May 11, 1926. 1,583,814

H. R. TILL

PRESSURE CONTROLLING DEVICE

Filed Sept. 20, 1924 2 Sheets-Sheet 1

Fig. 1.

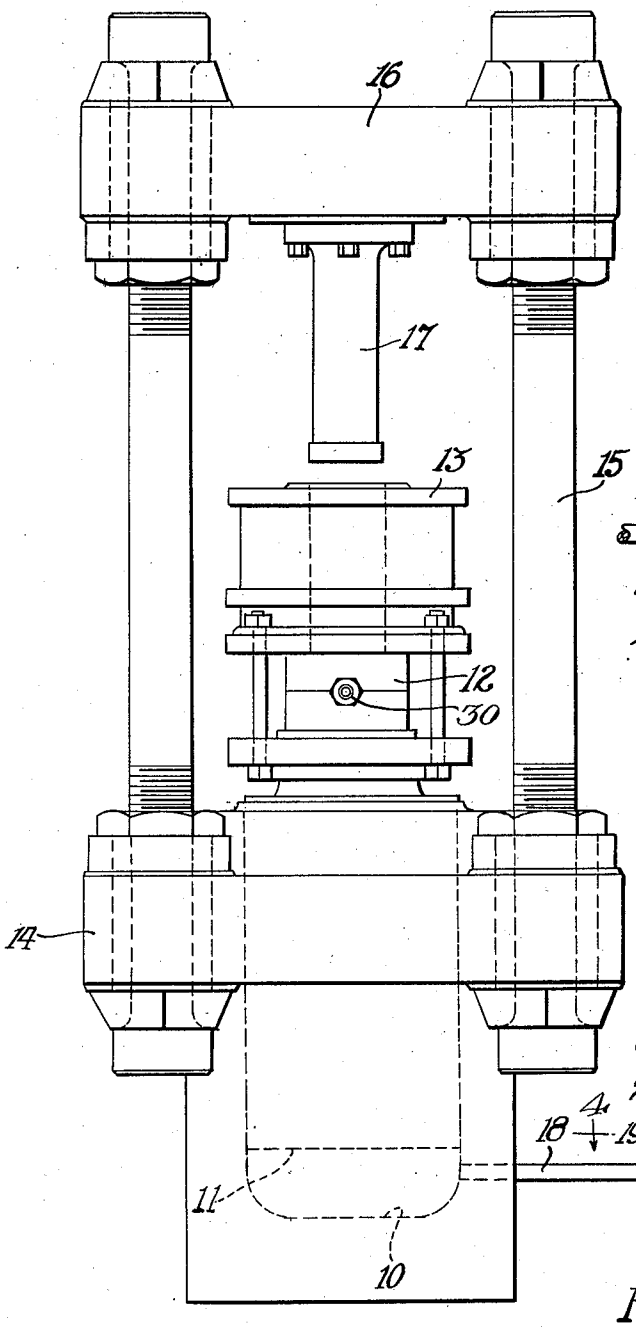
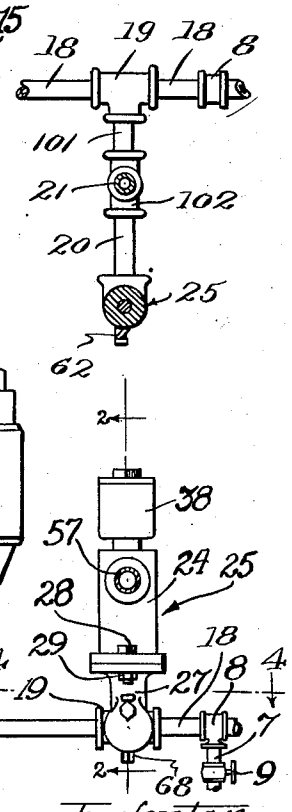


Fig. 4.



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Fig. 2.

