

July 20, 1937

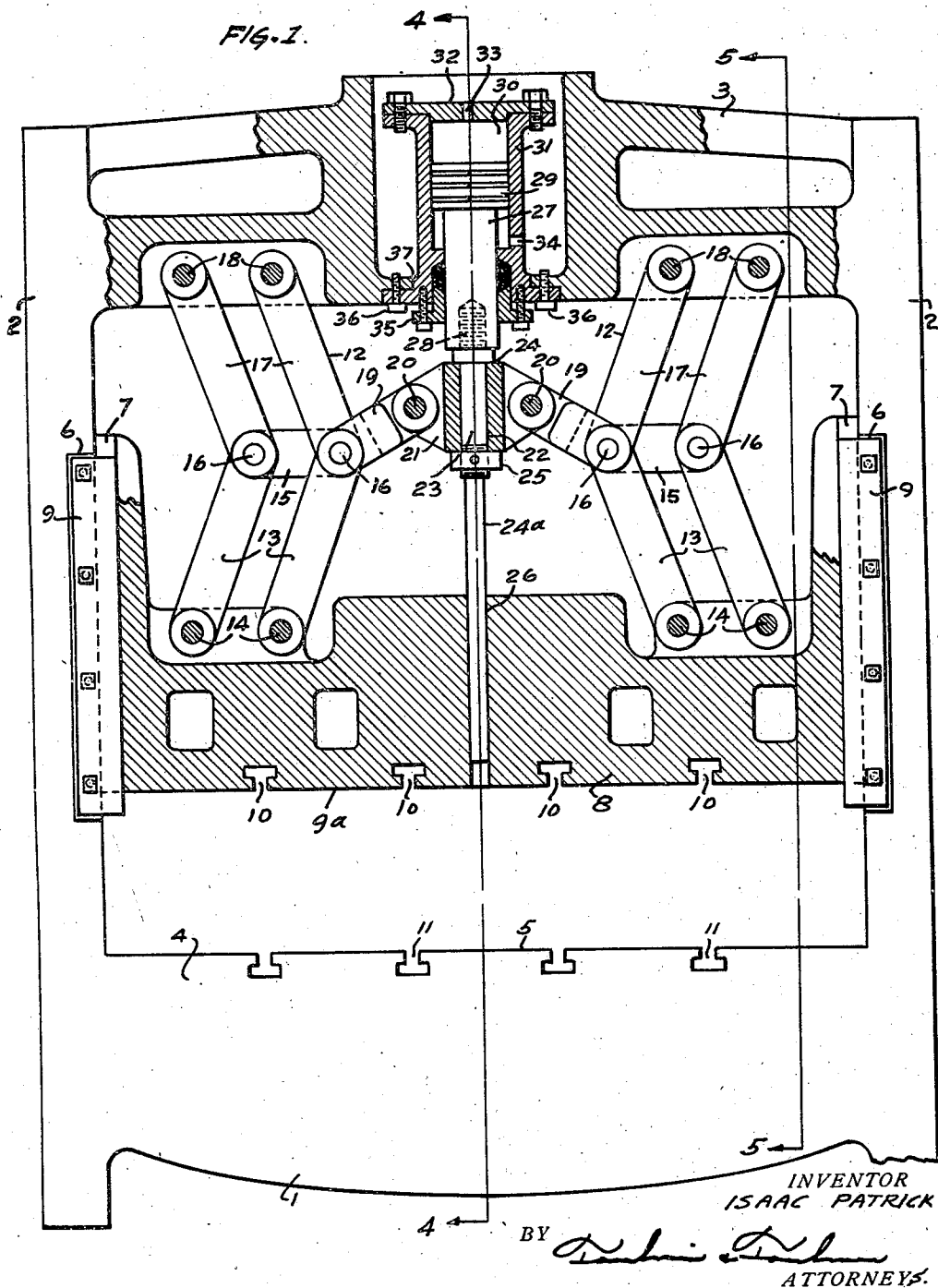
I. PATRICK

2,087,811

PRESS

Filed June 15, 1934

3 Sheets-Sheet 1



July 20, 1937

I. PATRICK

