

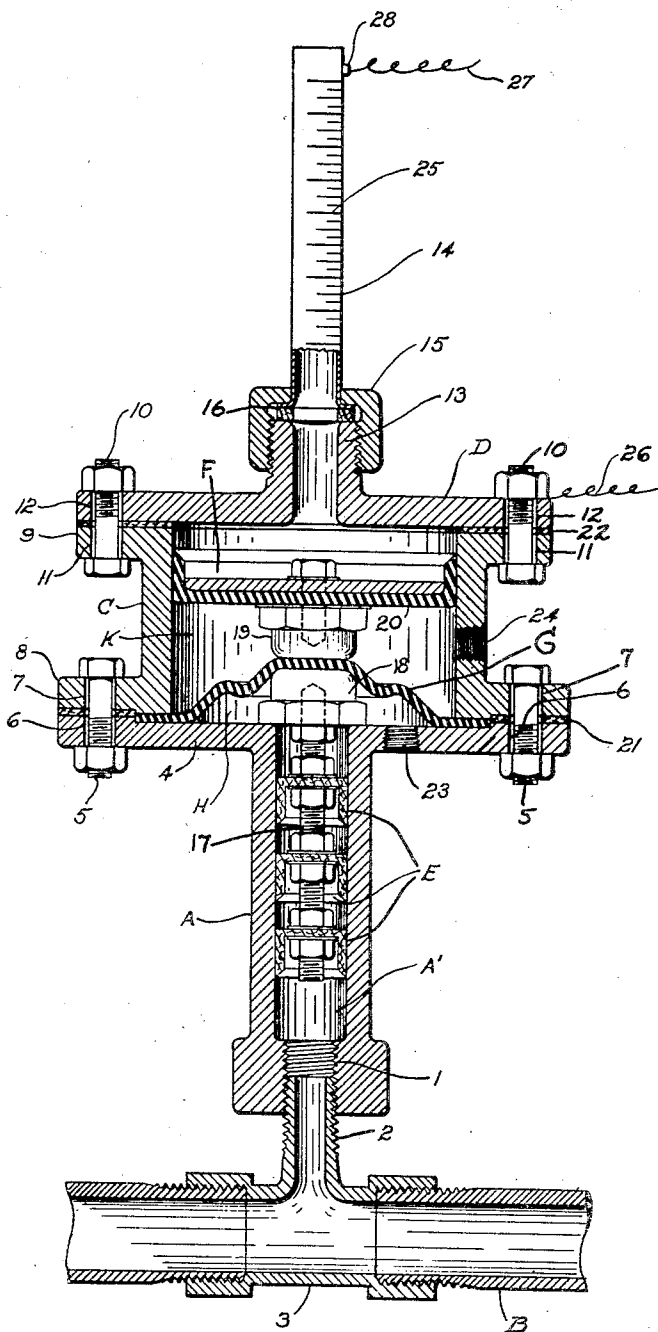
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BALANCED PRESSURE GAGE AND SWITCH

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BALANCED PRESSURE GAGE AND SWITCH

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5 Claims. (Cl. 200—81.6)

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The present invention relates to improvements in a balanced pressure gage, and it consists of the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide a balanced pressure gage which is intended to register the pressures of liquids or gases visually and is especially designed to operate at extremely low pressures as well as any other pressure desired.

A further object of my invention is to provide a device of the type described in which the usual spring actuated plunger is dispensed with and instead I make use of two pistons and place them in equilibrium. One of the pistons is actuated by the liquid or gas pressure in the line and the other piston actuates the liquid for moving it in a calibrated tube so that the pressure can be visually read.

A further object of my invention is to provide a device of the type described which is extremely simple in construction and which is durable and efficient for the purpose intended.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawing forming a part of this application, in which the figure shows a vertical section through the device, portions thereof being shown in elevation.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit and scope of the invention.

In carrying out my invention I provide a casing A that has a cylindrical portion A¹ tapped at 1 for receiving the threaded end 2 of a T indicated at 3. The T is connected in a pipe B through which a liquid or a gas flows under pressure.

