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NO-FLOW ALARM CIRCUIT CLOSER

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Fig. 1.

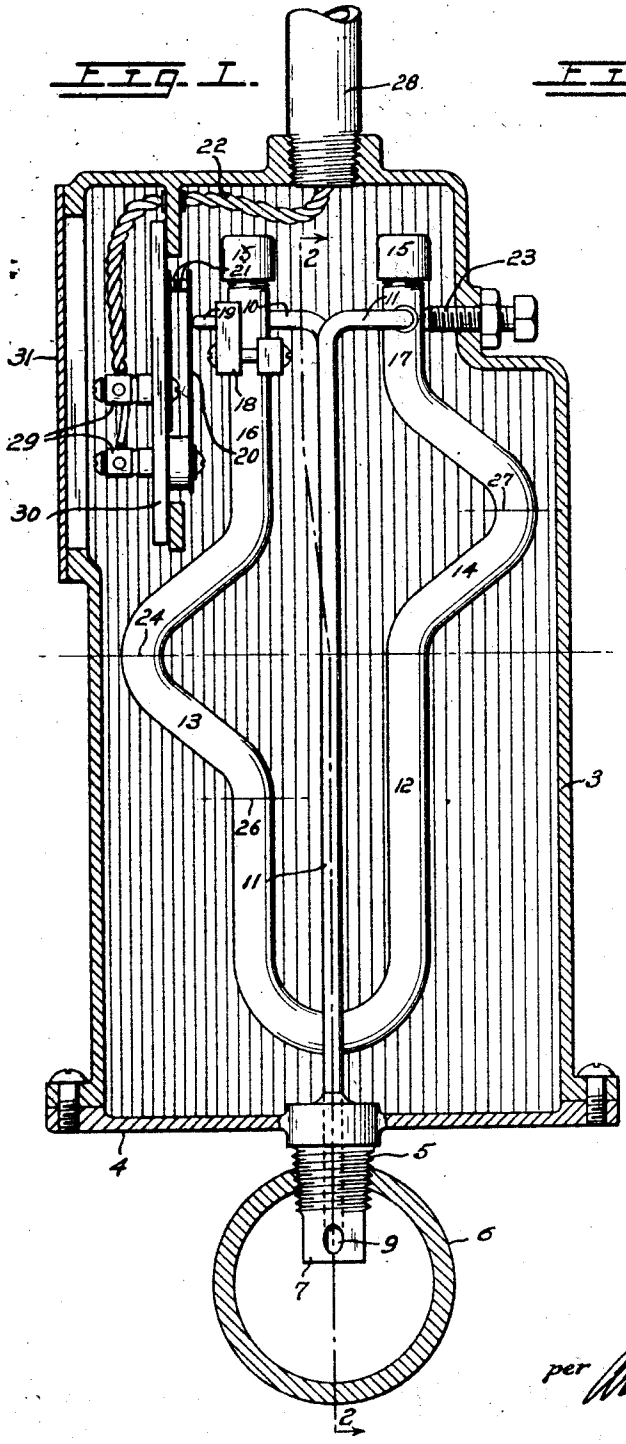
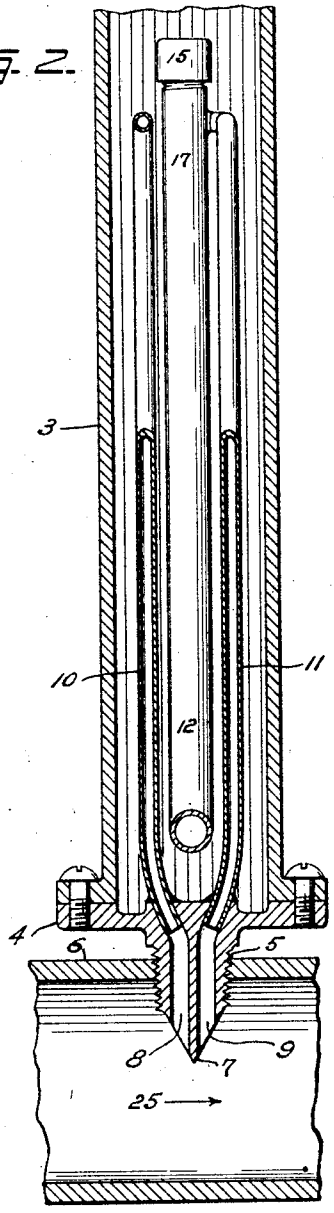


Fig. 2.



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NO-FLOW ALARM-CIRCUIT CLOSER.

