

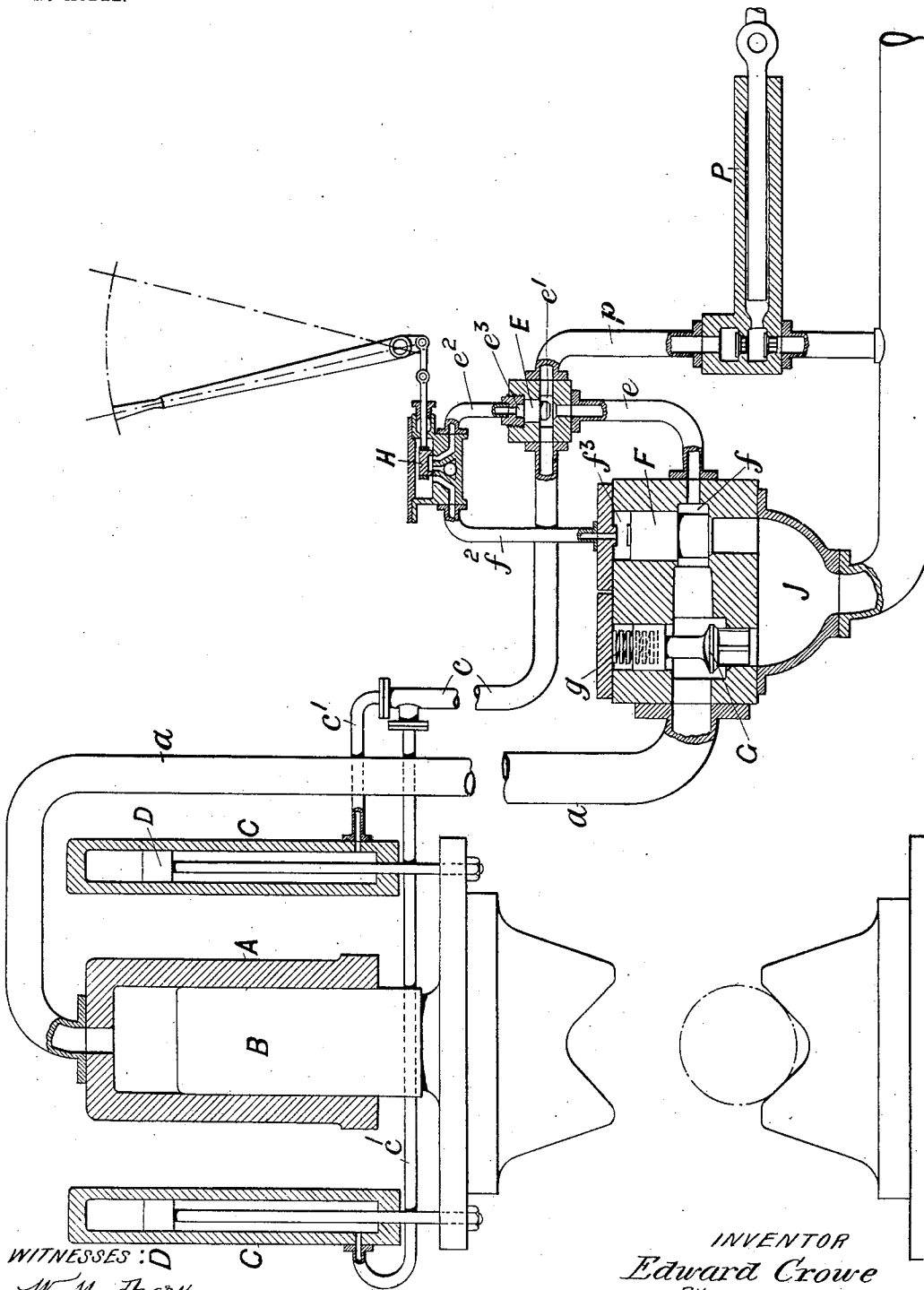
No. 762,149.

PATENTED JUNE 7, 1904.

E. CROWE.  
HYDRAULIC PRESS.

APPLICATION FILED JUNE 15, 1903.

NO MODEL.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC PRESS.

SPECIFICATION forming part of Letters Patent No. 762,149, dated June 7, 1904.

Application filed June 15, 1903. Serial No. 161,538. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD CROWE, engineer and chief draftsman, a subject of the King of Great Britain, residing at Birchholm, Bushey Wood, Totley Rise, Sheffield, England, have invented certain new and useful Improvements in Hydraulic Presses, of which the following is a specification.

