

April 2, 1940.

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2,195,478

PRESS

Filed Nov. 24, 1936

2 Sheets-Sheet 1

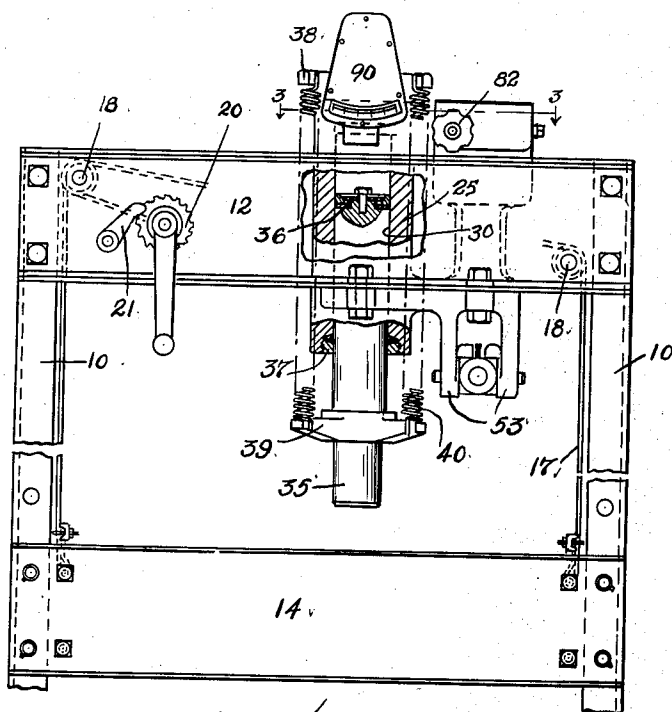


Fig. 1

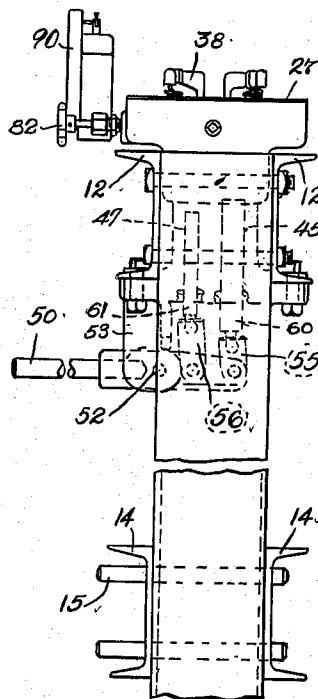


Fig. 2

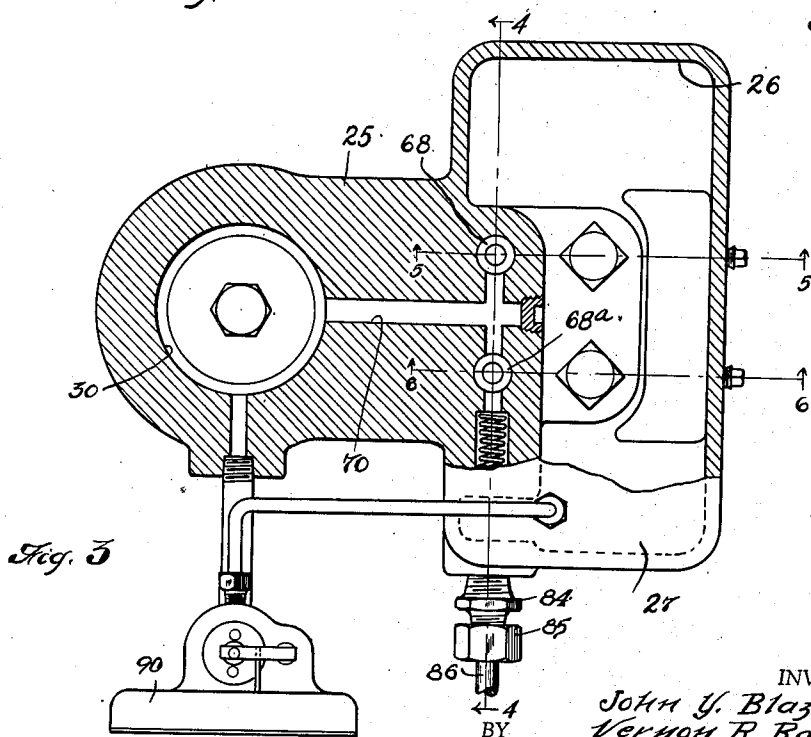


Fig. 3

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2 Sheets-Sheet 2

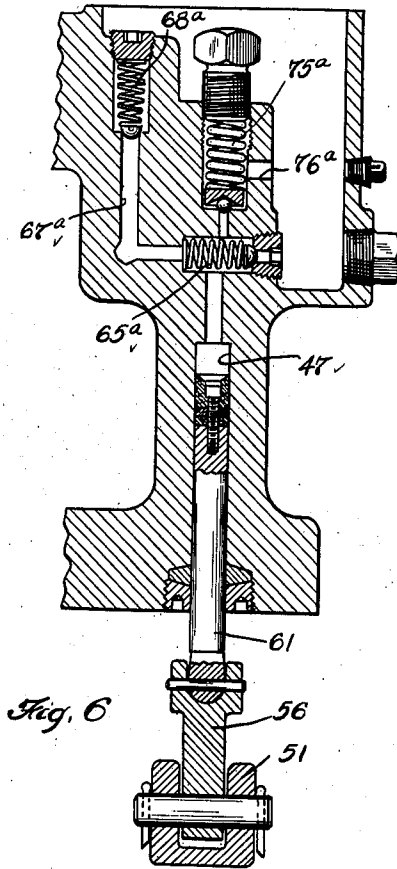


Fig. 6

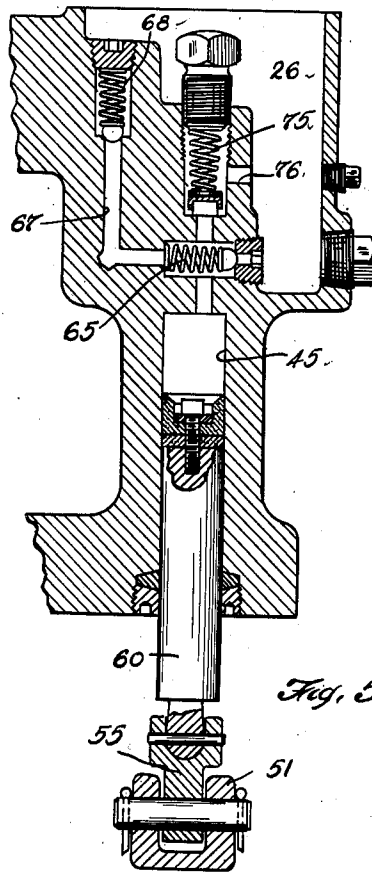


Fig. 5

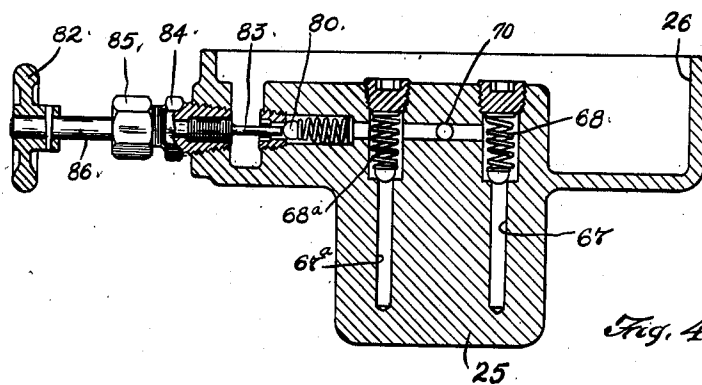


Fig. 4

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UNITED STATES PATENT OFFICE

2,195,478

PRESS

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Application November 24, 1936, Serial No. 112,526

1 Claim. (Cl. 103—11)

This invention relates to a press operated on the same principle as the familiar hydraulic press, in which a fluid acts as the agent for transmitting pressure exerted on it at one point to the work in the press.

Heretofore presses operated under fluid pressure have been constructed employing a ram which is moved into contact with the work and applies a great pressure thereto. An objection to the prior form of construction has been the time required for moving the ram from an inactive position into contact with the work and, again, the time required for moving the ram from the work to a position enabling removal of the work from the press. A further disadvantage of the types of presses heretofore used has been in the transmission of fluid through the system from the compression cylinders to the ram cylinder. The extreme pressures developed in the fluid together with the distance to be traversed by the same have resulted in unwieldy and uneconomical fittings rendered necessary to withstand the pressures involved. With the old type of fluid transmission system leakage, especially at the joints and connections, was very common and equally undesirable.

It has been an object of our invention to produce a hydraulic press which wastes less time in idle motion and which permits the application of a considerably greater fluid pressure to the ram than has heretofore been deemed possible. We have also designed our invention to accomplish this in such manner that all the fluid ducts are carried in a single casting which thereby eliminates the use of many couplings and other connecting devices.

