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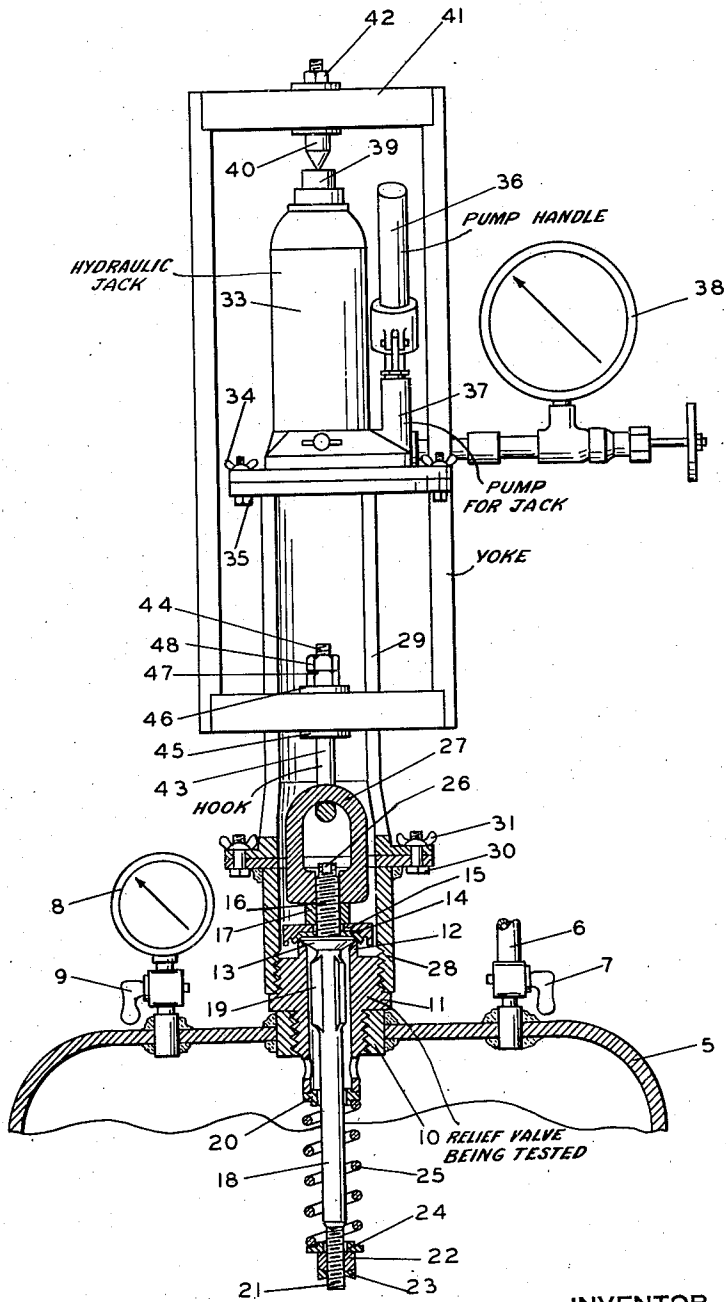
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2,419,293

