April 26, 1932. H. F. VICKERS 1,855,434

PRESS

Filed May 19, 1930

Fig. 1.

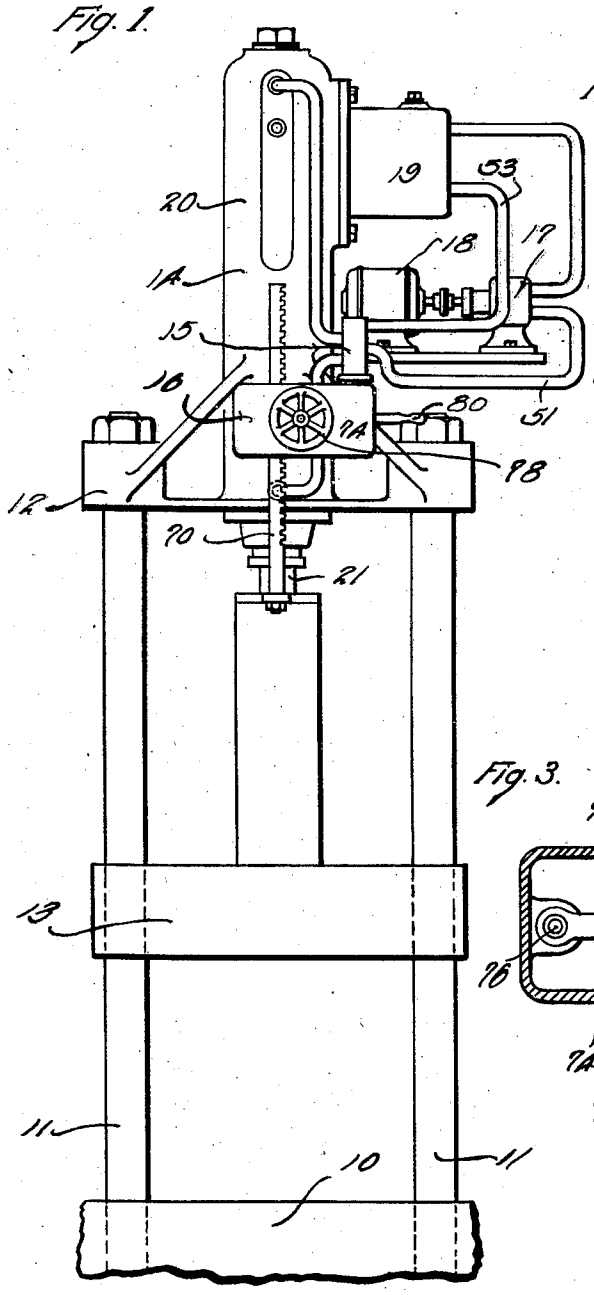


Fig. 2.

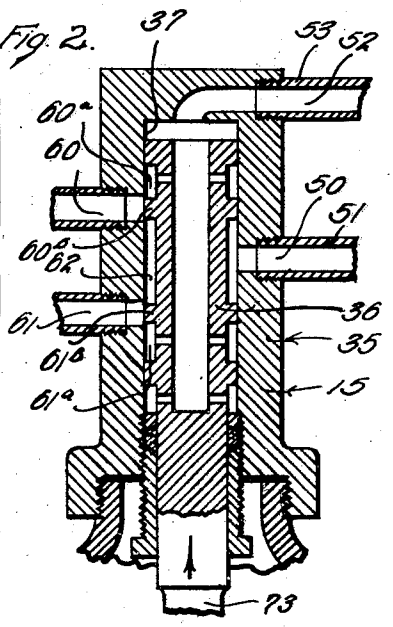
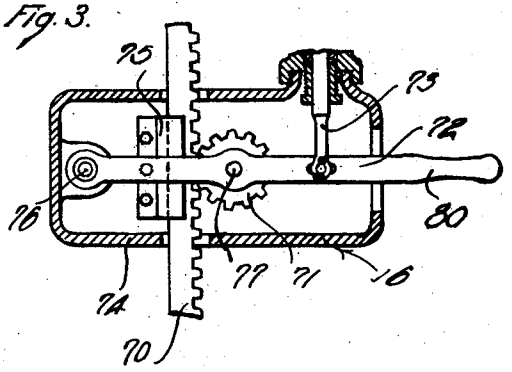


Fig. 3.