The time ordinarily idly consumed in movement of the ram to and from the work is reduced by the provision of a dual pressure applying device, one portion of which acts to move the ram into contact with the work rapidly and then becomes inactive while the operating pressure is applied through a second device. A release has been provided for the pressure built up in the ram cylinder which operates to permit the return of the ram cylinder rapidly to an inactive position, whereupon the work acted on may be removed from the press.

The fluid, which is ordinarily oil, used in the creation and maintenance of the desired operating pressure in the ram head is, in accordance with our invention, confined to ducts formed in a casting carrying both the pressure applying means and the ram cylinder.

Other objects of our invention will become

apparent from the detailed description following, which is to be interpreted by reference to the annexed drawings. The novel features of our invention will be summarized in the claim. It is understood that we have only described a preferred form of construction embodying our invention and that variations may appear without departing from the spirit of this invention.

Referring now to the drawings:

Fig. 1 is a side elevation of a press embodying our invention;

Fig. 2 is an end view of such a press;

Fig. 3 is a horizontal section as indicated by the lines 3—3 in Fig. 1 showing a one-piece construction of the ram and pressure cylinders;

Fig. 4 is a transverse section as indicated by the lines 4—4 in Fig. 3 showing the pressure cylinder check valves and the release valve;

Figs. 5 and 6 are transverse sections as indicated by the lines 5—5 and 6—6 in Fig. 3 and showing respectively the large and small pump cylinders; and

Fig. 7 is a fragmentary section showing the form of gauge used to determine the ram operating pressure.

Our invention as hereinafter described contemplates the use of a pair of pump cylinders which act on a body of oil to force the same into a ram cylinder and create a pressure therein which moves the ram into contact with the work and at the same time applies the requisite pressure thereto.

The frame for such a press may be constructed of structural shapes and, as shown in Fig. 1, may comprise end members 10 mounted on a suitable base, not shown, and connected at their top by cross-channels 12. A second pair of channels 14 is provided which may be adjustably positioned on the end members 10 by movable pins 15 to provide a table for the work. This table may be raised or lowered by means of cables 17 secured at one end thereto and passing over pulleys 18 to be wound on a drum carrying a ratchet wheel 20, to which is also secured a hand crank. A suitable pawl 21 enables the table to be raised on rotation of the crank and, due to the pawl, will retain the same in a suspended position.

The ram and its operating mechanism are carried by the upper channels 12. As shown in Fig. 3 a casting 25 is carried by said channels and provides an oil reservoir 26 open at the top and for which a suitable cover plate 27 may be provided.

A ram cylinder 30 is provided in the casting 25. Carried by the cylinder is the ram 35, the

lowermost or work-engaging end of which is removable for repair or replacement. This ram, which snugly occupies the cylinder 30 is provided at its upper end with sealing means 36 which, together with a seal 37 of the bottom of the cylinder, eliminates substantially all loss of oil pressure in the cylinder. Four arms 38 are carried by the casting 25 at top of and about the cylinder 30. Complementary arms 39 are carried by a bracket which is attached to the lower end of the ram 35. Tension springs 40 connect the respective complementary brackets and provide a quick return for the ram head which operates substantially as fast as the oil is released from the ram cylinder.

A pair of pump cylinders of different bore is provided to apply pressure through the oil to the ram 35. The larger of these cylinders will be designated 45 and the smaller 47. As shown in Fig. 2, the cylinders are positioned side by side to permit the pistons of both to be simultaneously operated by a hand bar 50. The bar 50 terminates at its inner edge in a channel 51 which is pivoted at 52 to a pair of downwardly extending ears 53 of the casting 25. The channel 51 carries a pair of links 55 and 56, to which are pivoted the pistons 60 and 61 of the large and small pump cylinders respectively. The piston lengths and the distances between centers of the links 55 and 56 is such that the difference in piston stroke due to the respective distance of the pump cylinders from the pivot point 52 is compensated for. Expressed in another fashion, the pivoted channel 51 mounted at 52 will apply a different arcuate angle of movement and a different force to a piston depending on the distance between the pivot of the channel and the pivot of the links 55 or 56 on the bar. Thus the link 55 will move its cooperating piston farther for a given arcuate movement of the channel 51 than will link 56, but the applied force will be less. For this reason the piston adjacent pivot 52 is employed as the high pressure piston and the other is the low pressure piston. Thus the large travel and low pressure of piston 60 rapidly moves the parts to position and after this piston becomes idle the piston 61 operates at high pressure to transmit the small added volume of oil to the parts to apply the operating pressure.

