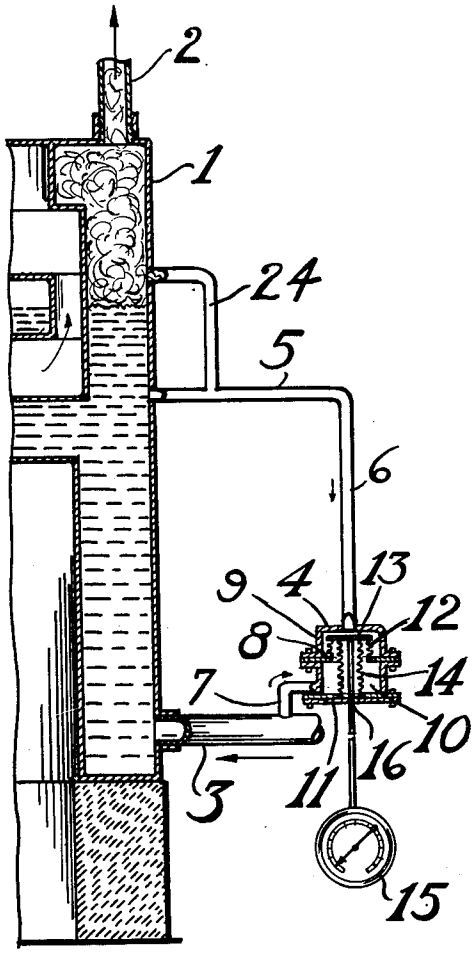
Feb. 9, 1937. H. G. M. FISCHER 2,069,917

LIQUID LEVEL INDICATOR

Filed Dec. 29, 1934



Herbert G. M. Fischer Inventor

By P. L. Young Attorney

Patented Feb. 9, 1937 2,069,917

UNITED STATES PATENT OFFICE

2,069,917

LIQUID LEVEL INDICATOR

Herbert G. M. Fischer, Westfield, N. J., assignor to Standard Oil Development Company, a corporation of Delaware

Application December 29, 1934, Serial No. 759,613

2 Claims. (Cl. 73—54)

This invention relates to improvements in liquid level indicating and regulating devices and especially to pressure responsive devices suitable for use in preventing damage to boilers and the like through loss of substantial portions of their contents during heating.

It is an object of this invention to provide an apparatus in which the indicating and regulating mechanism will not be subjected to pressures greater than atmospheric and in which the sensitiveness of the pressure responsive device is substantially improved.

For a better comprehension of the invention reference may be had to the accompanying drawing, wherein the figure represents a vertical section of a portion of a conventional boiler with the apparatus applied thereto.

Referring now to the drawing, numeral 1 designates a boiler, numeral 2 the steam line leading from the boiler and numeral 3 the return water line to the boiler. Numeral 4 designates the casing of the pressure responsive device communicating by means of lines 5 and 6 with the upper portion of the boiler below the normal level of the contents thereof, and by means of line 7 with the return water line 3. A gauge glass 24 communicates with the line 5 at one end and with the vapor space within the boiler at the other end. As shown in this figure the casing 4 of the pressure responsive device is in a vertical position and has an annular wall 8 disposed transversely of the casing, forming an upper pressure chamber 9 into which the line 6 opens and a lower pressure chamber 10 into which the line 7 opens. The casing of course may be sectional, in which case the transverse wall would probably be an annular plate positioned between upper and lower casing sections. A removable annular plate 11 is secured to the lower end of the casing 4. A short annular fluted member 12 which is approximately the same diameter as the opening in the transverse wall of the casing is secured to the wall about the edge of the opening therein. This member 12 is capable of being elongated or compressed by pressure against the diaphragm 13 secured to its upper end and with the diaphragm seals the upper pressure chamber from the lower. A second and longer annular fluted member 14 approximately the diameter of the opening in the cover plate 11 is secured to the plate about the edge of the opening therein and extends upwardly to fluid tight engagement with the diaphragm 13, sealing the opening of the cover plate.

The fluted members 12 and 14 are preferably made of a light flexible metal and operate substantially in the manner of a sylphon bellows. The pressure exerted upon the upper side of the diaphragm by the constant head of liquid in line 6 is opposed by a variable pressure against the lower side of the diaphragm exerted by the changing head of liquid in the boiler 1. It is to be noted however that as long as the level of liquid in the boiler remains above the line 5 the pressures against the upper and lower sides of the diaphragm 13 are at all times substantially equal.

Fluctuations in the liquid level above the line 5 and changes in pressure in the space above the liquid level are transmitted equally to both sides of the diaphragm. However, when the liquid level in the boiler falls below the opening of line 5 a differential pressure is set up between the head of liquid in the boiler as transmitted to the lower side of the diaphragm 13 through line 7, and the head of liquid in line 6 which exerts a constant pressure against the upper side of the diaphragm causing the fluted members to be compressed. This movement of the diaphragm may be transmitted to an indicating and regulating mechanism 15 by means of a rod 16 centrally secured to the lower side of the diaphragm within the passageway formed by the fluted member 14 and the opening in the cover plate 11 and connected to the indicating and regulating mechanism. The connection may be of conventional construction but must provide compensation for a difference in area of that portion of the diaphragm upon which downward pressure is exerted to that upon which upward pressure is exerted. Alternatively the indicating and regulating mechanism may be equipped for adjustment to provide such compensation.

The indicating and regulating mechanism may be of conventional design and is preferably arranged to shut off the supply of heat to the boiler when the level of the liquid therein drops below a safe limit as predetermined by the location of the line 5. The indicating portion of the mechanism, of course, is only operative after the liquid level has dropped below the predetermined point, but enables an observer to estimate the source of the difficulty by showing the speed with which the level drops and the quantity of liquid lost.

Although the invention has been disclosed by a description of its preferred form, it is not to be limited thereby, but only by the following claims in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. A pressure responsive device comprising a vertical casing, an annular wall transversely disposed therein forming upper and lower chambers, an annular cover plate for the lower end of said casing having a central opening of substantially smaller diameter than that of the transverse wall and means for communicating pressure to said upper and lower chambers, a cylindrical resilient member of a diameter substantially equal to that of the opening in the transverse wall mounted on said wall concentrically with said opening and extending into the upper chamber to an intermediate point therein, a cylindrical resilient member of diameter substantially equal to that of the opening in the cover plate mounted on said plate concentrically with said opening and extending upwardly to the level of the upper end of the resilient member in the upper chamber, a diaphragm secured to the upper ends of said resilient members and a rod secured to the under side of said diaphragm extending downwardly out of said casing without frictional engagement with any portion thereof.

2. A pressure responsive device. comprising a casing, a diaphragm movably disposed within the upper portion of the casing, a pair of expansible bellows of different lengths within the casing and arranged one within the other, the inner bellows being at least twice as long as the outer bellows and attached at its base to the base of the casing, the outer bellows being attached to an annular plate protruding inwardly from an intermediate portion of the sidewalls of the casing, the opposite ends of the bellows being connected to the diaphragm whereby the diaphragm is yieldably supported with respect to the casing by the bellows, the diaphragm and inner and outer bellows cooperating with the casing to form a chamber one wall of which is the annular portion of the diaphragm between the bellows, the diaphragm and outer bellows cooperating with the casing to form a second chamber, one wall of which is constituted by the entire diaphragm, an inlet opening into one of the chambers, and an inlet opening into the other chamber.

HERBERT G. M. FISCHER.