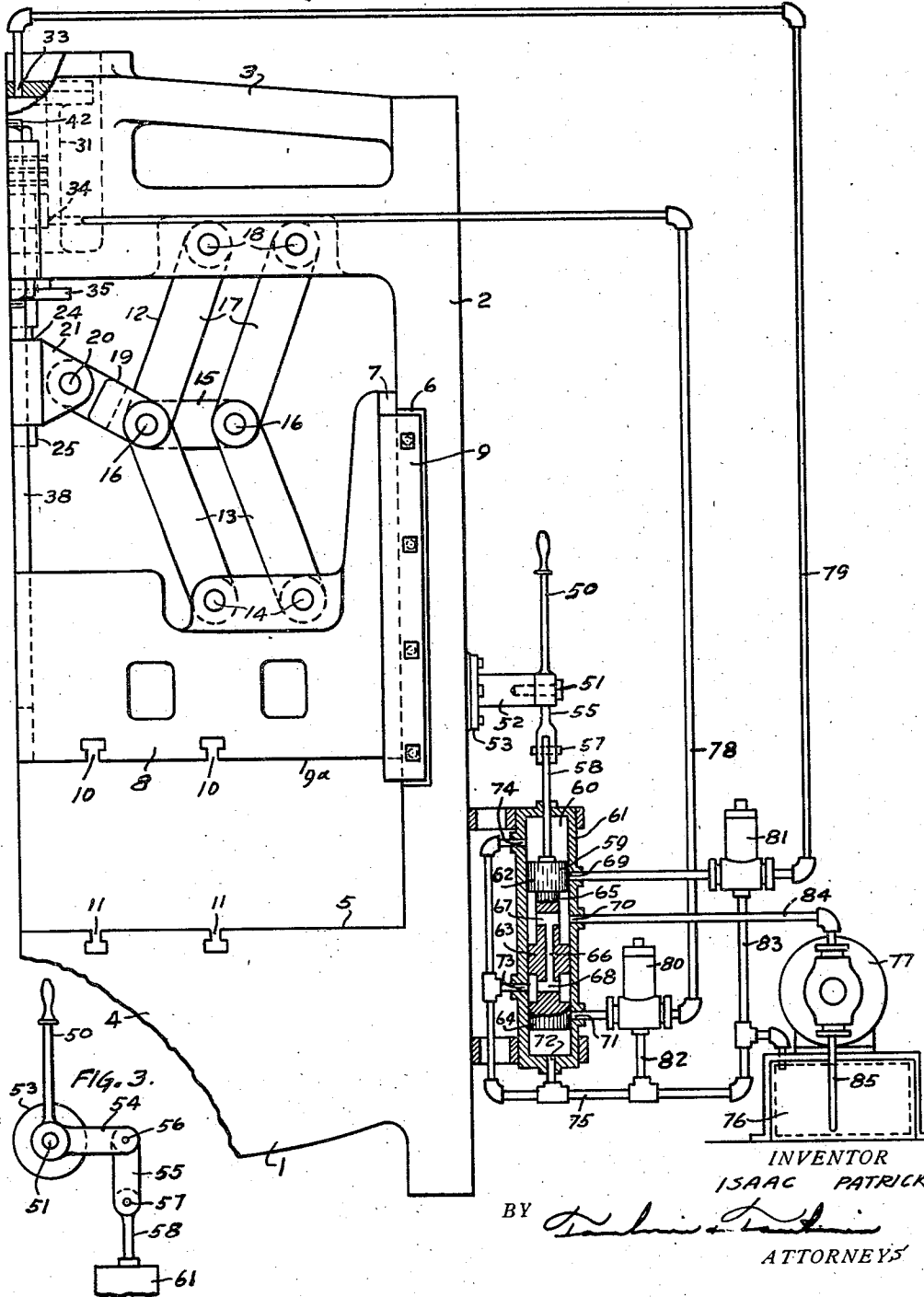
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PRESS

Filed June 15, 1934

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FIG. 2.

