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AUTOMATIC PRESSURE REGULATOR

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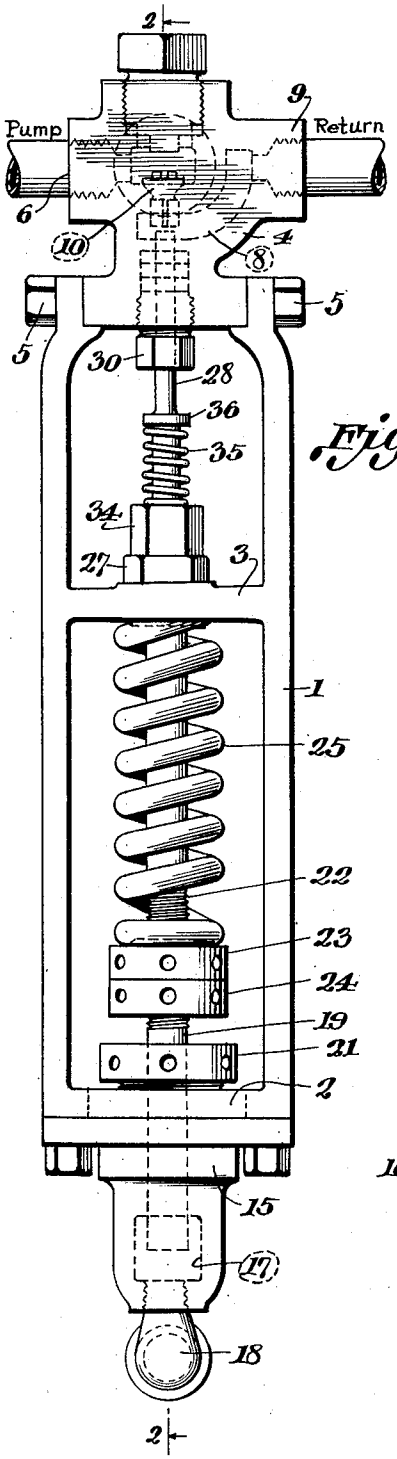


Fig. 1.