INVENTOR
HARRY F. VICKERS
By W. Hallaxell
HIS ATTORNEY

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UNITED STATES PATENT OFFICE

HARRY F. VICKERS, OF LOS ANGELES, CALIFORNIA

PRESS

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This invention relates to an hydraulic mechanism and has particular reference to a press, or the like. It is a general object of the present invention to provide a mechanism of the character mentioned that can be accurately and conveniently controlled.

Hydraulic presses of ordinary construction include a cylinder and piston mechanism supplied with fluid under pressure under control of a valve so that the moving element moves whenever the control valve is opened. The direction of operation of the moving element is determined by the direction of operation of the valve, and the extent of movement of the valve and the speed of movement of the valve are determined by the period during which the valve is left open and the extent to which the valve is opened, respectively. Because of this mode of control, it is more or less difficult to accurately control an hydraulic press and it requires considerable skill to operate such a press with a reasonable degree of accuracy.

It is an object of this invention to provide an hydraulic press which can be accurately and conveniently controlled without the exercise of great skill or judgment. The mechanism provided by this invention includes a control having a manually operable member, the control being such that the movable element of the press operates only while the manually operated member is moved and only to the extent that the manually operated member is moved. With this feature the press can be very accurately controlled as there can only be a certain definite operation of the movable element of the press for a given amount of movement of the control member.

Another object of this invention is to provide a mechanism of the character mentioned in which the control means is simple and inexpensive of manufacture and is particularly accurate and dependable in operation.

It is another object of this invention to provide a mechanism of the character mentioned in which the control means includes a construction whereby the movable element of the press may be operated in a manner corresponding to that in which an ordinary press is operated through the ordinary control valve.

The various objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a front elevation of a press embodying the invention showing a preferred form of the invention. Fig. 2 is an enlarged longitudinal detailed sectional view of the valve provided by the invention for the control of the press, and Fig. 3 is an enlarged detail sectional view through the control mechanism for the valve.

The present invention may be carried out to advantage in presses of various forms and construction, in fact, it is applicable to various machines similar to presses. In order to facilitate an understanding of the invention I will describe a typical preferred form of the invention applied to a simple or common form of press, it being understood, of course, that the broader principles of the invention are not to be considered limited to the details herein set forth.

The press illustrated includes, generally, a base 10, spaced standards 11, a head 12 carried by the standards, a pressure plate 13 guided by the standards, a cylinder and piston mechanism 14 carried by the head for operating the pressure plate 13, a valve means 15 for controlling the cylinder and piston mechanism, and operating means 16 for the valve 15. The press may be supplied with a suitable fluid under pressure from any suitable source. In the particular press illustrated I have shown a pump 17 operated by a motor 18 so that it is supplied with fluid from a suitable reservoir 19 and delivers it to the valve mechanism 15.

The press illustrated is a vertical structure in which the standards 11 are spaced apart and vertically disposed to not only support the head 12 and the various parts mounted thereon but also to form guides for the pressure plates 13. The cylinder and piston mechanism may be of any suitable construction;

for instance, it may be of the type ordinarily found in devices of this character. In the case illustrated the cylinder 20 of the mechanism is formed integral with the head 12 and the piston is connected to a rod 21 which projects from the lower end of the cylinder to connect with the pressure plate 13. It will be obvious how the control of fluid to and from the ends of the cylinder effects operation and control of the piston in the cylinder and therefore of the pressure plate 13.

The valve 15 includes, generally, a body 35 and a valve proper 36 operable in the body. The valve is preferably of the piston type in which case the body 35 is in the nature of a cylinder having a bore 37 slidably carrying the valve 36. The valve 35 in the case illustrated is stationary with the cylinder 20 of the mechanism 14; for instance, it may be integral with the cylinder as illustrated throughout the drawings.

A fluid supply port 50 enters the middle portion of the body 35 and may be supplied with fluid under pressure from the pump 17 by a conduit 51.

A fluid outlet port 52 is provided at one end of the body and connects with a suitable conduit 53 provided for conducting fluid from the valve to the reservoir 19.

Cylinder ports 60 and 61 connect the bore 37 with the two ends of the cylinder 20 of the mechanism 14. The ports 60 and 61 communicate with the interior of the valve body at spaced points, preferably at points located in opposite directions from the fluid inlet port 50.