A cylindrical body C is secured to a flange 4 of the casing A. Any securing means may be used and I have shown bolts 5 that are passed through openings 6 of the flange 4 and openings 7 in a flange 8 of the body C. A cover D is secured to the flanged end 9 of the body C by bolts 10 that are passed through aligned openings 11 and 12 formed in the flange 9 and cover D respectively. The cover D has an exteriorly threaded outlet 13 and a calibrated transparent tube 14 is held in communication with the outlet by means of a coupling 15. A gasket 16 is placed between

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the flanged end of the tube 14 and the end of the outlet 13.

Fundamentally the gage consists of two cylinders A¹ and C and the cylinder A¹ carries one or more pistons E that are connected in tandem by a threaded shank 17 that extends downwardly from a head 18. A second piston F of a larger area than the piston E is mounted in the cylinder body C and has a head 19 projecting downwardly from the rubber apron 20 that forms a part of the piston. A flexible diaphragm G is clamped between the body C and the casing A so as to make a hermetically tight fit and the diaphragm extends between the heads 18 and 19.

Gaskets 21 and 22 are placed between the flanges 4 and 8 and the flange 9 and the cover D respectively, for forming hermetically tight joints. A bleed opening 23 communicates with the compartment H formed by the diaphragm G and the casing A. A second opening 24 communicates with a compartment K formed in the body C and bounded by the diaphragm G and the piston F. If desired, the openings 23 and 24 may be tapped for receiving pipes, not shown. The tube 14 is calibrated at 25 for registering different liquid levels.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

The piston E is connected to the source of liquid or gas supply by the T shown at 3. Any variation in pressure of the liquid or gas in the pipe B will actuate the piston E to raise or lower it. The piston E in the drawing, is shown in its lowermost position. Movement of the piston E will flex the diaphragm G and will move the piston F by direct contact with the head 19. The piston F in the secondary cylinder C will move and displace the liquid covering the piston and force this liquid up into the calibrated tube 14. I preferably use mercury in the tube 14. The displaced liquid rises in the tube 14 until the height of the column of liquid balances the pressure applied from the source to the piston E in the primary cylinder A¹. The height of this column of liquid, when viewed through the glass tube, registers visually the pressure from the source.

The drawing illustrates a primary cylinder A¹ having a piston three-fourths of an inch in diameter and having an area of .441 square inch. If two hundred pounds per square inch be applied over an area of .441 square inch the total pressure from the source will be found to equal 88.2 total pounds acting on the primary piston E. The piston E is so designed that it will move the

three inch diameter piston F contained in the secondary cylinder C. The liquid displaced by the secondary piston will rise in the tube 14. The area of the secondary piston is 7.06 square inches and if mercury is used for the fluid it will be found that mercury, having a weight of .49 pound per inch of height when applied to an area of 7.06 square inches times .49 will equal an effort of 3.459 pounds applied to the top of the secondary piston. Therefore the total effort from the source being 88.2 pounds and the weight of a column of mercury being applied over an area 7.06 square inches equaling 3.459 pounds per inch of elevation, it will be apparent that when the mercury rises to an elevation of 25.5 inches, the secondary and primary pistons will be in equilibrium and the height of the mercury column will indicate a pressure of 200 pounds per square inch at the source.

For various pressures and sizes, different sized cylinders and pistons variously related to each other, may be used. The change in the capacities of the compartments H and K can take place because air can enter or leave these compartments through the openings 23 and 24. Should any leakage develop past the pistons E, the liquid or gas entering the compartment H would exhaust through the opening 23. Also if any leakage developed past the piston F into the compartment K the liquid could bleed off through the opening 24.

The registering liquid may be mercury, brine, water or any liquid which will give the desired effect in the most practical manner. Should a liquid such as mercury or brine be used, the electrical conductive qualities of that liquid may be made to operate the electrical apparatus at remote points or to indicate pressures at considerable distances from the source. I have shown a wire 26 connected to the cover D and have shown a second wire 27 connected to a terminal 28 that penetrates the tube 14 so as to be contacted by the mercury or brine contained in the tube when the liquid rises to a height equal to the position of the contact. Since the tube 14 is glass, the circuit will not be closed between the wires 26 and 27 until the electrical conducting liquid reaches the terminal 28. The closing of the circuit can be made to do any work desired.

An important feature of the gage is the corrugated diaphragm G separating the primary and secondary pistons E and F. The corrugated diaphragm is intended to prevent the intermingling of the two fluids, or the gas and fluid. The diaphragm is corrugated to minimize any friction which might occur due to the stretching of an elastic diaphragm.