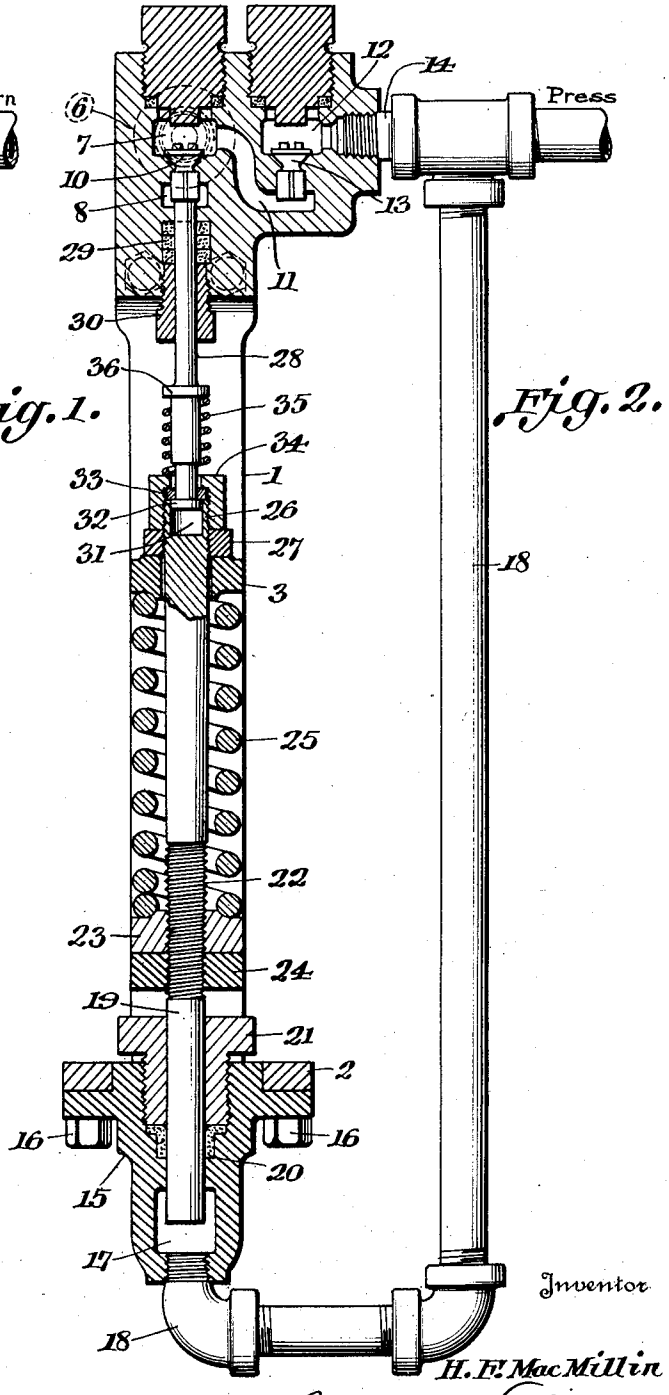


Fig. 2.

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AUTOMATIC PRESSURE REGULATOR

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This invention relates to a pressure regulator particularly adapted for use with high pressure hydraulic service. It has a dual function and not only relieves the pump when the pressure in the entire system reaches a predetermined limit, but also maintains a definite pressure at the point of application of the pressure. The employment of this invention obviates the necessity for using a safety valve as a pressure control which is always objectionable in that it in no way relieves the pump but merely prevents the pressure from reaching the dangerous point. When a safety valve is employed as a pressure control, the pump must operate at full load in order to keep the necessary pressure and maintain the safety valve open. By means of the present invention, whenever the pressure reaches the desired limit, a by-pass is opened so that the pump runs idly and the fluid is by-passed through a return pipe back to the pump. At the same time a check valve maintains the pressure at the point of application.

Further details of the invention will be apparent from the following description and the appended claims.

In the drawings:

Figure 1 is a side elevation of the automatic pressure regulator.

Figure 2 is a vertical section on the line 2—2 of Figure 1.

A frame or casting 1 has a lower cross bar 2 and a cross bar 3 intermediate its ends. In the upper end of this frame is mounted a valve casing 4 which may be fastened to the frame by bolts 5 or in any other desired manner. This valve casing has an inlet 6 which is connected to the pump and communicates with a chamber 7 having a communication with a by-pass 8 which leads to the return pipe 9 which goes back to the suction reservoir of the pump or to an exhaust line such as sewer. Communication between the chambers 7 and the by-pass 8 is controlled by means of a by-pass relief valve 10. From the chamber 7 a second passage 11 communicates with a chamber 12 through the medium like, as may be desired.

of supply or exhausting it into a sewer or the of a check valve 13 and this chamber 12 is connected by a pipe 14 to the press. From the foregoing it will be observed that the inlet pipe 6, the chamber 7, and the passage 11 constitute a conduit serving as a source of pressure fluid supply; and that the pipe 14 and the chamber 12 constitute a conduit for discharge of pressure fluid to a point of use. The check valve 13 controls the flow of fluid between the two conduits in such a way that fluid can flow through the valve in only one direction, namely, from the supply conduit to the discharge conduit. It will also be observed that the by-pass relief valve 10, when open, diverts the pressure fluid from the discharge conduit, either returning the fluid to the source of supply or exhausting it into a sewer or the like, as may be desired.

Carried by the lower end of the frame 1 is a member 15 which may be fastened to said frame by bolts 16 or in any other suitable manner. This member has a chamber 17 in its lower end to which connects one end of piping 18, the other end of which is connected to the pipe 14 leading to the press. In this manner it is obvious that the pressure in the chamber 12, the chamber 17, and the piping 18 is always uniform.

A rod 19 is slidably mounted in the cross bar 3 of the frame 1 and in the member 15 and has its lower end projecting into the chamber 17. Suitable packing 21 is provided which is held in position by a packing nut 21 which also acts to guide the rod 19 in its movements. Intermediate its ends this rod is provided with a threaded portion 22 screw threaded on which is an adjusting nut 23 and a lock nut 24. A heavy coil spring surrounds the rod and one end of the same bears against the adjusting nut 23 while the other end bears against the cross bar 3. The spring 25 tends to force the rod 19 downward, but its movement in this direction is limited by a nut 27 engaging the upper screw threaded end 26 of the rod on the upper side of the cross bar 3.