RELIEF VALVE TESTER

Filed Oct. 14, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

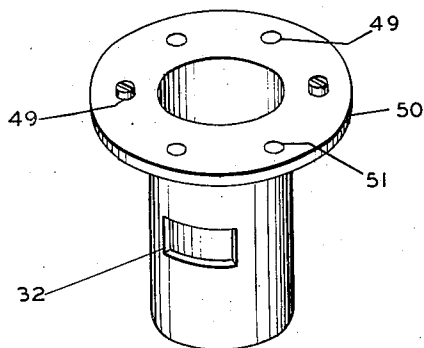


FIG. - 2

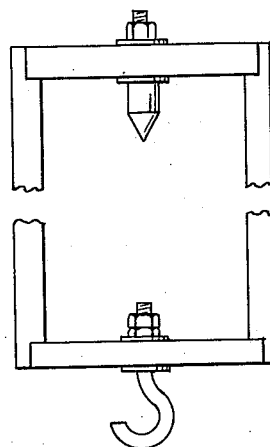


FIG. - 3

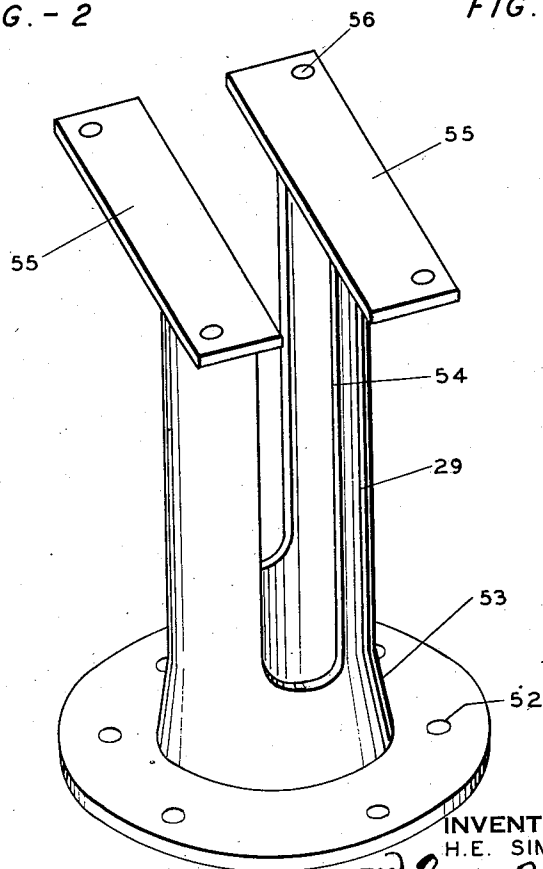


FIG. - 4

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RELIEF VALVE TESTER

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4 Claims. (Cl. 73—4)

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This invention relates to the testing of valves, and has particular relation to apparatus for the testing of safety valves on high pressure fluid containers by pulling the valve off of its seat.

In the art of distributing fluids under pressure in cylinders it is very important to provide these cylinders with a pressure relief valve that will be sure to open if a safe pressure is exceeded by the fluid inside the cylinder. Even a single accident caused by the rupturing of a cylinder in the distribution or use by the consumer of domestic cooking gas or industrial fuel gas, or other gases in cylinders might very well result in the loss of numerous customers or potential customers. A test of the safety valve at reasonable time intervals is good practice. The present invention makes this test with a minimum loss of gas and only one filling and no bleeding off of the container is necessary afterwards as would be the case if the cylinder were filled until the valve opened by internal pressure alone.

It is an object of the present invention to test the safety valve in each cylinder after the cylinder is filled with fluid to see that the safety valve is in order and will operate at the desired relief pressure.

Another object of my invention is to provide easily attached means simple in operation for testing safety valves of fluid cylinders.

Another object is to provide hydraulic valve pulling means so that exact measurements of the forces involved may be made.

Another object is to provide means whereby the safety valve may be adjusted if it should fail to seat properly after being tested.

Numerous other objects will be apparent to those skilled in the art by reading the specification and the claims and studying the drawings of this application.

In the drawings:

Figure 1 is an elevational view with parts in cross section and parts broken away of a hydraulic-jack valve-pulling embodiment of my invention applied to the safety valve of a fluid pressure cylinder.

Figure 2 is a perspective view of the adapter employed in Figure 1 to mount the apparatus on the valve body.

Figure 3 is an elevation of the yoke and hook shown in Figure 1 with the hook rotated through an angle of 90°.

Figure 4 is a view in perspective of the stand shown in Figure 1 on which the hydraulic jack is mounted.

In Figure 1, a cylinder 5 for transporting fluids

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under pressure is provided with a filling line 6 and a filling valve 7. The cylinder 5 is also provided with a test gage 8 and test gage valve 9. When the cylinder is transported, valves 7 and 9 are closed and pipe 6 and gage 8 are removed. Tank 5 is provided with a threaded nipple 10 to receive a safety valve body 11. To prevent accidents, tank 5 is provided with a safety pressure relief valve composed of body 11, valve seat 12 and a valve head 13. The valve head is provided with a sealing gasket 14, a gasket compressing member 15, an upwardly projecting screw stud 16 and a washer adjustment nut 17. The valve head 13 has a valve stem 18 depending therefrom, the valve stem being guided by fins 19 in valve body 11 and by collar 20. Valve stem 18 is provided with a screw threaded end 21 and lock nuts 22 and 23 to secure spring engaging collar 24 to the valve stem. A spring 25 is under compression between sleeves 20 and 24 and tends to hold the valve closed. Adjustment of lock nuts 22 and 23 will adjust the compression of this spring and thereby the force necessary to open the safety valve 13.

The upper end of stud 16 is slabbed off to a substantially square end 26 and a pull ring 27 may be screwed on stud 16 for the purpose of making a test of the force necessary to open the safety valve 13.

While a particular type of valve has been shown it is obvious that other types of valves could be used as long as they opened upwardly and had a screw threaded portion 16 to be engaged by the pulling ring 27.

The apparatus for pulling the valve 13 open consists of a pulling ring 27 on the valve and an adapter sleeve 28 on the valve body 11, the remainder of the apparatus being supported on the adapter sleeve and engaging the pulling ring. By employing different sizes of adapters the same pulling apparatus may be used to test different sizes of valves.

Adapter sleeve 28 supports stand 29 which is removably secured thereto by bolts 30 and wing nuts 31. Adapter 28 has a rectangular slot 32 in the side thereof to provide access to the nut 17 for adjusting it with an end wrench.

Stand 29 supports a hydraulic jack 33, the jack being removably secured to the stand by wing nuts 34 and bolts 35.

Hydraulic jack 33 is provided with a jack handle 36 for pumping up pressure in pump 37 and with a pressure gage 38 for indicating the pressure in the cylinder of jack 33. Jack 33 has a movable

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piston member 39 which is forced upward by oil from pump 37.