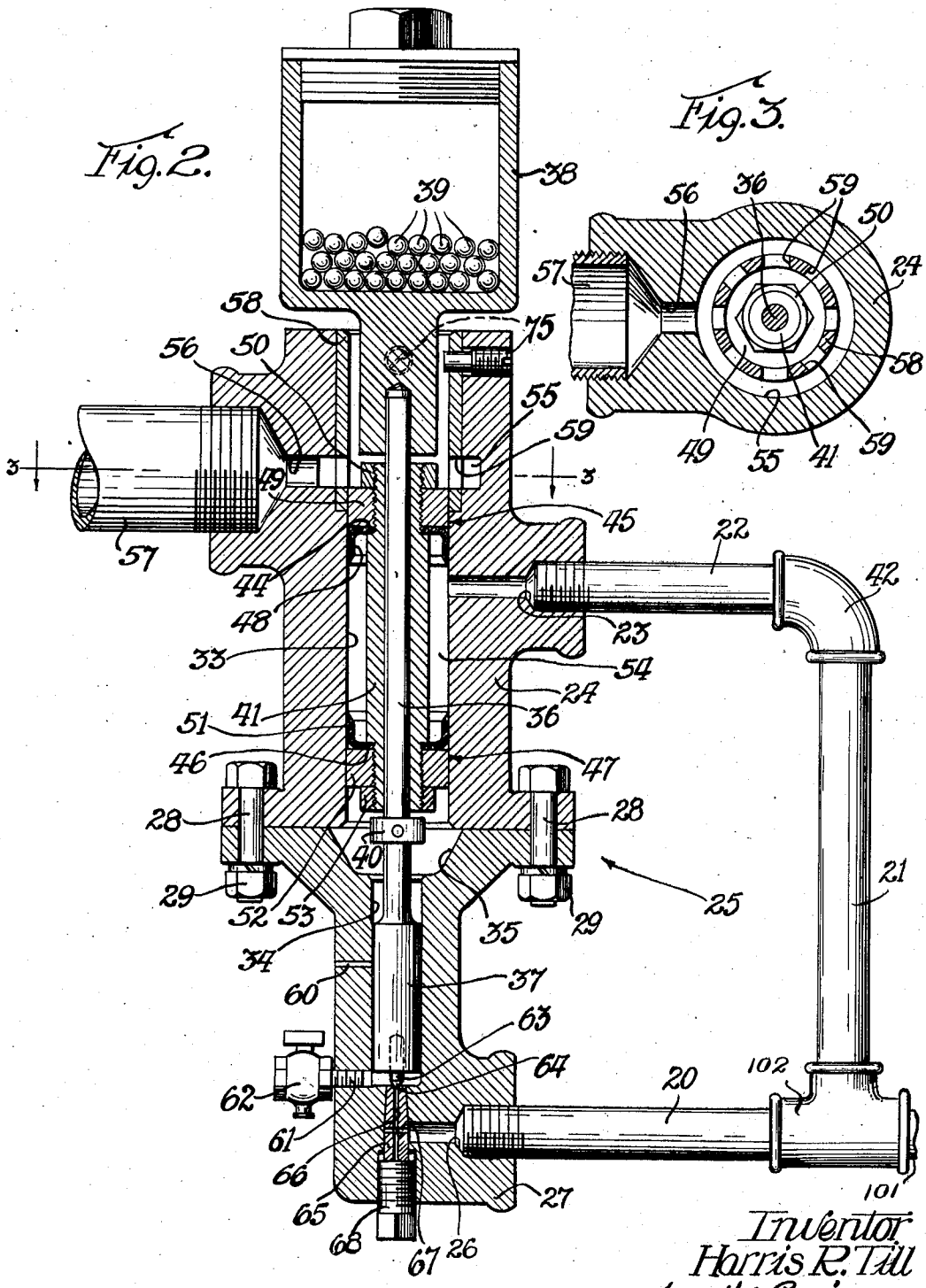


Fig. 3.