A smaller rod 28 is guided at its upper end in the valve casing 4 by means of packing 29 and a packing nut 30. The lower end of this rod fits slidably within a small chamber 31

formed in the upper end of the rod 19. The lower end of the rod 28 is provided with an enlargement 32 above which is a washer 33 which is positioned between the upper end of the rod 19 and a nut 34 which is screw threaded on the screw threaded portion 26 of the rod 19. In this manner the rod 28 may have a certain amount of longitudinal movement relative to the rod 19, but at other times is forced to move in unison with said rod 19. A spring 35 surrounds the rod 28 and bears at one end against the top of the nut 34 and at its other end against an enlargement 36 on the rod 28. This spring tends to move the rod 28 upward, but its movement in this direction is limited by the engagement of the enlarged lower end 32 with the washer 33. When in normal position the upper end of the rod 28 lies just below the relief valve 10 when the latter is in closed position.

Assuming that the parts are in the position shown in Figures 1 and 2 and that the spring 25 has been adjusted for the desired pressure then when the pump is placed in operation, fluid under pressure will be forced into the chamber 7 and will close the relief valve 10 or rather will hold the same closed if it has been previously closed by gravity. This fluid under pressure will pass through the passageway 11 to the underside of the check valve 13 which will be lifted off its seat, permitting the fluid to pass into the chamber 12 and pipe 14 and thence to the press. At the same time the fluid under pressure will pass through the pipe 18 into the chamber 17 beneath the rod 19. At all times the pressure in the chamber 17 will be substantially the same as that exerted upon the press.

This pressure on the lower end of the rod 19 will tend to move the rod upwardly against the tension of the spring 25. During the first part of this movement the rod will move upward relative to the rod 28 and the spring 35 will be tensioned, but the tension of this spring itself is not sufficient to lift the valve 10 from its seat against the pressure of the fluid in the chamber 7. When the rod 19 has moved upward until the lower end of the cavity 31 comes in contact with the end 32 of the rod 28, the next succeeding movement of the rod 19 will also move the rod 28 and as soon as the relief valve 10 is lifted slightly from its seat, the spring 35 will operate to lift the check very quickly.

The fluid under pressure will then pass from the chamber 7 into the chamber 8 and through the return pipe 9 back to the suction reservoir of the pump or to an exhaust line such as a sewer, thus taking the load off the pump. The pressure in the line to the press, however, will then be exerted on top of the check valve 13 and immediately close the same, maintaining the pressure in the press chamber 12, piping 18, and chamber 17 uniform. Whenever this pressure drops below a predetermined point, the spring 25 will force the rod 19 back toward the position shown in the drawings and in this movement the rod 28 will be drawn with the rod 19, thus allowing the check valve 10 to be seated by the force of gravity or the pressure of the fluid entering through the pipe 6.

It is obvious that the tension of the spring 25 may be adjusted by the nut 23. It will be apparent from the above description that the use of a safety valve as a regular operating means of pressure regulation is avoided and that when the predetermined pressure is reached, the load will be taken off the pump, while at the same time the desired pressure will be maintained in the press. The automatic regulator, therefore, not only supplements the safety valve as a protective device but at the same time also acts to unload and relieve the pump and to maintain the desired pressure at the point of application and performs all of these functions efficiently.

Minor details may be modified without in any way departing from the spirit of the invention, which is to be regarded as limited only by the scope of the appended claims.

I claim as my invention:

1. In an automatic pressure regulator, a conduit serving as a source of pressure fluid supply, a conduit for discharge of pressure fluid to a point of use, a valve to control the flow from one conduit to the other, a by-pass relief valve in the supply conduit for diverting the pressure fluid from the discharge line, and means for opening said relief valve comprising a slidably mounted rod, means for subjecting one end of the rod to the same pressure as that in the discharge line, spring means tending to move the rod in the other direction, a second rod having a lost motion connection with the first and having its end directly underlying said check valve, and spring means tending to move the second rod toward said check valve.

2. In an automatic pressure regulator, a conduit serving as a source of pressure fluid supply, a conduit for discharge of pressure fluid to a point of use, a valve to control the flow from one conduit to the other, a by-pass relief valve in the supply conduit for diverting the pressure fluid from the discharge line, and means for opening said relief valve comprising two slidably mounted rods having lost motion connection, the end of one rod directly underlying the check valve and the opposite end of the other rod being subjected to the same pressure as that in the discharge line, a spring tending to force the first rod toward the check valve, and a stronger spring tending to force the other rod away from the check valve and against the fluid pressure.

In testimony whereof, I have hereunto subscribed my name.

HOWARD F. MacMILLIN.