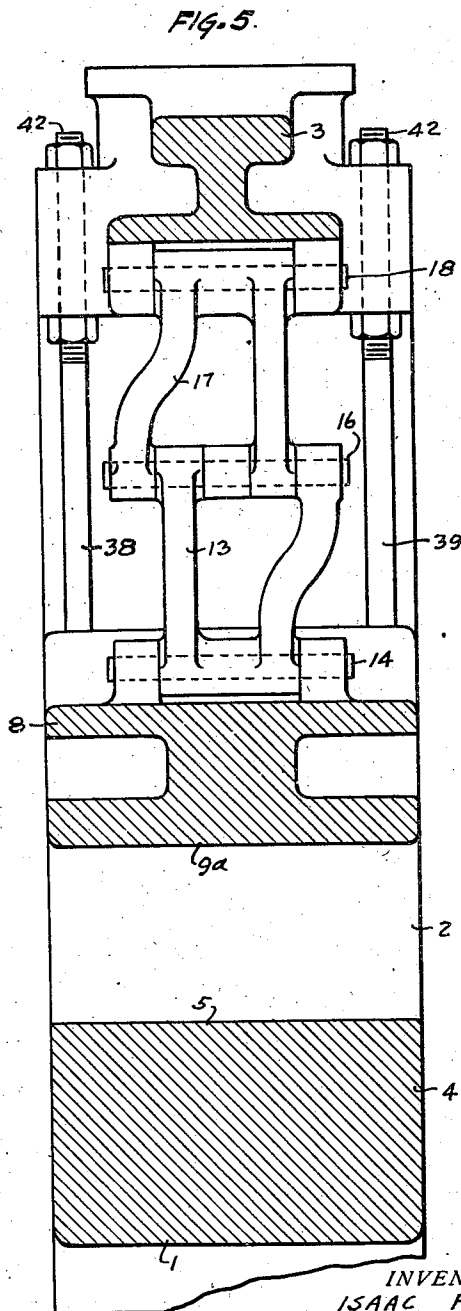


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UNITED STATES PATENT OFFICE

2,087,811

PRESS

Isaac Patrick, Mount Gilead, Ohio, assignor, by
mesne assignments, to The Hydraulic Press
Corporation, Inc., Wilmington, Del., a corpora-
tion of Delaware

Application June 15, 1934, Serial No. 730,821

4 Claims. (Cl. 113—38)

This invention relates to presses and, in particular, to toggle-operated presses.

One object of my invention is to provide a press of toggle construction, which is operated by hydraulic means.

Another object is to provide a press wherein the application of power to the platen is accomplished mechanically by means of toggle connections, but wherein the application of power to the toggle connection is accomplished by a hydraulic cylinder-and-piston assembly.

Another object is to provide such a press wherein the toggle pivots move in a substantially horizontal position, but wherein the actuating-hydraulic plunger moves in a substantially vertical position.

Another object is to provide a press which will have the quickness of operation of a mechanically actuated press combined with the smoothness of operation of the hydraulic press, this result being obtained by a combination of these two means of actuation.

Another object is to provide a hydraulically-actuated toggle press, wherein the power of the hydraulic plunger is multiplied by its toggle connections with the platen.

In the drawings:

Figure 1 is a somewhat diagrammatic front elevation, partly in section, of the press of my invention;

Figure 2 is a front elevation of half of the press shown in Figure 1, partly in section, showing the hydraulic circuit and valves for operating the press;

Figure 3 is a side elevation of the control lever and the top of the valve casing for operating the press;

Figure 4 is a central vertical section along the line 4—4 of Figure 1;

Figure 5 is a vertical section along the line 5—5 of Figure 1.

Hitherto hydraulic presses have been commonly employed in order to apply great pressure to work pieces within accurate limits, because the fluid pressure may be precisely controlled. These hydraulic presses of the prior art have been slow in their action and consequently are unsuitable for modern high speed operations. The mechanical presses of the prior art, although operating at a high speed through their cranks and/or levers are inflexible and not controllable because their cranks must make complete revolutions and cannot be halted within a partial revolution; further their pressures cannot be delicately varied nor the press halted when a predetermined pres-

sure has been reached. The hydraulic press, therefore, has a slow but accurate and powerful movement whereas the mechanical press has a rapid but weaker and uncontrollable movement.

The present invention seeks to combine the advantages of the hydraulic press with those of the mechanical press without involving their defects. This is done by operating the platen from the hydraulic piston through a series of toggle members thereby giving the press a high speed of operation with the controllability afforded by the use of hydraulic pressure. Further, the press of my invention applies the force to the platen and to the frame respectively, at a plurality of points, over the surface of the platen, thereby distributing the thrust over widely scattered positions and eliminating the warping effects of concentrated thrusts. By this construction the platen may be lightened and its inertia correspondingly reduced, yet the strength and rigidity retained, thereby increasing the rapidity of action of the press without weakening its construction.

Referring to the drawings in detail, the press of my invention consists of a frame, generally designated 1, having side members 2 and a top connecting member 3 joining the latter. Also joining the side members 2 is a bottom connecting member 4, whose upper surface 5 is adapted to receive the work pieces or dies used in connection with the operation of the press.