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UNITED STATES PATENT OFFICE.

HARRIS RAYMOND TILL, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PRESSURE-CONTROLLING DEVICE.

Application filed September 20, 1924. Serial No. 738,959.

This invention relates to pressure controlling devices, and more particularly to a relief valve adapted for use in connection with hydraulic machinery.

An object of the invention is to provide an improved pressure controlling device actuated by the pressure of a medium.

In accordance with the general features of the invention there is provided a vertical chamber in which is tightly fitted a pair of balance-pistons mounted on a common stem and reciprocable therein. Located intermediate the inner faces of the balance-pistons is an inlet through which the water under pressure is admitted into the portion of the regulating chamber isolated by the pistons. Located above the pistons and communicating with the regulating chamber is a relief outlet normally closed to the water under pressure by the balance-pistons. Adjoining the regulating chamber is an auxiliary chamber into which the end of the stem extends. Communicating with the lower part of the auxiliary chamber is a needle valve and an associated conduit through which water under pressure is admitted to react on the end of the stem. Secured to the upper end of the piston stem is a weight which applies pressure to the stem and the pair of pistons in a reverse direction to that exerted by the water under pressure and thereby causes both the needle valve and the relief outlet to be normally closed; but upon the pressure exceeding a predetermined amount the weight becomes ineffective, thereby permitting the valve to open, admitting the water into the auxiliary chamber, raising the stem and associated piston and allowing the water to escape from the portion isolated by the pistons into the relief outlet.

Other objects and advantages of the invention will more fully appear from the following detailed description taken in connection with the accompanying drawings which illustrate one embodiment thereof, and in which—

Fig. 1 is a front elevation of a hydraulic press for sheathing cable cores with lead, showing the improved pressure controlling device applied thereto;

Fig. 2 is a vertical section taken on the line 2—2 of the pressure controlling device shown in Fig. 1;

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2, and

Fig. 4 is a sectional view on the line 4—4 of Fig. 1 showing the manner of connecting the pressure regulating device to a pressure line.

In order to clearly illustrate the invention, Fig. 1 of the accompanying drawings shows the invention applied to a hydraulic extruding press, such as is frequently used in applying lead sheathing to a cable core, but it is to be understood that other applications may be made without departing from the spirit and scope of the invention and that the invention should be limited only in so far as defined by the appended claims.

Referring now to the drawings in detail in which like reference numerals designate similar parts throughout the several views, 10 denotes a hydraulic cylinder in which is reciprocably positioned a piston 11. Carried by the piston 11 is a die block 12 and an extruding cylinder 13. Integral with the cylinder 10 are a plurality of apertured lugs 14 in which are secured columns 15. Suitably secured to the upper ends of the columns 15 is a cap 16 which carries a fixed ram 17.

Communicating with the lower part of the cylinder 10 is a pipe or conduit 18 through which water under pressure is admitted into the cylinder 10 to actuate the piston 11, as will be more fully described hereinafter. A pipe 7, which may discharge into a sewer pipe (not shown) is connected through a three-way connection 8 to the pipe 18. Positioned in the pipe 7 is a valve 9 which during the operation of the hydraulic press is closed. Located in the pipe 18 is another three-way connection 19, two connections of which are connected in the pipe 18, the third connection affording means for securing the pressure regulating device designated generally by the numeral 25 to the pipe 18. A pipe 101 connects the three-way connection 19 to another three-way connection 102 from which two other pipes 20 and 21 (Fig. 2) which are included in the regulating device, project. Secured on the end of the pipe 21 is a right angle elbow 42 in which is secured another pipe 22 communicating with a passage 23 in a casing 24 of the pressure controlling device 25, embodying the features of the invention. The pipe 20 communicates

with an opening 26 in a casing 27 secured to the casing 24 by a plurality of bolts 28 and nuts 29.