This invention relates to hydraulic presses for forging and for other purposes—such, for example, as bending and testing armor-plates, flanging, and the like—in which the hydraulic power for lifting the press-head is supplied from the same source as the power for causing the press-head to perform its work.

The invention has for its object to effect economy of time and power, and so increase the speed of working and the efficiency of the press. This end is attained mainly by the provision of means whereby the idle descent of the press-head onto its work may be effected quickly and by gravity alone and whereby the power of the pumps is caused to come into action automatically immediately the tool carried by the press-head encounters the work.

The invention will be described with reference to the accompanying drawing, which shows in an elementary form the improved apparatus and arrangement of parts, the two portions of the figure being drawn to different scales.

The press comprises a main cylinder A and ram B (one or more) for imparting the working stroke to the press-head, and lifting-cylinders C and pistons D for imparting the return stroke, the pipe connections with these cylinders being controlled by valves arranged to operate in such manner that during the idle descent of the press-head the main and lifting cylinders can be connected at the same time with the exhaust-tank or with each other and the exhaust in such manner as to allow the lifting-cylinders to exhaust into and the main cylinder to draw from the exhaust-tank, so that the press-head will be permitted to descend freely by its own weight, the main pumps then either running light or being out of work, while during the working portion of the press-stroke pressure can be supplied to

the main cylinder and exhausted from the lifting-cylinders and on the return stroke can be supplied to the lifting-cylinders and exhausted from the main cylinder alternatively.

Between the main cylinder A and the exhaust-valve F there is provided a self-closing by-pass suction-valve G, which while permitting the main cylinder to draw from the exhaust during the free descent of the press-head will be closed immediately the descent of the main ram is checked in consequence of the tool meeting the work, so that pressure then brought to bear on the main ram will cause its descent to be continued, but at a slower speed.

The supply from the pumps P to the main cylinder A is under the control of a high-pressure distribution-valve E, while the exhaust from the main cylinder is under the control of an exhaust-valve F. The connection of the lifting-cylinders C with the main cylinder A for the passage of water from the one to the other during the descent of the main ram is also under the control of the high-pressure distribution-valve E, while the connection of the main cylinder A with the exhaust for the admission of water to the main cylinder during the idle part of the descent of the press-head is through a by-pass controlled by the self-closing suction-valve G, which permits of flow in one direction only when the exhaust-valve F is closed.

The upper end of the main cylinder is connected by a pipe *a* with the valve-box of the valves G and F and is also connected through a constantly-open annular passage *f* around the latter valve with a pipe *e*, controlled by the pump-pressure distribution-valve E. The delivery-pipe *p* from the pumps P connects through a constantly-open annular passage *e'* around valve E with a pipe *c*, connected by branch pipes *c'* with the lower ends of the lifting-cylinders C.

J is the exhaust to the tank.

The high-pressure distribution-valve E and the exhaust-valve F are operated by an auxiliary hydraulic-pressure service controlled by a slide-valve H, operated by a handing-lever, the valve H working in a valve-chest in connection with the auxiliary-pressure service in

such manner that the pressure may be admitted to act alternatively on the upper end of valve E or valve F (for the purpose of closing the one or other of those valves) or may be released therefrom. The valve H controls ports, of which two are respectively connected by pipes  $e^2$ ,  $f^2$  with cylinders  $e^3$ ,  $f^3$ , in which the upper ends of the valves E F (which are of larger diameters than the valves themselves) work as plungers, while the third port is connected to an exhaust. It is to be distinctly understood, however, that neither this method of working these valves nor their particular construction is essential, as the valves may be adapted to be worked by steam or other power and in small presses would preferably be worked by hand, the essential features being the coöperation of the self-closing by-pass suction-valve with the exhaust-valve and the further coöperation with those valves of a valve controlling the distribution of the pump-pressure to the main and lifting cylinders and likewise the connection of the lifting-cylinders with the main cylinder of a press in which the lifting-cylinders are supplied by the same pumps as the main cylinder.