The side members 2 are machined, as at 6, to provide slides which are engaged by the machined portions 7 of the movable platen 8; and, in their reciprocation, are retained in engagement by the retaining plates 9 secured to the side members 2.

The platen 8 is provided with a lower surface 9a adapted to receive die members or work pieces, as may be desired, these being held by devices inserted in the slots 10, corresponding to the similar slots 11 in the surface 5 of the lower frame cross member 4.

The platen 8 is joined to the upper cross member 3 through a toggle connection, generally designated 12. The toggle connection 12 consists of the lower links 13, pivotally connected to the platen 8, as at 14, and pivotally connected to the cross link 15, as at 16 (Figure 1). Also pivotally connected to the pivot pins 16 are the upper links 17, having the pivotal connections 18 to the upper cross member 3 of the press. The link members 13 are yoke-shaped (Figure 5) in order to engage the pivot pins 16, the upper link members 17 and the cross links 15 simultaneously.

Likewise attached to the toggle connections 12, 55

as to the inner pivot pins 15, are the oblique links 19, which at their inner ends are pivotally connected, as at 20, to the piston rod yoke 21. The latter is provided with a bore 22, which encircles a piston rod 23 and is held against the abutment 24 thereof by the collar 25, threaded thereon (Figure 1). The piston rod 23 continues downward in a reduced diameter portion 24a, which serves as a guide member and reciprocates in the bore socket 26 of the platen 8.

The piston rod 23, beyond its abutment 24, is connected to the piston 27, as by the threaded connection 28. The piston 27 is provided with the piston head 29, adapted to reciprocate in the cylinder bore 30 of the hydraulic cylinder 31. The latter is provided with a removable cylinder head 32, having a port 33, giving access to the cylinder bore 30 (Figure 1). The cylinder 31 also is provided, near its lower end, with a port 34 opening into the cylinder bore 30 beneath the piston head 29. The lower end of the hydraulic cylinder 31 is provided with an adjustable packing connection 35, encircling the piston 27 and preventing leakage from the cylinder bore 30. The hydraulic cylinder 31 is secured to the cross member 3 by means of the bolts 36, holding together the correspondingly flanged and countersunk connection 37 thereof.

The platen 8 is guided in its vertical reciprocation by the guide rods 38 and 39 placed in front of and behind the platen respectively. These guide rods 38 and 39 slidably engage the platen 8 in the bores 40, and also the yoke 21 in the bores 41; and are secured to the upper or crown cross member 3 above the platen 8 by the threaded connections 42 (Figure 4).

The hydraulic circuit for operating the hydraulic cylinder to cause the platen 8 to rise and fall may be of any suitable kind, as may be desired for the particular conditions under which the press is designed to operate. One such circuit is shown in Figure 2, but it is understood that the invention is not restricted to the use of this particular circuit, which is shown for illustrative purposes only.

The hydraulic circuit, shown in Figure 2, consists of the operating lever 50, which is pivotally supported, as at 51, upon the bracket 52 secured to the side member 2 of the press, as at 53. The operating lever 50 has a bell crank portion 54 (Figure 3), pivotally connected by the link 55 and the pivot pins 56 and 57 to the valve connecting rod 58. The latter is connected to the reciprocable valve member 59, which is mounted to reciprocate within the bore 60 of the valve chamber 61.

The valve member, generally designated 59, consists of the three spaced heads 62, 63, and 64, joined by the connecting neck 65, having the longitudinal bore 66 and transverse bores 67 and 68 therethrough. The valve chamber 61 is provided with suitably disposed ports 69, 70, 71, 72, 73, and 74. The ports 72, 73, and 74 are connected to the conduit 75, leading to the tank 76 forming the fluid supply for the hydraulic pump 77. The port 71 is provided with the conduit 78, leading to the lower port 34 in the hydraulic cylinder 31 (Figure 2), whereas the port 69 has the conduit 79, leading to the upper port 33 thereof. The conduit 78 and 79 are provided with the high pressure relief valves 80 and 81 respectively, these being designed to discharge the fluid therein through the relief conduits 82 and 83 into the conduits 75, leading to the tank 76, when the pressure within the conduits 78 or 79 exceeds

the predetermined pressure for which the relief valves 80 and 81 are designed to be released. The port 76 of the valve chamber 61 is connected by the conduit 84 to the outlet or pressure side of the pump 77, the intake or suction side being connected by the conduit 85 to the fluid supply in the tank 76.