The casing 24 is provided with a chamber 33 and the casing 27 is provided with an auxiliary chamber 34; the centers of the two chambers being in alignment. The chamber 33 empties into an enlargement 35 in the chamber 34. Concentric with the two chambers 33 and 34 is a stem 36 having an enlarged or piston like end 37 which fits tightly in the chamber 34. Carried on the opposite end of the stem 36 is a receptacle 38 adapted to hold a plurality of shot 39. Splined to the stem 36 is a collar 40 and surrounding the stem 36, but not secured thereto is a sleeve 41.

The upper end of the sleeve 41 is machined to form a shoulder 44 against which a piston 45 is held in place. Similarly the lower end of the sleeve 41 is machined to form a shoulder 46 against which a piston 47 is held in place. The piston 45 consists of a cup leather packing 48 surrounding the sleeve 41 and held in place by two lock nuts 49 and 50 threaded onto the upper end of the sleeve 41. Similarly the piston 47 consists of a cup leather packing 51 surrounding the sleeve 41 and held in place against the shoulder 46 by two lock nuts 52 and 53, threaded onto the lower end of the sleeve 41. The pistons 45 and 47 may be termed balance-pistons and they form a space or isolated section 54 in the chamber 33 in which water under pressure is admitted through the opening 23, as will be more fully described hereinafter.

Formed in the casing 24 above the piston 45 is an annular recess 55 which is concentric with the chamber 33. Communicating with the recess 55 is an opening 56 which terminates in a relief pipe 57 secured in the casing 24. Surrounding the upper part of the chamber 33 and concentric therewith is a sleeve 58 which has a plurality of slots 59 (Fig. 3), having a length approximately the same as the width of the recess 55, which connect the recess with the chamber 33. An over-flow port 60 is provided which communicates with the chamber 34. Similarly drilled in the casing is another port 61 which communicates with the bottom of the chamber 34. Threaded into the port 61 is a drain cock 62. Secured in the lower part of the piston-like end 37 of the stem 36 is a needle valve pin 63 which has a needle like point 64 protruding a short distance from the bottom of the end 37. Located in the end of the casing 27 is a member 65 which has a small opening 66 in which the point 64 of the pin 63 projects and is seated forming a needle valve. The member 65 is held in place in the casing 27 by a plug 68 threaded into the end of the casing 27. Located at right angles to the opening 66 is an orifice 67 which forms a passage between the opening 66 and the opening 26. Threaded into the upper part of the casing 24 are a plurality of studs 75 whose ends protrude into the chamber 33 a short distance so as to engage the nut 49 in its upward movement as will be more fully described hereinafter.

The operation of this mechanism is as follows: By closing the valve 9 water under pressure is transmitted from a pump such as a multi-cylinder high pressure hydraulic pump through the three-way connection 19 and the high pressure pipe 18 into the cylinder 10 raising the piston 11 carrying the cylinder 13 into a position wherein the ram 17 may enter the cylinder. Continued upward movement of the piston 11 will cause the ram 17 to displace any matter, such as lead, which may be contained in the cylinder and causing it to be extruded from the die block 12 in the form of a sheath around a cable core 30 (Fig. 1). If, for any reason, the pressure of the water exceeds a certain maximum, it is desirable that the pressure be relieved in order to prevent any deleterious effects therefrom. It has been found that a pressure controlled device or safety valve 25 embodying the features of the present invention tapped in the pipe 18 at the three-way connection 19 will relieve the cylinder 10 of the undesirable high pressure.

The water is transmitted from the three-way connection 19 through the high pressure pipes 21 and 22, through the opening 23 and into the space 54 in the chamber 33 formed by the balance-pistons 45 and 47. Water under pressure from the three-way connection 19 is also transmitted through pipe 20, opening 26, the orifice 67, and into the opening 66 immediately below the needle point 64 which is integral with the end 37 of the stem 36 as has been previously described. The sleeve 41 and its associated members are prevented from normally falling on collar 40 by the tight frictional contact between the cup leather packings 48 and 51 and the walls of the chamber 33.