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In this specification, and the accompanying drawing, I shall describe and show a preferred form of my invention, and specifically mention certain of its more important objects. I do not limit myself to the forms disclosed, since various changes and adaptations may be made therein without departing from the essence of my invention as hereinafter claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

My invention relates to auxiliary devices for pipe line systems for sounding an alarm when the flow in the pipe line ceases. Its principal objects are: First, to provide positive means for sounding a no-flow alarm independently of changes of static pressure in the pipe line; second, to furnish convenient facilities for quickly adjusting the device to meet a wide range of flow velocities; and, third, to accomplish these objects by means of a very simple and relatively inexpensive construction.

My objects are attained in the manner illustrated in the accompanying drawing, in which—

Figure 1 is a vertical central section of my device in operative relation to a pipe line, with the interior parts shown in elevation; and Figure 2 is a fragmentary section taken on the line 2—2 of Fig. 1.

Similar reference numerals refer to similar parts throughout both views.

The form of my invention selected for illustrative purposes comprises a housing 3, of inverted box-shape, separably mounted upon a base 4. The base is provided with a downwardly projecting taper-threaded plug 5, adapted for being screwed into a pipe line 6. Plug 5 has a wedge-shaped lower extremity 7 and passages 8 and 9 leading upwardly from the respective wedge faces. This arrangement obviously affords means for utilizing the principles of the Pitot tube for obtaining differential pressures in passages 8 and 9 when there is a flow in pipe line 6. I employ this pressure differential to hold open an electric alarm circuit which will automatically close when the flow in pipe line 6 ceases, since the pressures in passages 8 and 9 will become equalized in consequence.

A pair of small pressure tubes 10 and 11, of resilient material such as hard drawn bronze, lead upwardly from passages 8 and 9 respectively, and support a much larger U-tube 12 suspended from their upper extremities. The arms of the U-tube have oppositely extending U-bends 13 and 14 therein at different levels, and caps 15 close their upper extremities. Pressure tubes 10 and 11 communicate with the respective arms 16 and 17 of the U-tube near their upper ends.

Arm 16 of the U-tube carries a clamp 18, with a projecting pin 19 thereon, adapted to press against a switch spring 20 and to close the electrical contacts 21 thereby. These contacts are electrically connected by means of cable 22 to an alarm gong and battery (not shown) in such manner that the alarm will sound when the contacts 21 are closed.

Arm 17 is restricted in its motion to the right by means of the adjustable stop screw 23.

The U-tube is filled with mercury through one of the caps 15 up to the normal level indicated by line 24. The cap is then replaced so as to be pressure tight. The mercury in the two branches of the tube will continue to stand at level 24 so long as the pressure in the two branches of the tube is equalized, as is the case when there is no flow in pipe line 6. It is quite immaterial what the static pressure in the pipe line may be. As soon as there is a flow in the pipe line there will be a difference in pressure in the two arms of the U-tube due to the Pitot effect produced in passages 8 and 9 by the flow. This will cause the level of the mercury to fall in one arm, and to rise proportionally in the other arm.

The mercury in the two branches of the U-tube stands at level 24 with no flow in pipe line 6, as stated. At this level it is obvious that the center of gravity of the mercury filled U-tube is to the left of the center line by reason of the mercury contained in bend 13. When a flow in the pipe line takes place in the direction of arrow 25, the pressure increases in tube 10 and arm 16. There will be a corresponding diminution of pressure in tube 11 and arm 17 at the same time. This pressure differential will force the mercury down in the left hand side of the U-tube to, say, level 26; and cause the mercury to rise in the right hand side to level 27. The center of gravity will then be on the right hand side of the center line by reason of the mercury contained in bend 14.

The shifting of the center of gravity in the manner just described will cause the resilient supporting tubes 10 and 11 to bend slightly to the right by reason of their eccentric loading. The movement is slight, but quite sufficient to break the electrical circuit at contacts 21. When the flow in pipe 6 stops the mercury will return to level 24 and cause the tubes 10 and 11 to bend to the left and thus close contacts 21 to sound the no-flow alarm.

To accomplish my second stated object, and to prevent too great variation in the mercury levels with possible loss of mercury, it is only necessary to turn the device slightly with respect to the pipe line. Thus the maximum effect of the pressure differential is obtained when the device is positioned as shown in the drawing. If it is turned 90 degrees there will be no Pitot effect at any flow velocity. Intermediate Pitot effects are obtainable at intermediate angular positions of the device.

In order to allow the instrument to be turned in the manner just described, the electrical conduit 28 is tapped into the housing co-axially with plug 5. The device may therefore be turned on the threads of the conduit and the plug.

The electrical binding posts 29 are mounted upon a strip 30 of insulating material, and a cover plate 31 over an opening in the side of the housing gives access to the electrical connectors.

I desire particularly to point out that my invention is not limited to the use of a Pitot tube. Any means for obtaining a pressure differential due to flow in the pipe line will serve. Thus the use of an orifice with manometric connections on the respective sides thereof is a satisfactory means for securing the pressure differential.

