with the pump casing 23. The pipes 63, 64 and 65 are comparatively small relative to the other pipes previously mentioned. It is understod that the several pipes, channels, ports and the accelerator cylinder 25 are filled with oil or other liquid.

The operation is as follows:

When the pump 22 is running and the hydraulic press piston 21 and the accelerator pistons 28, 29 are in lowermost positions, and the valve plug 33 is turned into the position shown in Figs. 4, 5, 6, 7 and 8, then the liquid pumped by the pump 22 passes by way of the pipe 39, channel 36, port 43, channel 38, pipe 41 and channel 42 into the lower end of the small bore 27 of the cylinder 25 thus exerting an upward pressure against the small piston 29 to raise the latter and the large piston 28 thereby displacing the liquid contained in the upper portion of the bore 26 of the accelerator cylinder 25. The liquid passes out of the upper end of the bore 26 of the cylinder 25 by way of the pipe 53, the channel 50, the port 56, channels 52, 55 and 37, and pipe 40 into the lower end of the hydraulic press cylinder 20 to raise the piston 21 therein. It will be noticed that the accelerator piston 28 in rising displaces a larger amount of liquid in comparison to the amount of liquid passing into the bore 27 from the pump 22 and hence a correspondingly large amount of liquid is forced into the hydraulic press cylinder 20 to quickly raise the piston 21 therein. When the piston 21 reaches the compression stage and is in contact with the work then the operator turns the valve plug 33 from the position shown in Figs. 4, 5, 6, 7 and 8 into the position shown in Fig. 9. When this takes place the accelerator cylinder 25 is practically cut out and the pump 22 is directly connected with the hydraulic press cylinder 20 by way of the pipe 39, channel 36, port 43, channel

37 and pipe 40. Thus during the compression period the high pressure of the pump is directly utilized on the piston 21 of the hydraulic press.

After the end of the compression stage has been reached, the operator turns the valve plug 33 into the position shown in Fig. 10 to cut out the pump relative to the hydraulic press cylinder 20. The liquid contained in the hydraulic press cylinder 20 now flows by its own gravity and the weight of the piston 21 by way of the pipe 40, channels 37, 55 and 52 into and through the port 56 connected with both channels 50 and 51 which by their pipes 53 and 54 are connected with the upper end of the bore 26 of the accelerator cylinder 25, the lower end of which is connected by the vent pipe 65 with the pump casing 23. The pistons 28 and 29 are now forced downward by the liquid flowing into the top of the bore 26 of the accelerator cylinder 25, and the liquid in the bottom of the bore 27 of the accelerator cylinder 25 passes by way of the passage 42, pipe 41, channel 38. port 43 and channel 37 into the channel 55 to return to the top of the bore 26 with the liquid from the cylinder 20. The hydraulic press cylinder 20 is thus quickly relieved of the liquid and the piston 21 therein descends rapidly but is cushioned before reaching the end of its downward stroke. This takes place about the time the accelerator pistons 28, 29 reach the end of their downward movement. The liquid still coming into the upper end of the bore 26 of the accelerator cylinder 25 now passes by way of the pipe 63, the channel 60, port 62, channel 61 and pipe 64 into the pump casing 23, but as the outflow of the liquid is from the upper end of the bore 26 of the accelerator cylinder 25 through the small pipe 63, it is evident that the outflow of the liquid from the hydraulic press cylinder 20 is checked and the piston 21 is cushioned immediately prior to reaching the end of its downward movement.

It will be noticed that the accelerator piston 28 in rising displaces a larger amount of liquid in comparison with the amount of liquid passing into the bore 27 from the pump 22 and hence a correspondingly large amount of liquid is forced into the hydraulic press cylinder 20 to quickly raise the piston 21 therein.

It is understood that on starting the hydraulic press very little power is required to raise the dead weight of the piston 21 until the work is reached, and by forcing a large amount of liquid from the bore 26 of the accelerator cylinder 25 into the hydraulic press cylinder 20 under low pressure the piston 21 is quickly raised. During the compression period the accelerator is cut out and the high pressure of the pump is directly used.

The initial return movement of the hydraulic press piston 21 is accelerated as both pipes 53 and 54 are now connected with the upper end of the bore 26 to quickly fill the said bore and force the pistons 28 and 29 downward. When the piston 28 is seated the piston 21 is at the last stage of its downward movement and is cushioned owing to the return flow of the liquid from the bore 26 to the casing 23 by way of the small pipe 63 and valve connections above described.

From the foregoing it will be seen that the attendant in charge of the hydraulic press by simply manipulating handle 35 of the valve plug 33 can readily control the flow of the liquid from the pump 22, first to the small bore 27 of the accelerator cylinder and then direct to the hydraulic press cylinder 20, and when the end of the compression period has been reached the attendant gives a further turning of the valve plug 33 to direct the flow of the liquid from the hydraulic press cylinder 20 to the accelerator cylinder 25 to refill the bore 26 and to eventually check or cushion the descent of the piston 21 and to return to the casing 23 the amount of the liquid pumped out of it by the pump 22 during the raising of the piston 21 of the hydraulic press.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:—

1. In a hydraulic press, a cylinder, a piston reciprocating in the said cylinder, a pump connected with the said cylinder to force a liquid into the cylinder, and an accelerator in the connection between the pump and the said cylinder and having a two-bore cylinder and a double piston reciprocating therein, the smaller piston being adapted to be actuated by pressure from the said pump and the larger piston forcing a larger amount of liquid into the hydraulic press cylinder than is used by the said pump to actuate the smaller piston, and a single manually controlled valve connected with the said pump, the hydraulic press cylinder and the bores of the accelerator cylinder to control the flow of the liquid from the pump to the small bore of the accelerator cylinder, to subsequently control the flow of the liquid direct from the pump to the hydraulic press cylinder, and to subsequently control the return flow of the liquid from the hydraulic press cylinder to both the pump and the large bore of the accelerator cylinder.

2. In combination, a hydraulic press cylinder, a piston reciprocating therein, a pump, an accelerator having a cylinder provided with two bores, a double piston reciprocating therein, connections between the said pump, the said hydraulic press cylinder and the said accelerator cylinder, a single manually controlled valve in the said connections to control the flow of the liquid from the pump to the small bore of the said

accelerator cylinder and subsequently direct to the said hydraulic press cylinder, and from the said hydraulic press cylinder to the large bore of the said accelerator cylinder and the pump.

3. In a hydraulic press, a cylinder, a piston reciprocating therein, a pump having a casing, an accelerator cylinder having a large and a small bore, a double piston reciprocating in the said bores, and a valve having a manually controlled valve plug, the said valve being connected with the said pump, the said hydraulic press cylinder, the said large and small bores of the accelerator cylinder and the said pump casing.

4. In a hydraulic press, a cylinder, a piston reciprocating therein, a pump having a casing, an accelerator cylinder having a large and a small bore, a double piston reciprocating in the said bores, and a valve having a manually controlled valve plug, the said valve being connected with the said pump, the said hydraulic press cylinder, the said large and small bores of the accelerator cylinder and the said pump casing, the said valve in one position controlling the flow of the liquid pumped by the pump to the small bore of the accelerator cylinder, the said valve in another position directing the flow of the liquid pumped by the pump direct into the hydraulic press cylinder, and the said valve in a third position controlling the outflow of the liquid from the hydraulic press cylinder back into the large bore of the accelerator cylinder, checking this return flow to cushion the hydraulic press piston and to refill the pump casing with liquid from the large bore of the accelerator cylinder.

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