

Jan. 11, 1938.

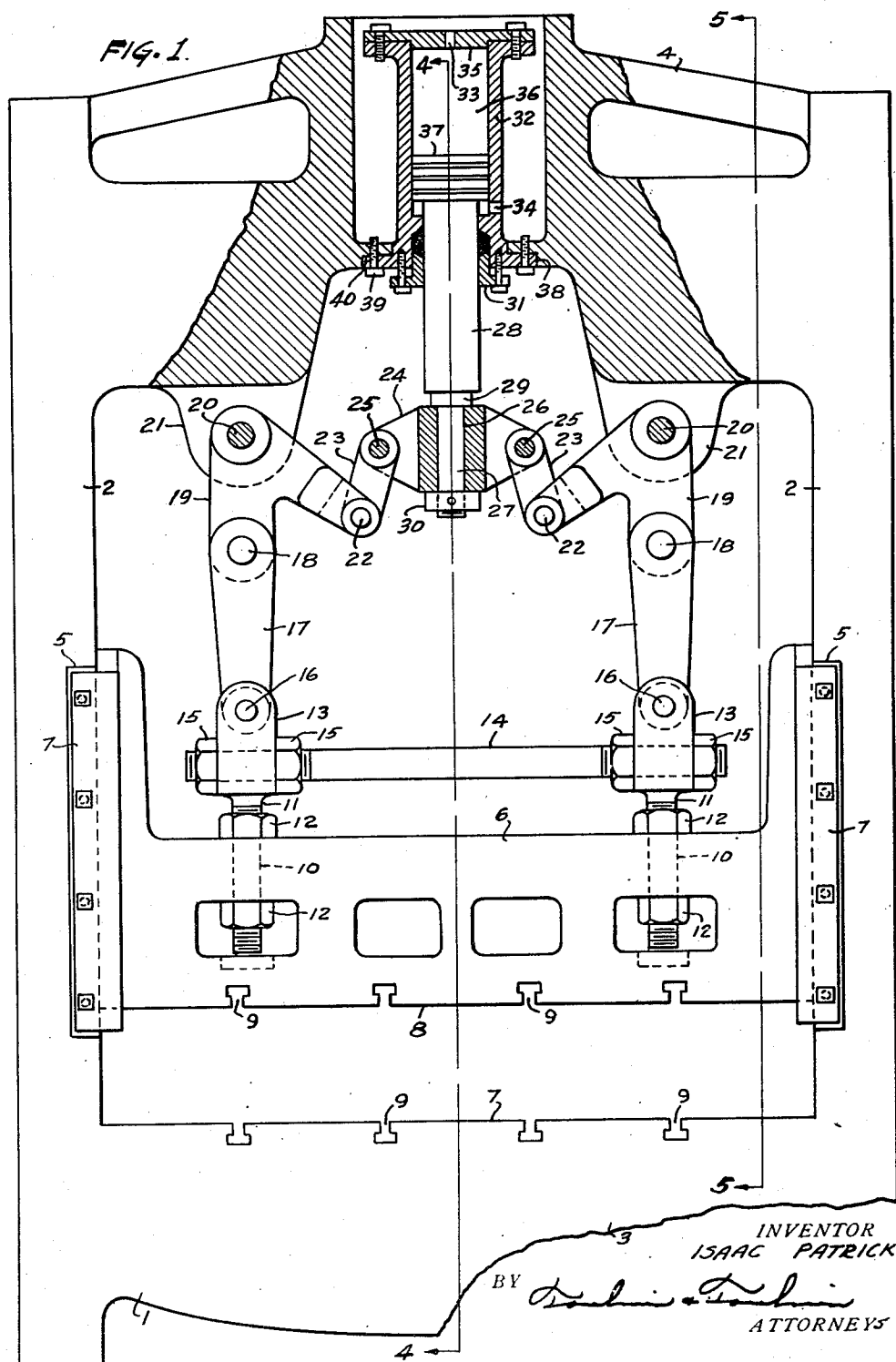
I. PATRICK

2,105,053

FOUR-POINT HYDRAULICALLY OPERATED PRESS

Filed June 15, 1934

3 Sheets-Sheet 1



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