In operation, the valve member 59 is shown in its neutral position in Figure 2. When the operator faces the press (Figure 2) and pulls the operating lever 50 toward himself, the valve member 59 rises in the valve chamber 61. The head 62 then uncovers the port 69, and the head 64 uncovers the port 71. Pressure fluid then flows from the pump 77 through the conduit 84 and the port 70 into the valve bore 60, thence out through port 69 and along the conduit 79 through the port 33 into the hydraulic cylinder 31. This causes pressure fluid to be applied to the upper side of the piston head 29. The latter moves downward, forcing the fluid beneath it out through the port 34, the conduit 78, and the port 71 into the lower part of the valve bore 60. This fluid passes out through the port 72 therein, and returns to the tank 76 by way of the conduit 75.

When the piston head 29 moves downward, it likewise moves the yoke 21 downward, and the oblique links 19 move the pivot pins 16 outward. This motion, when transmitted to the toggle links 13 and 17, causes the platen 8 to move downward, operating the dies or compressing the work pieces in the manner desired.

To reverse the press, the operator pushes the operating lever 50 away from himself, thus lowering the valve member 59. This causes the valve head 62 to uncover the port 69 and the valve head 64 to uncover the port 71. Pressure fluid then flows from the pump 77 through the conduit 84 and the port 70 into the middle portion of the valve bore 60, thence through the bores 66, 67 and 68 of the valve member neck 65, and out through the port 71 and the pipe line 78. The latter conveys the pressure fluid to the cylinder bore 30 of the hydraulic cylinder 31 by way of the port 34, situated below the piston head 29 thereof. This moves the latter upward, forcing the fluid above it out through the port 33, and the conduit 79 into the valve bore 60 by way of the port 69. The fluid thus passes into the upper part of the valve bore 60 and out through the port 74 into the conduit 75, whence it returns to the tank 76. In this manner, the platen 8 is caused to move upward, and the operation of the press is thereby reversed.

When the platen reaches a downward position, wherein it is exerting a predetermined pressure, the relief valve 81 opens, discharging the excess fluid into the relief conduit 83 and thence into the tank 76. This prevents overloading and damage to the press or to the work articles. Similarly, the relief valve 80 serves to release the pressure fluid when the press has been reversed and the platen reaches its topmost position, the excess fluid being discharged through the relief conduit 82 and the conduit 75 into the tank 76.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination in a press, a frame, a movable platen having a guide cavity therein, a piston, a hydraulic cylinder for said piston, a pair

of upper and lower toggle members on each side of said piston, each toggle member being approximately U-shaped the closed ends of said toggle members being pivotally anchored to said frame and said platen respectively, the open ends being pivotally connected, and means connecting said toggle members to said piston, each pair of said toggle members being interconnected by a pivotally attached member, said last-mentioned member being pivotally attached to a yoke piece joined to said piston, said piston having an extended guiding portion adapted to engage and reciprocate in said guide cavity in said platen, whereby to provide the piston with additional guidance and support against deflection.

2. In combination in a press, a frame, a movable platen, a piston, a hydraulic cylinder for said piston, a pair of upper and lower toggle members on each side of said piston, each toggle member being approximately U-shaped, the closed ends of said toggle members being pivotally anchored to said frame and said platen at spaced points respectively, the open ends being pivotally connected, and means connecting said toggle members to said piston, said platen having a guide cavity, and said piston having an extended portion engaging said guide cavity and reciprocable therein whereby to provide additional support for said piston during the reciprocation thereof.

3. In combination in a press, a frame, a movable platen, a piston, a hydraulic cylinder for said piston, inner and outer sets of upper and lower toggle members on each side of said piston, each toggle member being approximately U-shaped, the closed ends of said toggle members being pivotally anchored to said frame and said platen respectively, the open ends being pivotally connected, and means connecting said toggle members to said piston, said platen having a guide cavity, and said piston having an extended portion engaging said guide cavity and reciprocable therein whereby to provide additional support for said piston during the reciprocation thereof.

4. In combination in a press, a frame, a movable platen, a hydraulic cylinder for said piston, inner and outer sets of upper and lower toggle members on each side of said piston, each toggle member being approximately U-shaped, the closed ends of said toggle members being pivotally anchored to said frame and said platen respectively, the open ends being pivotally connected, and means connecting said toggle members to said piston, said platen having a cylindrical guide cavity, and said piston having a tabular guiding plunger engaging said guide cavity and reciprocable therein whereby to provide additional support for said piston during the reciprocation thereof.

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