The two pump cylinders and pistons are substantially identical except as to size. Both pistons are provided at their inner ends with seals which, together with packing adjacent the lower ends of the cylinders eliminates substantially all leakage between the respective pistons and cylinders.

In the large cylinder 45 oil is admitted thereto through the check valve 65 when the ball of the same is drawn inwardly against its spring by creating a partial vacuum in the cylinder. Similarly oil is drawn into the small cylinder 47 through a check valve 65a. A partial vacuum is created by movement of the hand lever 50, which in turn acts to withdraw these pistons from their cylinders.

Upon filling the said cylinders with oil the same is pumped to the ram cylinder through the ducts 67 and 67a in the casting 25. In the course of travel through said ducts the oil passes a pair of check valves 68 and 68a which prevent its return to the respective cylinders. These check valves, shown in Figs. 4, 5 and 6, when pushed against their retaining springs by the fluid, allow the flow of oil to a common duct 70 leading to the ram cylinder 30. As the oil is pumped

to the cylinder 30 the ram 35 is forced downwardly against the springs 40 into contact with the work, whereupon the operating pressure is built up to the desired amount. The large pump cylinder 45 is used principally to rapidly move the ram into contact with the work, after which it becomes substantially inactive. A passage containing a check valve 75, leading to the reservoir 26 through an opening 76 is shown in Fig. 5. This valve normally acts to prevent flow of oil from the cylinder back to the reservoir. The coil spring in the same however, is of such strength that when the ram engages the work and begins to build up an operating pressure the valve proper is forced away from the opening by the oil under pressure and thus makes its escape to the reservoir 26.

The actual operating pressure, which reaches several tons, is built up by the action of the small piston, during which time the large piston reciprocates idly. If excessive pressure is built up at the ram head which might strain the working parts, a pressure release check valve 75a, incorporated as shown in Fig. 6, begins to function. This valve 75a is similar to the valve 75 just described, except that the operating spring is very much stronger and this requires a very much greater pressure acting against the valve proper to effect an oil release. As shown in Figs. 5 and 6, the valve proper of the check valve 75 and 75a are different. The pressure released by the larger valve 75 does not attain any considerable magnitude and with the ordinary type of valve results in a continual chattering. On the other hand, the valve proper of the unit 75a must withstand so great a pressure that the ball and spring socket construction there shown are rendered necessary.

It is well to note at this time that the point at which the large pump cylinder 45 cuts out, due to the action of the check valve 75, may be determined in two ways. If desired, the springs 40 may be so calibrated that upon a certain extension of the ram from the cylinder they will build up a spring pressure sufficient to overbalance the force exerted by the spring of the check valve 75. If desired, this form of release need not be used and the pressure set up in the fluid by contact of the ram head with the work may be utilized to effect such release.

The oil pressure built up in the ram cylinder may be released by a suitable valve. As shown in Fig. 4 this comprises a check valve 80 which normally prevents flow of the oil outwardly from the duct 70, in which it is confined by the check valves 68 and 68a. A hand wheel 82, carrying a pin adapted to engage the ball of the check valve 80 is threadingly carried in the casting 25. Thus rotation of the hand wheel 82 in a counterclockwise direction causes the pin 83 to push the ball 80 away from the outlet which it normally closes and thus permits flow of the oil to the reservoir 26. When the ram is returned to its uppermost position under the action of the springs 40 the pin 83 may be withdrawn, whereupon pressure may again be built up in the ram cylinder. To prevent leakage of oil from the reservoir the hand wheel 80 is carried by a tapered bushing 84 which, at its outer end, carries a nut 85 which forces packing about the hand wheel supporting rod 86.

It will be seen from the foregoing description that we have invented a novel oil-operated hydraulic press which incorporates many distinctions over similar press mechanism heretofore

built, and especially which provides a unitary construction for the various cylinders and ducts leading thereto, and which provides a ram rapidly movable into contact with the work and back again to an inactive position.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the structure herein disclosed, provided the means stated by the following claim or the equivalent of such stated means be employed.

We therefore particularly point out and distinctly claim as our invention:

In apparatus for supplying hydraulic pressure to presses and the like, a casting having cylinders therein of different diameters, pistons op-

erable in said cylinders, means for simultaneously operating said pistons, said means comprising a lever pivotally movable about an axis which is normal to a plane containing the axes of said pistons, links pivotally connecting said lever with said pistons, the point of pivotal connection of the link connected to the smaller piston being closer to the pivotal axis of said lever than the link connected to the larger piston, said casting having passages therein leading from the respective cylinders, a low-pressure relief valve in said large cylinder passage and a high pressure relief valve in said small cylinder passage.

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