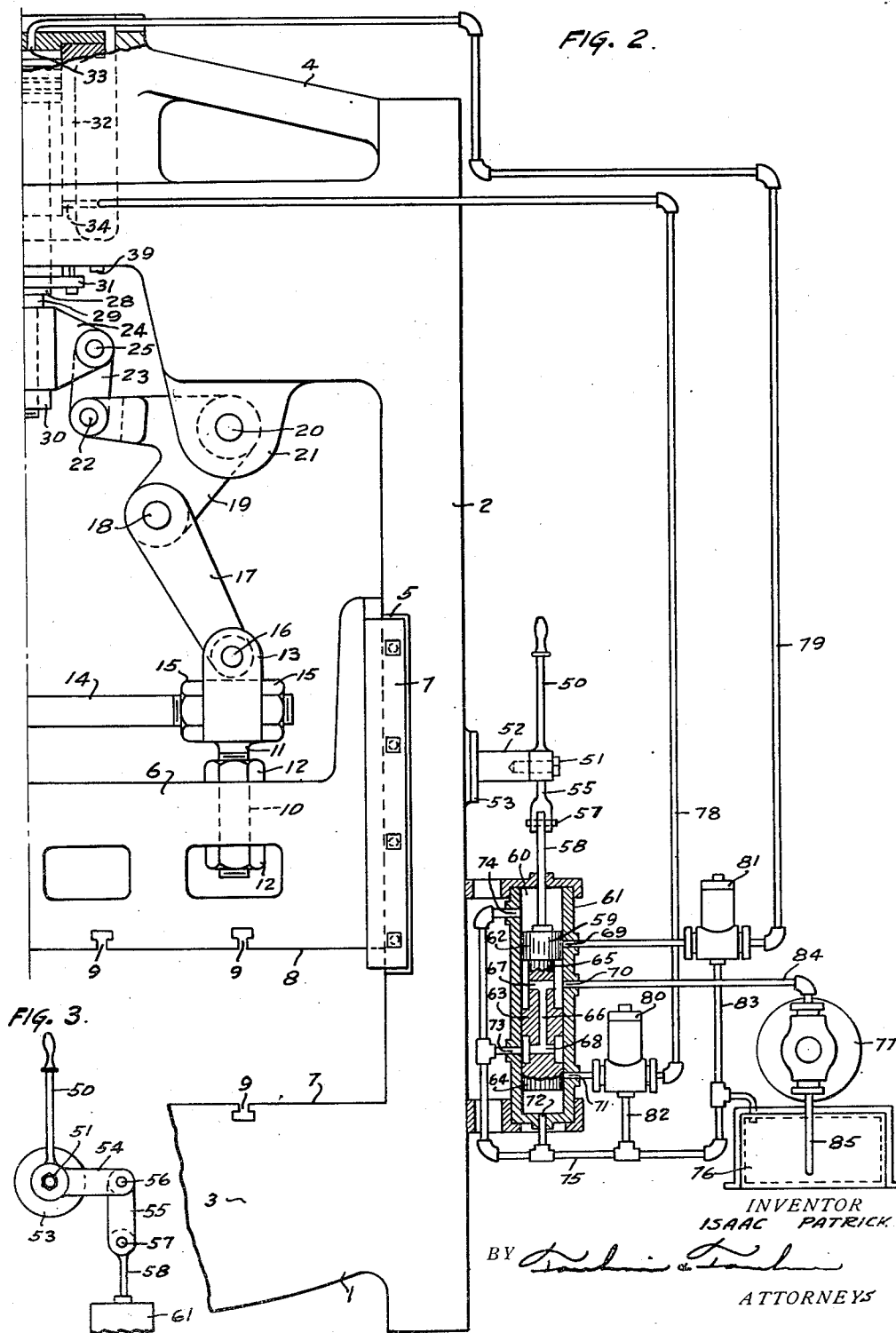
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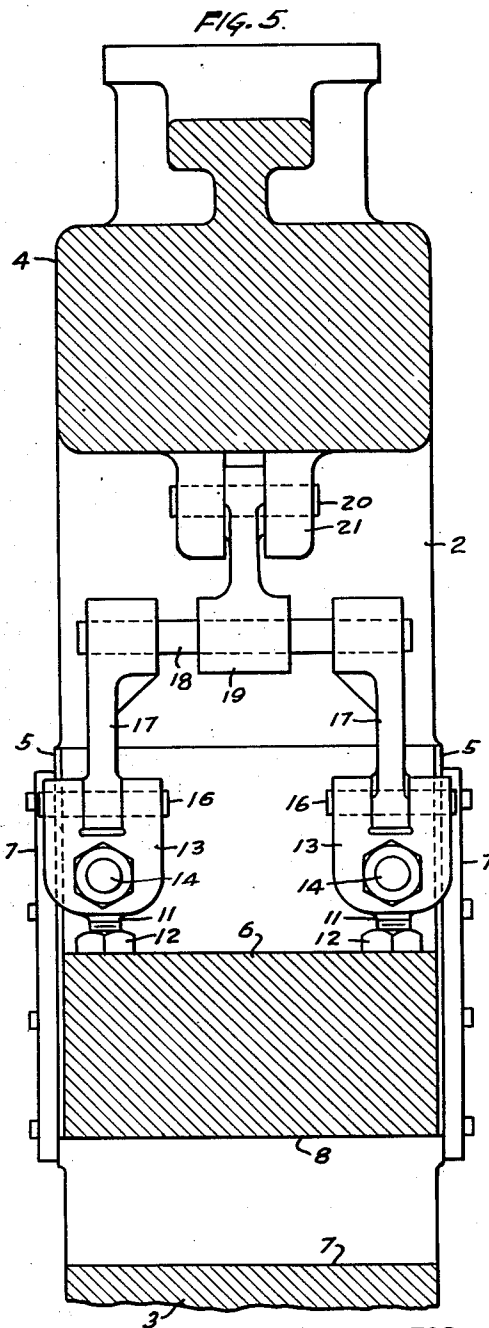
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ATTORNEYS

