June 29, 1937. R. W. DINZL 2,085,695

HYDRAULIC PRESS

Filed Dec. 23, 1933 2 Sheets-Sheet 1

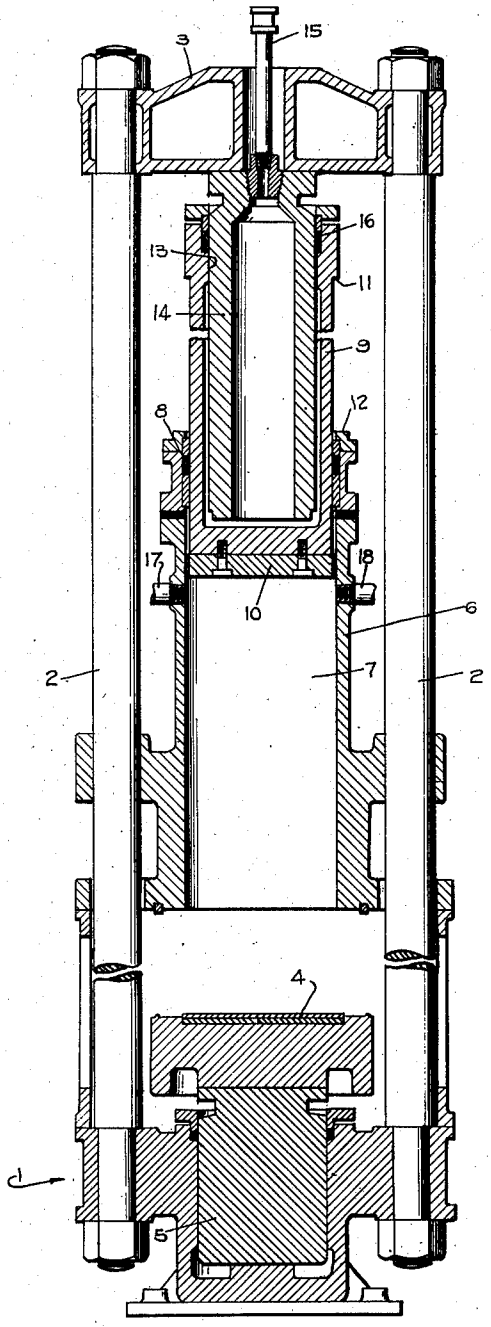

Fig. 1

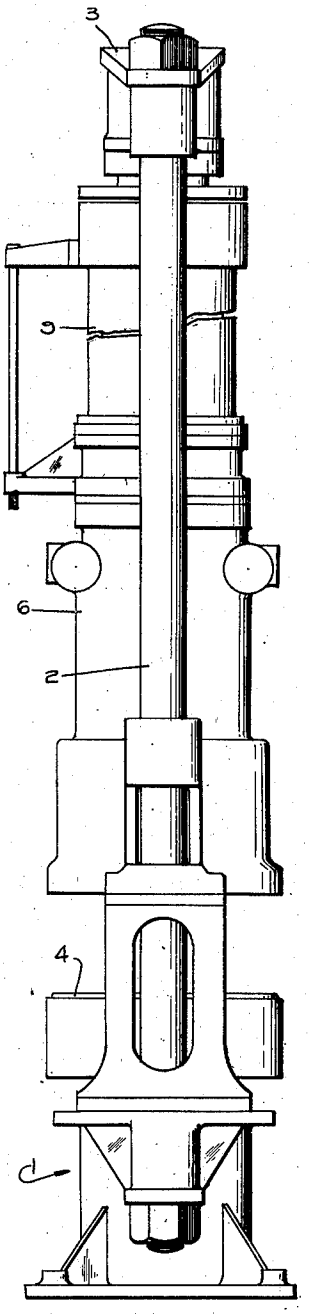

Fig. 2

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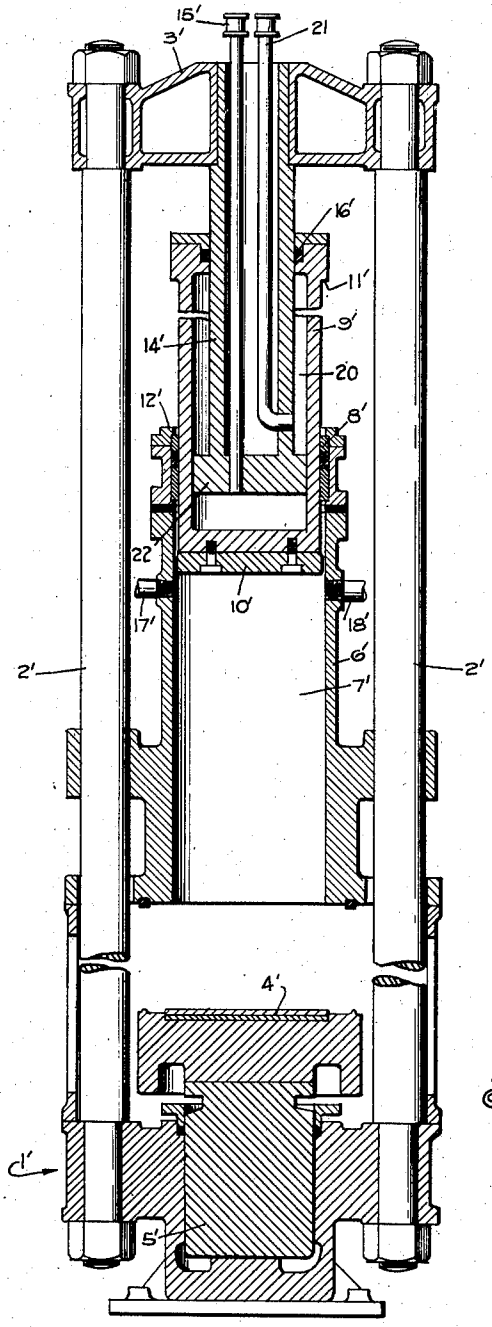

Fig. 3

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HYDRAULIC PRESS

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2 Claims. (Cl. 62—121)

This invention relates generally to presses and more particularly to a hydraulic press for dry ice.

In making cakes of dry ice it is highly desirable that the same is not contaminated by oil or other discoloring matter. Inasmuch as only a single drop of oil will permeate and spread over a large portion of the dry ice, it is seen that the press equipment must be highly effective in preventing leakage from the hydraulic mechanism into the dry ice chamber. Various arrangements have heretofore been proposed involving packing glands and the like but have not met with the necessary degree of success either on account of the cost of manufacture or the inefficiency of the arrangements.

It is one object of my invention to provide an improved arrangement whereby there is no possibility of the hydraulic actuating fluid contaminating the dry ice or other material that may be contained within the material chamber.

A more specific object is to provide a material chamber in combination with what is herein termed a cylinder-ram having a closed end for engaging the material. A further object in this respect is to provide preferably a material receiving cylinder in which is disposed a reciprocable hollow cylindrical ram having its inner end closed while a stationary piston is disposed within the hollow ram. As a result of this improved arrangement, the hydraulic fluid is contained wholly within the closed end of the ram without the use of any sliding joint for sealing the interior of the ram from the material chamber, thereby completely eliminating the possibility of leakage into the material chamber.

Another object is to provide an improved arrangement as above described wherein the ram-cylinder is adapted to be moved in opposite directions by hydraulic pressure, or, to be moved during the pressing operation by hydraulic pressure but returned by admission of liquid or gaseous material in the material chamber.