The valve 36 has a central opening extending into it from the end adjacent the outlet port 52 and has a recess or chamber 62 formed in its exterior to remain in communication with the fluid supply port 50. Chambers 60^a and 61^a are formed in the exterior of the valve at points spaced from the chamber 62 to cooperate with the ports 60 and 61, respectively. The chambers 62, 60^a, and 61^a are in the nature of recesses formed around the valve 36 and are proportioned and located so that the valve has parts 60^b and 61^b located opposite the ports 60 and 61. The chambers 60^a and 61^a are in communication with the central opening in the valve and are therefore in communication with the outlet opening 52. The valve parts above described are proportioned and related so that the valve 36 may be positioned in a central or neutral position where the parts 60^b and 61^b are related to the ports 60 and 61, respectively, so that fluid under pressure received through the port 50 enters the ports 60 and 61 equally and as fast as it enters the ports it escapes the chambers 60^a and 61^a discharging into the central opening of the valve and hence through the outlet port 52. In Fig. 2 of the drawings the valve is illustrated in the neutral position where the fluid is thus by-passed around the parts 60^b and 61^b leaving the mechanism balanced with equal pressure at the two sides of the piston in the cylinder 20.

Movement of the valve 36 in either direction from the balanced or neutral position will immediately disturb the equilibrium or balanced position at which the parts are all at rest and will cause more pressure to come at one side of the piston than the other with the result that the mechanism is operated by fluid pressure. For example, upon movement of the valve 36 in the direction indicated by the arrow in Fig. 2 the valve moves up allowing a greater amount of fluid from the chamber 62 to enter the port 60 than the port 61 and allowing free exhaust of fluid through the port 61 to the outlet port 52. With the valve thus positioned, fluid under pressure enters the cylinder through the port 60, which port is connected to the upper end of the cylinder, causing the piston to move downwardly in the cylinder as fluid escapes from the lower end of the cylinder through the port 61, the port 61 being connected with the lower end of the cylinder. Upon return of the valve to the neutral position the flow of fluid to the cylinder 20 ceases so that the piston is held in the cylinder so that it cannot move in either direction. If the valve is moved in the opposite direction the flow is reversed from that just described with the result that the piston is moved upwardly in the cylinder. It will be obvious that flow to the cylinder in either direction will continue only so long as the valve is in one direction or the other from the neutral position.

The control 16 provided by the present invention for controlling operation of the valve 15 includes in its preferred form a rack 70 connected with the movable element of the press, a pinion 71 meshing with the rack, and a pivoted lever 72 carrying the pinion and operatively connected with the stem 73 of the valve part 36. The rack 70 may be connected with the rod 21 or pressure plate 13 to project upwardly through a housing 74 which carries the other parts of the control just mentioned. A suitable guide 75 may be provided in the housing to carry the rack 70. The lever arm 72 is carried on a fixed pivot pin 76 and is provided at a point removed from the pivot pin 76 with a shaft 77 on which the pinion 71 is rotatably supported. The shaft 77 may project from the housing 74 and may be provided at the exterior of the housing with a hand wheel 78, or the like, for effecting rotation or operation of the pinion. The valve stem 73 is pivotally connected to the lever arm 72 at a point removed from the pinion, preferably at a point outward of the pinion. The construction just described is such that operation of the hand wheel 78 in either direction turns the pinion 71 so that the pinion cooperates with the rack 70 causing the lever arm 71 to be moved either

up or down, depending upon the direction of rotation of the hand wheel. Movement of the lever arm 71 in either direction from the neutral position illustrated in Fig. 3, causes the valve 36 to be operated from the neutral position so that the piston of the mechanism 14 is operated in the cylinder. It is to be noted, however, that as soon as the piston starts operation the rack 70, being connected with the piston is moved with it and thus tends to return the control to the neutral position by operating the arm 72 through the pinion 71. In fact, the movement given to the rack 70 will return the parts to the neutral position as soon as operation of the hand wheel ceases. However, so long as the hand wheel is operated in either one direction or the other the mechanism will continue to function and will operate directly in proportion as the hand wheel is operated, that is, if the hand wheel is operated slowly the mechanism will operate slowly, whereas if the hand wheel is operated rapidly the mechanism will operate rapidly.