UNITED STATES PATENT OFFICE

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FOUR-POINT HYDRAULICALLY OPERATED PRESS

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Application June 15, 1934, Serial No. 730,822

4 Claims. (Cl. 100—70)

This invention relates to presses and, in particular, to presses operated by mechanical linkages.

One object of my invention is to provide a press having mechanical linkages interconnecting the platen and the power supply, this power supply comprising a hydraulic piston.

Another object is to provide a hydraulic press having linkages applying power to four points on the platen, and receiving power from a hydraulic piston.

Another object is to provide a press of this type, wherein the linkage is actuated by bell cranks pivotally mounted on the frame, these bell cranks being in turn actuated by a hydraulic piston-and-cylinder assembly.

In the drawings:

Figure 1 is a 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, showing the hydraulic circuit and valve for operating the press;

Figure 3 is a detailed side elevation of the operating lever of the press;

Figure 4 is a central vertical section through the press 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 used where great pressure is to be applied, and by this means the application of the pressure is controllable within accurate limits. A hydraulic press, however, as used in the prior art has been slow in its action and consequently at a disadvantage in the performance of modern high speed production operations. The mechanical press wherein the platen is operated through cranks and/or levers, has a high speed of operation, but its motions are not controllable because the crank must make a complete revolution hence the platen executes a complete stroke without possibility of any change in the high speed operation thereof. The mechanical press, however, has a rapid but a harsh and uncontrollable action which makes it unsuitable for delicate mechanical operations of forming parts liable to buckle or wrinkle in an undesired way if the pressure is not accurately and suitably applied.

The present invention seeks to combine the advantages of the hydraulic press with those of the mechanical press and yet eliminate the defects of both. In other words, the press of my invention by utilizing hydraulic means for supplying the force yet mechanical means for applying it to the platen, gives the controllability a

delicacy of operation of the hydraulic press, yet with a speed of operation comparable to the all-mechanical press, at the same time avoiding the harshness of operation and uncontrollability of the latter. At the same time, the press of my invention avoids the complex and intricate lever and crank systems which have heretofore been utilized to control the application of pressure by purely mechanical means.

Referring to the drawings in detail, Figure 1 shows a press having a frame, generally designated 1, with side members 2, and lower and upper cross members 3 and 4 respectively. On the vertical members 2 are machined guideways 5 relative to which slides a platen, generally designated 6, having retaining plates 7 mounted thereon and adapted to maintain the platen 6 in proper relationship to the guideways 5. The lower cross member 3 and the platen 6 are provided with machined surfaces 7 and 8 respectively and recesses 9 therein suitable for the connection of dies or work pieces.