Another object is to provide an improved press of the above type in combination with a structural arrangement of the press and a lower movable platen for sealing and closing the lower end of the material chamber.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a vertical sectional view through a press embodying my improvements;

Fig. 2 is a side elevation of the press of Fig. 1;

Fig. 3 is a modified form of press employing a cylinder ram adapted to be moved in opposite directions by hydraulic pressure.

In the particular embodiments of the invention which are disclosed herein merely for the purpose of illustrating certain specific forms among possible others that the invention might take, I have shown in Fig. 1 a press having a base 1 carrying a pair of joining columns 2 for supporting a crosshead 3. A lower platen 4 is moved vertically by a ram 5 supported in base 1. Fluid pressure to this ram may be supplied from any suitable and usual means such as a pump. Supported upon joining columns 2 is a cylinder 6 having preferably a cylindrical material chamber 7 whose lower end is open. The upper end of this cylinder is provided with what might be termed an atmospheric packing gland 8. Reciprocably disposed in cylinder 6 is a cylinder-ram 9 whose lower closed end may be provided with a removable facing plate 10. This plate does not necessarily have a leakproof fit with cylinder 6 as it does not have to resist hydraulic actuating fluid. The upper end of ram cylinder 9 has a shoulder 11 adapted to engage the upper collar 12 of the packing gland when the ram cylinder is in its lowermost position to be described later. The ram cylinder has an internal cylindrical bore 13 to receive a stationary piston or ram element 14. This piston is supported by crosshead 3 and actuating fluid pressure is supplied from any suitable source through a suitable valve controlled pipe 15 to the hollow interior of piston 14 or a suitable passage therein, whereby the fluid pressure may act upon the closed end of ram cylinder 9 to move the same downwardly. A packing gland 16 is interposed between piston 14 and ram cylinder 9. However, any hydraulic fluid that leaks past gland 16 will not have direct access to the material chamber 7, and hence there is no possibility of contaminating the material therein.