I claim:

1. A balanced visual pressure gage comprising a cylinder adapted for communication with a line that carries a fluid medium under pressure, a piston mounted in the cylinder and being moved in accordance with the varying pressures of the medium in the line, a second cylinder communicating with the first cylinder, a second piston slidably mounted in the second cylinder, a flexible diaphragm separating the two cylinders and being contacted by both pistons, a transparent calibrated tube communicating with the second cylinder, and visual pressure indicating means mounted in the tube and second cylinder and actuated by the movement of the second piston for indicating the rise and fall of pressure in the line at all times, said means comprising mercury

constituting a resisting force to counterbalance the pressure of the fluid medium.

2. A balanced visual pressure gage comprising a cylinder adapted for communication with a line that carries a fluid medium under pressure, a piston mounted in the cylinder and being moved in accordance with the varying pressures of the medium in the line, a second cylinder communicating with the first cylinder, a second piston slidably mounted in the second cylinder, a flexible diaphragm separating the two cylinders and being contacted by both pistons, a vertically disposed transparent and calibrated tube communicating with the second cylinder, and a liquid medium in the tube and being acted upon by the second piston, the level of the medium in the tube indicating the pressure of the medium in the line.

3. A balanced visual pressure gage comprising a cylinder adapted for communication with a line that carries a fluid medium under pressure, a piston mounted in the cylinder and being moved in accordance with the varying pressures of the medium in the line, a second cylinder communicating with the first cylinder, a second piston slidably mounted in the second cylinder, a flexible diaphragm separating the two cylinders and being contacted by both pistons, a vertically disposed transparent and calibrated tube communicating with the second cylinder, and a liquid medium in the tube and being acted upon by the second piston, the level of the medium in the tube indicating the pressure of the medium in the line, said first-named piston, first-mentioned cylinder and diaphragm forming a compartment which is vented to permit the diaphragm to flex and to permit any leakage of the first-mentioned medium past the first piston to escape through the vent, said second-named piston, second-named cylinder and diaphragm forming a second compartment which is vented to permit the diaphragm to flex and to permit any leakage of the second-named medium past the second piston to escape through the vent.

4. A balanced visual pressure gage comprising a cylinder communicating with a line that carries a fluid medium under pressure, a piston mounted in the cylinder and being moved in accordance with the rise and fall of pressures of the medium in the line, a second cylinder communicating with the first cylinder, a second piston slidably mounted in the second cylinder, a flexible diaphragm sealing one cylinder from the other and being contacted by both pistons, a vertically disposed transparent and calibrated tube communicating with the second cylinder, and a fluid medium in the tube and being acted upon by the second piston, the level of the medium in the tube indicating the pressure of the medium in the line, said second-mentioned fluid medium being a conductor of electricity, said calibrated tube being made of an insulating material, a wire in electrical connection with the second-named medium and constituting a part of an electrical circuit, and at least one electric terminal on the tube and constituting one electrode of a switch, the second-named medium constituting the other switch electrode and closing the circuit when it contacts the terminal.

5. A balanced visual pressure gage comprising a cylinder adapted for communication with a line that carries a fluid medium under pressure, a plurality of pistons in tandem mounted in the cylinder and being moved in accordance with the varying pressures of the medium in the line, a

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second cylinder of a larger diameter than the first communicating with the first cylinder, a second piston slidably mounted in the second cylinder, a flexible diaphragm separating the two cylinders and being contacted by both pistons, a vertically disposed transparent and calibrated tube communicating with the second cylinder, and a liquid medium in the tube and being acted upon by the second piston, the weight of the second medium and the two pistons counterbalancing the pressure of the first medium, the level of the second medium in the tube indicating the pressure of the first medium in the line.

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REFERENCES CITED

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

	Number
	142,128
5	187,053
	1,615,582
	1,938,492
10	Number
	48,812
	178,162

6

UNITED STATES PATENTS

Name	Date
Sewell -----	Aug. 26, 1873
Shaw -----	Feb. 6, 1877
Hawkins -----	Jan. 25, 1927
Moller -----	Dec. 5, 1933

FOREIGN PATENTS

Country	Date
Germany -----	Oct. 1, 1889
Great Britain -----	Apr. 10, 1922