The platen near its four points is provided with four bores 10, which receive four adjusting shafts 11 movably anchored thereto by the nuts 12, threaded on to the shafts 11. The latter on their upper ends are provided with yokes 13, these yokes being interconnected by tie rods 14 secured thereto by the nuts 15 threaded on to the ends of the tie rods 14. In this manner the adjusting shafts 11 and the yokes 13 are similarly interconnected with one another, so as to give a rigid construction.

Each yoke 13 is pivotally connected, as at 16, to a link 17, which at its opposite end is pivotally connected to a cross member 18 leading to one arm of a bell crank 19. Each bell crank 19 is pivotally mounted upon a shaft 20, which is secured to the projecting boss 21 of the frame cross member 4. The other arm of each bell crank 19 is pivotally connected, as at 22, to a connecting link 23, the other end of which is pivotally connected to a piston rod yoke 24, as at 25. By the term "bell crank" the applicant means a lever, whose two arms form an angle, having its fulcrum at the apex of the angle.

The piston rod yoke 24 has a bore 26, which encircles the reduced portion 27 of a piston rod 28 and is held against the enlarged portion 29 thereof by the collar 30, threaded on to the lower end thereof. The piston rod 28 passes through the adjustable packing 31 into the interior of the hydraulic cylinder 32, having a cylinder head 35. The latter is provided with a port 33, whereas the side walls of the cylinder 32 are provided 55

with a port 34 near the lower end of the cylinder bore 36. The piston rod 28 is provided with a piston head 37, which reciprocates within the cylinder bore 36. The entire cylinder-and-piston assembly is mounted in the countersunk portion 38 by the bolts 39, securing the flanged portion 40 therein.

The hydraulic circuit for operating the hydraulic cylinder to cause the platen 6 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 32 (Figure 2), whereas the port 69 has the conduit 79, leading to the upper port 33 thereof. The conduits 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 70 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 32. This causes pressure fluid to be applied to the upper side of the piston head 37. 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 37 moves downward, it likewise moves the yoke 24 downward, and the oblique links 23 move the pivot pins 22 outward.

This motion, when transmitted to the bell cranks 19 and the toggle links 17, causes the platen 6 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 36 of the hydraulic cylinder 32 by way of the port 34, situated below the piston head 37 thereof. This moves the latter upward, forcing the fluid above it out through the port 33, and the conduit 79 into 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 6 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, links pivotally attached to said movable platen near the four corners thereof, a pair of bell cranks operatively connected to said links and pivotally mounted on said frame, and a hydraulic piston-and-cylinder assembly disposed between said bell cranks and operatively connected to said bell cranks, said bell cranks and said piston being arranged in substantially the same plane.

2. In combination in a press, a frame, a movable platen, links pivotally attached to said movable platen near the four corners thereof, a pair of bell cranks operatively connected to said links and pivotally mounted upon said frame, a hydraulic piston-and-cylinder assembly disposed between said bell cranks and operatively connected to said bell cranks, said bell cranks and said piston being arranged in substantially the same plane, and transversely disposed members interconnecting each bell crank and each pair of links to form said operative connection, each member comprising a cross shaft having end connections with said links and an intermediate connection with said bell crank.

3. In combination in a press, a frame having a top member, a movable platen, links pivotally attached to said movable platen near the four corners thereof, a pair of bell cranks operatively connected to said links and pivotally mounted upon said top member, and a hydraulic piston-and-cylinder assembly disposed between said bell

cranks and operatively connected to said bell cranks, said bell cranks and said piston being arranged in substantially the same plane.

5 4. In combination in a press, a frame having a top member, a movable platen, links pivotally attached to said movable platen near the four corners thereof, a pair of bell cranks operatively connected to said links and pivotally mounted upon said top member, said bell cranks having in-

wardly directed arms, a hydraulic piston-and-cylinder assembly disposed between said bell cranks and operatively connected to the inwardly directed arms of said bell cranks, said bell cranks and said piston being arranged in substantially the same plane, and transversely disposed members interconnecting each bell crank and a pair of said links to form said operative connection. 5

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