In accordance with the preferred form of the invention, the control just described is further provided with means operable to hold the valve open in either direction without continuously operating a part such as the hand wheel. In the form of invention illustrated the lever arm 72 is continued beyond the point of connection of the valve stem 73 with the lever so that it has a handle portion 80 projecting from the housing 74. Upon movement of the handle in either direction from the neutral position the mechanism will be operated the same as though the lever had been operated through cooperation of the pinion 71 and rack 70. So long as the lever is held out of the neutral position the mechanism will continue to operate, the speed of operation being governed by the extent to which the lever has been moved out of the neutral position. As soon as the lever is released the rack 70 cooperating with the pinion 71 will return the lever 72 to the neutral position so that the mechanism ceases operation. In practice this last-mentioned control may be used when it is desired to rapidly operate the press up or down, while the control through the hand wheel 78 may be used when it is desired to accurately control or govern the operation of the press.

Having described only a typical preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A press including, a base, a plate movable relative to the base, a cylinder and piston mechanism for operating the plate, a valve controlling the mechanism, and means for operating the valve including a rack movable with the plate, an operating lever connected with the valve for moving the valve, and a manually operable pinion carried by the lever and cooperating with the rack to move the lever when the pinion is operated.

2. A press including, a base, a plate movable relative to the base, a cylinder and piston mechanism for operating the plate, a valve controlling the mechanism, and means for operating the valve including a rack movable with the plate, a pivoted hand lever connected with the valve for operating it, and a manually operable pinion carried by the lever at a point removed from the pivotal axis of the lever and in cooperative engagement with the rack to operate the lever when rotated.

3. A press including, a base, a plate movable relative to the base, a cylinder and piston mechanism for operating the plate, a valve controlling the mechanism, and means for operating the valve including a rack movable with the plate, a pivoted manually operable lever, a pinion rotatably mounted on the lever and cooperatively engaging the rack to operate the valve, and a manual operating member for the pinion.

4. A press including, a base, a plate movable relative to the base, a cylinder and piston mechanism for operating the plate, a valve controlling the mechanism, and means for operating the valve including a rack movable with the plate, a pivoted manually operable lever, a pinion rotatably mounted on the lever and cooperatively engaging the rack to operate it, and a manual operating member for the pinion, the axis of rotation of the pinion being removed from the pivotal axis of the lever.

5. A press including, a base, a plate movable relative to the base, a cylinder stationary relative to the base, a piston operable in the cylinder and operatively connected with the plate, a valve for controlling the flow of fluid to and from the cylinder, a rack connected with the plate to move therewith, a manually operable pivoted lever operatively connected with the valve, and a manually operable pinion rotatably mounted on the lever and cooperatively engaging the rack, the pinion being adapted to cause operation of the valve by being rotated to cooperate with the rack to move the lever.

6. A press including, a base, a plate movable relative to the base, a cylinder stationary relative to the base, a piston operable in the cylinder and operatively connected with the plate, means supplying fluid to the cylinder, a valve for controlling the flow of fluid to and from the cylinder, a rack connected with the plate to move therewith, a manually operable pivoted lever operatively connected with the valve, and a pinion pivotally mounted on the

lever and cooperatively engaging the rack, the valve being adapted to be operated either by movement of the lever through rotation of the pinion or by direct manual operation of the lever.

7. A press including a base, a plate movable relative to the base, a cylinder, a piston operable in the cylinder and operatively connected with the plate, a valve for controlling the operation of the piston including a cylinder body having inlet and outlet ports and spaced ports in communication with opposite ends of the cylinder, a plunger slidable in the body for controlling the passage of fluid under pressure through the ports, and means for operating the valve plunger including a rack movable with the plate, a pivoted lever operatively connected with the plunger, a pinion rotatably mounted on the lever at a point removed from the pivotal axis of the lever and operatively engaging the rack, and a manual operating member for the pinion.

8. A press including, a base, a plate movable relative to the base, a cylinder stationary relative to the base, a piston operable in the cylinder and operatively connected with the plate, a valve for controlling the flow of fluid to and from the cylinder, a rack connected with the plate to move therewith, a pivoted lever directly operatively connected with the valve, and a manually operable pinion rotatably mounted on the lever and cooperatively engaging the rack, the valve being adapted to be operated either by manual rotation of the pinion or by direct manual operation of the lever, the lever having a part forming a handle.

In witness that I claim the foregoing I have hereunto subscribed my name this 24th day of March, 1930.

HARRY F. VICKERS.