In the center of piston 39 is provided a circular depression and a sharp pointed pivot pin 40 rests in this depression. Pivot pin 40 is secured to a square yoke frame 41 by means of nut 42, the pivot pin passing through the frame. In the lower part of frame 41 a hook 43 is centrally located. Hook 43 has a screw threaded shank 44 passing through the frame and a flange 45 is formed in the shank. The hook is secured in place by washer 46 and lock nuts 47 and 48.

In Figure 2 screws 49 are provided in the adapter sleeve flange 50 to help in lining up holes 51 with holes 52 in the flange of the stand 29.

In Figure 4 the stand 29 is seen to have a flared lower portion 53 and a central slot 54 is provided to allow yoke 41 to operate inside the stand. Plates 55 having holes 56 are provided on the top of the stand for receiving nuts 35 to attach jack 33.

Operation

The test apparatus being assembled in the manner shown in Figure 1 and tank 5 being filled with its normal shipping load of fluid under pressure, valve 9 is opened so that pressure gage 8 will register the pressure of the fluid in the cylinder 5. Pump handle 36 is then pumped up and down until valve 13 is unseated enough to start to leak. Pump handle 36 should be operated very slowly between the time when hook 43 first contacts ring 27 and this first leak. The test is made at the first leak of the valve and not at the pressure at which it would pop open, because it would be the first leak that would annoy the customer, who naturally does not want a leaky gas cylinder around his house.

When the first leak occurs pressure gage 38 is read.

The relation between these pressures is as follows:

$$R = T + \frac{PB + FB}{A}$$

R is the relief pressure at which the valve will open; T is the tank pressure shown on gage 8; P is the pressure in the hydraulic jack shown on gage 38; B is the area of the hydraulic jack cylinder; F is the pressure in the hydraulic jack cylinder necessary to overcome friction in the jack and the weight of frame 41 and related parts; and A is the area of the valve seat 12.

As A and B are constants and F is a constant for the particular jack, the gage 38 can be calibrated in pounds, so that by adding the reading of gage 38 to the reading of gage 8 the relief pressure may be found without further calculation.

This can be expressed as:

$$R = T + J$$

where T is the reading of gage 8 and J is the reading of gage 38.

When safety valve 13 does not seat properly and leakage takes place, an end wrench may be inserted through hole 32 to tighten nut 17 and adjust washer 14 so that leaking will stop. This minor adjustment does not affect the pressure at which the valve will open to any measurable extent.

Valve 7 remains closed, valve 9 is closed, pipe 6 and gage 8 are removed, ring 27 and adapter

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23 are unscrewed from valve stem 16 and valve body 11 respectively and cylinder 5 is ready to be shipped to the customer with the assurance that the safety valve is in proper operating condition.

Alternative construction and changes in design of certain parts will obviously be within the scope of my invention which is defined by the following claims.

Having described my invention, I claim:

1. A jack for pulling relief valves comprising in combination a hydraulic cylinder, a piston in the cylinder, a pump for supplying pressure fluid to move the piston, a rectangular frame resting on the piston and passing beneath the cylinder, and a support for the cylinder comprising an adapter to fit the relief valve and a split support having two legs one on each side of the rectangular frame, the adapter supporting the support on the valve and the support supporting the cylinder on the adapter.

2. A jack for pulling relief valves comprising in combination a cylinder, a piston in the cylinder, a rectangular frame resting on the piston and passing beneath the cylinder, and a support for the cylinder comprising an adapter to fit the relief valve and a split support having two legs one on each side of the rectangular frame, the adapter supporting the support on the valve and the support supporting the cylinder on the adapter.

3. A jack for pulling relief valves comprising in combination a cylinder, a piston in the cylinder, a rectangular frame resting on the piston and passing beneath the cylinder, and a support for the cylinder comprising a split support having two legs one on each side of the rectangular frame.

4. A jack for pulling relief valves comprising in combination a hydraulic cylinder, a piston in the cylinder, a pump for supplying pressure fluid to move the piston, a substantially rectangular frame resting on the piston and passing beneath the cylinder, a support for the cylinder comprising an adapter having a cylindrical portion threaded to fit the relief valve and a spacing support member, the adapter supporting the spacing support member on the valve and the spacing support member supporting the cylinder on the adapter, said spacing support member being cut away to allow said rectangular frame to hang freely from said piston and to operate out of contact with said support, and means on said rectangular frame below said cylinder for engaging a portion of said valve.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
985,213	Shigley	Feb. 28, 1911
1,616,728	Willoughby	Feb. 8, 1927
2,113,725	Goldman	Apr. 12, 1938
2,178,901	Webster	Nov. 7, 1939
1,367,133	Guillery	Feb. 1, 1921
2,227,961	Caughey	Jan. 7, 1941
2,258,224	Sheppard	Oct. 7, 1941
1,637,743	Fine	Aug. 2, 1927
2,075,968	Heydekampf	Apr. 6, 1937