The shifting of the center of gravity of the U-tube is due not only to transferring the mercury from one side to the other, but also in marked degree to the use of laterally positioned reservoirs on the arms at different levels. Lateral bends 13 and 14 constitute such reservoirs in the form of my invention selected for illustration. It is entirely feasible to make use of closed chambers of various forms, in place of these lateral bends. The chambers are positioned on the outside of the respective arms of the U-tube, to increase the gravitational moment arm, and communicate with the arms of the tube at the top and bottom of the reservoir so as to permit them to fill by the rise of liquid in the arms.

Having thus fully described my invention, I claim:

1. A device of the character described comprising; an upright U-tube having closed ends, flexibly positioned for lateral movement in its plane; mercury filling the bend of the tube and portions of its arms; means whereby a flow of fluid may be made to create a difference of pressure in said arms for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the tube; and electric circuit closing means adapted for operation by said lateral movement.

2. A device of the character described comprising; an upright U-tube having closed arms outwardly bent at different levels in the plane of the tube; a flexible suspension for the tube allowing it to move laterally in its plane; mercury filling the bend of the tube and the arms up to the level of the upper outward bend; means whereby a flow of fluid may be made to create a difference of pressure in said arms for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the tube; and electric circuit closing means adapted for operation by said lateral movement.

3. A device of the character described comprising; an upright U-tube having closed arms with laterally extending reservoirs thereon at different levels and communicating with the respective arms so as to fill by the rise of liquid in the arms; a flexible suspension for the tube allowing it to move laterally in its plane; mercury filling the bend of the tube, and the arms to a normal level approximately the same as at the top of the lower reservoir; means whereby a flow of fluid may be made to create a difference of pressure in said arms for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the tube; and electric circuit closing means adapted for operation by said lateral movement.

4. A device of the character described comprising; an upright U-tube having closed arms, flexibly suspended by a pair of small resilient tubes respectively communicating with the upper ends of said arms and permitting the U-tube to move laterally in its plane; mercury filling the bend of the U-tube and portions of its arms; means whereby a flow of fluid may be made to create a difference of pressure in said resilient tubes for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the U-tube; and electric circuit closing means adapted for operation by said lateral movement.

5. A device of the character described comprising; an upright U-tube having closed arms bent outwardly at different levels in the plane of the tube; a pair of small resilient tubes respectively communicating with the upper ends of said arms and flexibly supporting the U-tube so as to permit the latter to move laterally in its plane; mercury filling the bend of the U-tube and the arms up to the level of the upper outward bend; means whereby a flow of fluid may be made to create a difference of pressure in

said resilient tubes for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the U-tube; and electric circuit closing means adapted for operation by said lateral movement.

6. A device of the character described comprising; an upright U-tube having closed arms with laterally extending reservoirs thereon at different levels and communicating with the respective arms so as to fill by the rise of liquid in the arms; a pair of small resilient tubes respectively communicating with the upper ends of said arms and flexibly supporting the U-tube so as to permit the latter to move laterally in its plane; mercury filling the bend of the tube, and the arms to a normal level approximately the same as at the top of the lower reservoir; means whereby a flow of fluid may be made to create a difference of pressure in said resilient tubes for displacing the mercury to shift its center of gravity and thereby cause lateral movement of the U-tube; and electric circuit closing means adapted for operation by said lateral movement.

7. In combination; a pipe line; a pair of resilient manometric tubes communicating with the pipe line; means cooperative with the pipe line for causing a flow of fluid therethrough to create a pressure differential in said tubes; an upright U-tube having closed arms the upper ends of which respectively communicate with said manometric tubes and are flexibly supported thereby to sustain the weight of the U-tube and permit it to move laterally in its plane; mercury filling the bend of the U-tube and portions of its arms; and electric circuit closing means adapted for operation by said lateral movements of the U-tube.

8. In combination; a pipe line; a plug with a wedge-shaped inner extremity tapped into the pipe line and having longitudinal passages communicating with the respective wedge faces of said extremity; resilient tubes respectively extending outwardly from said passages; an upright U-tube having closed arms, the upper ends of which respectively communicate with said resilient tubes and are flexibly supported thereby to sustain the weight of the U-tube and permit it to move laterally in its plane; mercury filling the bend of the U-tube and portions of its arms; and electric circuit closing means adapted for operation by said lateral movement of the U-tube.

9. A construction as set forth in claim 8 wherein said arms are bent outwardly at different levels in the plane of the U-tube and wherein the mercury normally fills the arms up to the level of the upper outward bend.

10. A construction as set forth in claim 8 wherein said arms have laterally extending reservoirs therein at different levels and communicating with the respective arms so as to fill by the rise of liquid in the arms; and wherein the mercury normally fills the bend of the tube, and the arms to a level approximately the same as the top of the lower reservoir.

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