The action (assuming the high-pressure and exhaust valves to be operated by hydraulic, steam, or other fluid-pressure) is as follows: In order to lower the press-head, the valve H is moved to such position that the auxiliary hydraulic, steam, or other fluid-pressure will be admitted through pipe  $F^2$  to act on and close the exhaust-valve F and will at the same time be exhausted from pipe  $e^2$ . The high-pressure distribution-valve E will thereupon be caused to open by the pressure of the water coming from the lifting-cylinders and acting on the area of the valve corresponding to the difference of its two diameters. The press-head will then descend by its own weight, forcing the water out of the lifting-cylinders C through the pipe  $e$ , passage  $f$  around valve F, and pipe  $a$  into the main press-cylinder A, the further quantity of water necessary to fill that cylinder being drawn from the exhaust J through the by-pass suction-valve G, which is loaded by a spring  $g$ . On the tool carried by the press-head meeting the work the valve G will immediately close and the further motion of the press-head will be due to the action of the pumps and will be continued under the pump-pressure without pause if (as would usually be the case) the pumps work continuously or are started before the tool encounters the work, the pumps in either case running light until the moment when the free descent of the press-head is checked. To lift the press-head, the position of the valve H is reversed, auxiliary pressure being thus admitted above the high-pressure distribution-valve E, which is thereby closed to its seat, while the exhaust-valve F is caused (by the pressure acting on the area of that valve corresponding

to the difference of its two diameters) to open, whereupon the water from the pumps will flow through passage  $e'$  and pipe  $c$  into the lifting-cylinders C and raise the press-head, while the water from the main press-cylinder A passes out through the exhaust-valve F.

The pumping-engines may be of the continuous-running type and may be fitted with a fly-wheel and centrifugal governors; but it is preferred (with a view both to the better control of the press and to economy of power) to employ pumps which are furnished with a throttle-valve or its equivalent under the control of a handing-lever in order that the pumps may be started and stopped instantly at will.

I claim—

1. In a downwardly-acting hydraulic press wherein the main press-ram is free to descend by gravitation during the idle part of its working stroke, the combination with a positively-operated valve adapted to control the passage of water from the main press-cylinder to the exhaust and when closed, to permit the passage of water from the pumps to the main press-cylinder, of an independent self-closing suction-valve on a by-pass to the said exhaust-valve, adapted to be held open by the flow of water from the exhaust to the main press-cylinder while the exhaust-valve is closed during the idle part of the descent of the main press-ram and to automatically close and thus enable the pump-pressure to come into action upon the main press-ram immediately the flow from the exhaust to the main press-cylinder ceases in consequence of the idle descent of the main press-ram being arrested, substantially as specified.

2. In a hydraulic press having main pressure and lifting rams connected with the press-head, the combination of a self-closing by-pass suction-valve and a positively-operated exhaust-valve interposed between the main press-cylinder and the exhaust, adapted the one to permit flow of water from the exhaust to the main cylinder, while the other is closed during the idle descent of the press-head, and of a pump-pressure distribution-valve controlling the delivery of the pumps, the said valve also controlling communication between the main and lifting cylinders, substantially as specified.

3. In a hydraulic press having main pressure and lifting rams connected with the press-head, the combination of a self-closing by-pass suction-valve and a positively-operated exhaust-valve interposed between the main press-cylinder and the exhaust, adapted the one to permit flow of water from the exhaust to the main cylinder, while the other is closed during the idle descent of the press-head, a pump-pressure distribution-valve controlling the delivery of the pumps, the said valve also controlling communication between the main and lifting cylinders, the exhaust-valve and the

5 pump-pressure distribution-valve being both carried by pistons adapted to work in cylinders, and a hand-operated slide-valve adapted to control the supply of auxiliary or independent pressure to the one and its exhaust from the other of the said valve-operating cylinders alternatively, substantially as described.

10 4. In a hydraulic press wherein both the main press and lifting cylinders are supplied from a single source of high pressure, the combination with valves adapted the one to control the passage of water from the main press-cylinder to the exhaust, and the other to distribute the supply of high pressure to the  
15 main and lifting cylinders alternatively, of means for enabling said valves to be opened by the action of the high pressure and closed

by the action of auxiliary pressure from an independent source of supply in alternation 20 with one another, said means consisting of pistons integral with the respective valves and fitted to work each in a cylinder wherein the piston presents a certain area to the high pressure tending to open the valve and an effectively 25 superior area to the auxiliary pressure tending to close the valve, and a hand-operated valve adapted to control the distribution of the said auxiliary pressure to, and its exhaustion from the respective valve-cylinders alternatively, substantially as described. 30

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Witnesses:

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