In the operation of a hydraulic press for sheathing cable core with lead, such as the one shown in Fig. 1, it is necessary that the pressure of the water in the cylinder does not exceed 7000 pounds per square inch. It is to be understood, however, that the maximum pressure varies with the type of press employed and that the pressure controlled device disclosed herein may be adjusted to function at any predetermined pressure.

Assuming that the desired maximum predetermined pressure of the water is 7000 pounds per square inch and the diameter of the opening 66 is approximately $\frac{1}{32}$ of an inch, it has been found that 30 pounds of lead shot 39 plus the weight of the stem 36 and its associated members will be sufficient to prevent the water under the point 64 from raising the stem 36. However, as soon as the

pressure exceeds 7000 pounds per square inch the pressure in the opening 66 will be sufficient to raise the valve pin 63 out of its seat, opening the valve and bringing the collar 40 in contact with the lower surface of the nut 53. As soon as this occurs the water rushes in underneath the whole of the end of the member 37 in the auxiliary chamber 34, and due to the fact that much more of the surface of the end 37 is exposed to the water under pressure, the stem 36 and the balance pistons 45 and 47 are moved upwardly, practically instantaneously to their uppermost position, opening the relief pipe 57 and establishing a path for the water between the opening 23 and the relief pipe 57. The stem 36 and the balance-pistons 45 and 47 are prevented from being forced entirely out of the chamber 33 by the studs 75 engaging the top of the nut 49. The over-flow port 60 allows the water to escape, thereby preventing the water under high pressure from exerting too great a pressure on the lock nuts 49, 50, 52, and 53, and the studs 75.

The operator then opens the valve 9 diverting the water under pressure from the pipe 18 into the sewer pipe (not shown). By so doing the stem 36 is allowed to recede establishing the original relation between the balance-pistons 45 and 47 and the opening 23. In order to prevent a water cushion from being formed in the bottom of the auxiliary chamber 34 a drain cock 62 is opened by the operator, permitting the water to escape therefrom and thereby enabling the valve point 64 to be properly seated in the opening 66 closing the needle valve. As soon as the needle valve is closed the operator closes both the valve 9 and the drain cock 62 and the water under pressure again enters the cylinder 10.

It is to be understood that although lead shot 39 are disclosed as the preferred form of a means for pushing the stem 36 downwardly any other suitable means may be used in place thereof without departing from the spirit and scope of the invention, and that the invention is to be limited only in so far as defined in the appended claims. Furthermore, should it be desired to change the maximum predetermined pressure at which the pressure controlled device or relief valve 25 operates, the device may be adjusted to accommodate such change by making a relative change in the amount of the shot 39 in the receptacle 38.

What is claimed is:

1. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, a member movable in the chamber designed to isolate a portion thereof, means affording a communication between the confined space and said isolated portion of the chamber, a relief outlet communicating with the chamber externally of the isolated portion thereof, and means actuated by the medium when said medium exerts a predetermined pressure for moving the member in the chamber to associate the relief outlet with the isolated portion of the chamber and thus establish communication between the confined space and the relief outlet.

2. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, a member movable in the chamber designed to isolate a portion thereof, a relief outlet communicating with the chamber externally of the isolated portion thereof, means affording a communication between the confined space and the isolated portion, means affording communication between the confined space and another portion of the chamber to permit pressure of the medium against an end portion of the member, and means associated with the member counterbalancing a normal pressure of the medium thereon to prevent movement of the member to discharge the medium at the relief outlet through the isolated portion of the chamber.

3. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, a member movable therein, a plurality of pistons carried by the member cooperating to form an isolated portion in the chamber, means affording communication between the confined space and the isolated portion formed by the pistons, a valve associated with the member, a passage-way admitting the medium to the valve, said valve designed to open and thereby move the member when a predetermined pressure is exceeded and a relief outlet rendered effective by the movement of the element to permit the free flow of the medium through the chamber.

4. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, an element movably mounted therein, a plurality of separated members carried thereby and cooperating to isolate a section of the chamber, an inlet valve carried and normally maintained closed by the element, an inlet for freely admitting the medium into the section formed by the members, conduits for supplying the medium in multiple paths to the inlet and the valve, said valve being responsive to variations in pressure to move the element, thereby causing a registration of the isolated section with an opening in the wall of the chamber for permitting the escape of the medium from such section.

5. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, an element movable therein, a plurality of members carried thereby and cooperating to isolate a section of the chamber, a valve carried by the element and normally

closing an inlet into the chamber, and connections for supplying the medium to the isolated section of the chamber and to the inlet, said valve responding to a predetermined pressure of the medium to move the element, thereby shifting the isolated section into registration with the outlet to discharge the medium freely from the confined space through the section and the outlet.

6. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, an element movable therein, a pair of pistons carried thereby for isolating a section of the chamber, another piston carried by the element for isolating a second section thereof, a needle valve member carried by the last mentioned piston and extending through the last mentioned section adapted to cooperate with a valve seat in an end wall of the chamber for closing an inlet therein, means for supplying the medium to the first mentioned chamber section and to the inlet, and means carried by the element to maintain the valve closed during a predetermined pressure of the medium, but responsive to an increase of pressure in the medium within the inlet, thereby permitting the valve to open and admit the medium into the last mentioned chamber section and cooperate with the last mentioned piston to move the element so that the first mentioned section of the chamber registers with a relief outlet.

7. In a mechanism for controlling the pressure of a medium in a confined space, a chamber, an element movable therein, a plurality of pistons carried thereby and cooperating to isolate a section of the chamber, a weight carried by the element, an inlet valve carried and normally maintained closed by the element and associated weight, an inlet for freely admittting a medium into the section formed by the pistons, a passageway for supplying the medium to the inlet and to the valve, said valve being responsive to variations in pressure to move the element, thereby causing a registration of the isolated section with an opening in the wall of the chamber for permitting the escape of the medium from such section.

8. In a mechanism for controlling the pressure of a medium in a confined space, a cylindrical pressure regulating chamber, a pair of balance-pistons secured in spaced relation to a common member, the pistons forming a space in the chamber and movable together in the chamber, a pipe for admitting a medium into the chamber intermediate the pair of pistons, a pipe connecting the inlet with another portion of the regulating chamber, a relief pipe communicating with the regulating chamber externally of the space formed by the pistons, and means by which pressure is applied to the member supporting the pair of pistons in a reverse direction to that exerted by the medium under pressure in the said portion of the chamber for causing the relief pipe to be normally closed to the medium.

9. The combination with a hydraulic press of a pressure controlling device comprising a chamber, an element movable therein, a plurality of separated members carried thereby and cooperating to isolate a section of the chamber, an inlet valve carried and normally maintained closed by the element, an inlet for freely admitting a medium into the section formed by the members, passages for supplying the medium to the inlet and the valve, said valve being responsive to variations in pressure to move the element, thereby causing a registration of the isolated sections with an opening in the wall of the chamber for permittitng the escape of the medium from such section.

10. The combination with a hydraulic press of a pressure controlling device comprising a chamber, an element movable therein, a plurality of members carried thereby and cooperating to isolate a section of the chamber, a valve carried by the element and normally closing an inlet into the chamber, and connections for supplying a medium to the isolated section of the chamber and to the inlet, said valve responding to a predetermined pressure of the medium to move the element, thereby shifting the isolated section into registration with the outlet to discharge the medium freely from a supply source through the section and the outlet.

In witness whereof, I hereunto subscribe my name this 11th day of September A. D. 1924.

HARRIS RAYMOND TILL.