In operation of this form of press it is assumed that ram cylinder 9 is in its uppermost position as shown, whereupon fluid pressure is admitted to ram 5 to move platen 4 into sealing and closing contact with the lower end of cylinder 6. To insure a tight fit, the contacting surfaces of platen 4 and cylinder 6 may be ground or provided with a suitable seal. However, with the lower end of cylinder 6 closed, material such as liquid carbon dioxide or a combination thereof with carbon dioxide gas is admitted through an inlet port 17 until by a liquid gauge or pressure gauge it is determined that the proper amount of material has been admitted to chamber 7. Passage 17 is then closed and in accordance with standard

dry ice practice, a suction pump is attached to another passage 18 to reduce the pressure in chamber 7, whereupon the liquid carbon dioxide turns to the well-known form of snow. Thereupon hydraulic pressure is admitted thorugh pipe 15 to the interior of ram cylinder 9 to force the same downwardly and compress the material therein. During this pressing operation which requires a very high pressure, it is seen that the actuating fluid cannot pass through any packing gland directly to the material chamber 7, and hence no contamination of the material can occur. When the block of material has been fully compressed or formed, the pressure on ram 5 is released by any suitable valve mechanism, whereupon ram-cylinder 9 moves downwardly to eject the cake of material from the lower end of cylinder 6, during which time the platen 4 moves downwardly. When the cake is fully ejected, shoulder 11 will have come into engagement with element 12 to thus limit the downward position of the ram-cylinder.

Inasmuch as no return piston area is provided for the ram cylinder 9, it is moved upwardly by first moving platen 4 and ram 5 upwardly to close the lower end of chamber 7, whereupon liquid carbon dioxide and its gas are admitted through inlet 17 to chamber 7. The fit of cylinder ram 9 and plate 10 with cylinder 6 has sufficient clearance that the liquid or gaseous carbon dioxide under pressure may flow downwardly past ram cylinder 9 to the under side of plate 10 and thereby force the same upwardly to the position shown in Fig. 1, whereupon the compressing cycle is repeated.

In the modification of Fig. 3 the same general arrangement of press structure is employed as shown in Fig. 1, and hence similar parts are given the same reference numbers. However, to provide for the hydraulic return of a ram cylinder 9', the piston 14' has a reduced portion as shown to provide an annular chamber 20. Hence it is seen that fluid pressure may be admitted below plate 22 to force ram cylinder 9' downwardly whereas fluid pressure may be admitted through pipe 21 to annular chamber 20 to move ram cylinder 9' upwardly. Packing gland 16' is completely free from direct communication with material chamber 7 so that any leakage of hydraulic fluid from annular chamber 20 cannot contaminate the material. Piston plate 10' does not require a tight leakproof fit with its surrounding wall because any leakage past the piston into annular chamber 20 will merely flow outwardly through pipe 21 which would be open to discharge during the pressing operation.

The mode of operation of this arrangement is the same as in the other form except that the gas pressure of the material in chamber 7 is not used to move cylinder ram 9' upwardly but instead it is moved upwardly by hydraulic pressure which is suitably controlled by any usual three-way valve mechanism.

From the foregoing disclosure it is seen that in either form I have provided an extremely simple and yet highly effective means whereby maximum pressure may be applied to the material without danger of contaminating the same while at the same time there is obtained other structural and functional advantages which will be more apparent to those skilled in the art, these various features and any other changes in structure or arrangement of parts being within the spirit of the appended claims.

I claim:

1. A press comprising, in combination, means forming a material chamber, a cylinder-ram mounted for reciprocation within said chamber and projecting therefrom at one end of the chamber, said ram having a portion permanently disposed within said chamber, means forming a substantially close fit between said chamber and cylinder-ram at said end, said cylinder-ram having a closed pressure end and the other end being open, and a piston disposed in said cylinder-ram and projecting through said open end whereby actuating fluid pressure supplied between said piston and said closed end is adapted to effect movement of the ram without leakage of actuating fluid into said material chamber.

2. A dry ice press comprising, in combination, a cylindrical material chamber having one end open, a ram actuated platen adapted to close and seal said open end, a hollow ram reciprocable in said material cylinder through the other end thereof, one end of said hollow ram being closed to provide a material engaging surface, a piston disposed within said hollow ram, said ram and material cylinder having clearance to permit flow of liquid or gas therebetween, and means providing an inlet to said material cylinder at a point where said hollow ram will overrun the inlet port, whereby liquid or gas pressure admitted into said inlet will flow through said clearance to said chamber and move said ram to a reloading position.

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