Oct. 31, 1944. J. H. RODGERS 2,361,872

TUBE GAUGE SAFETY DEVICE FOR HIGH PRESSURE TANKS

Filed Dec. 20, 1941 2 Sheets-Sheet 1

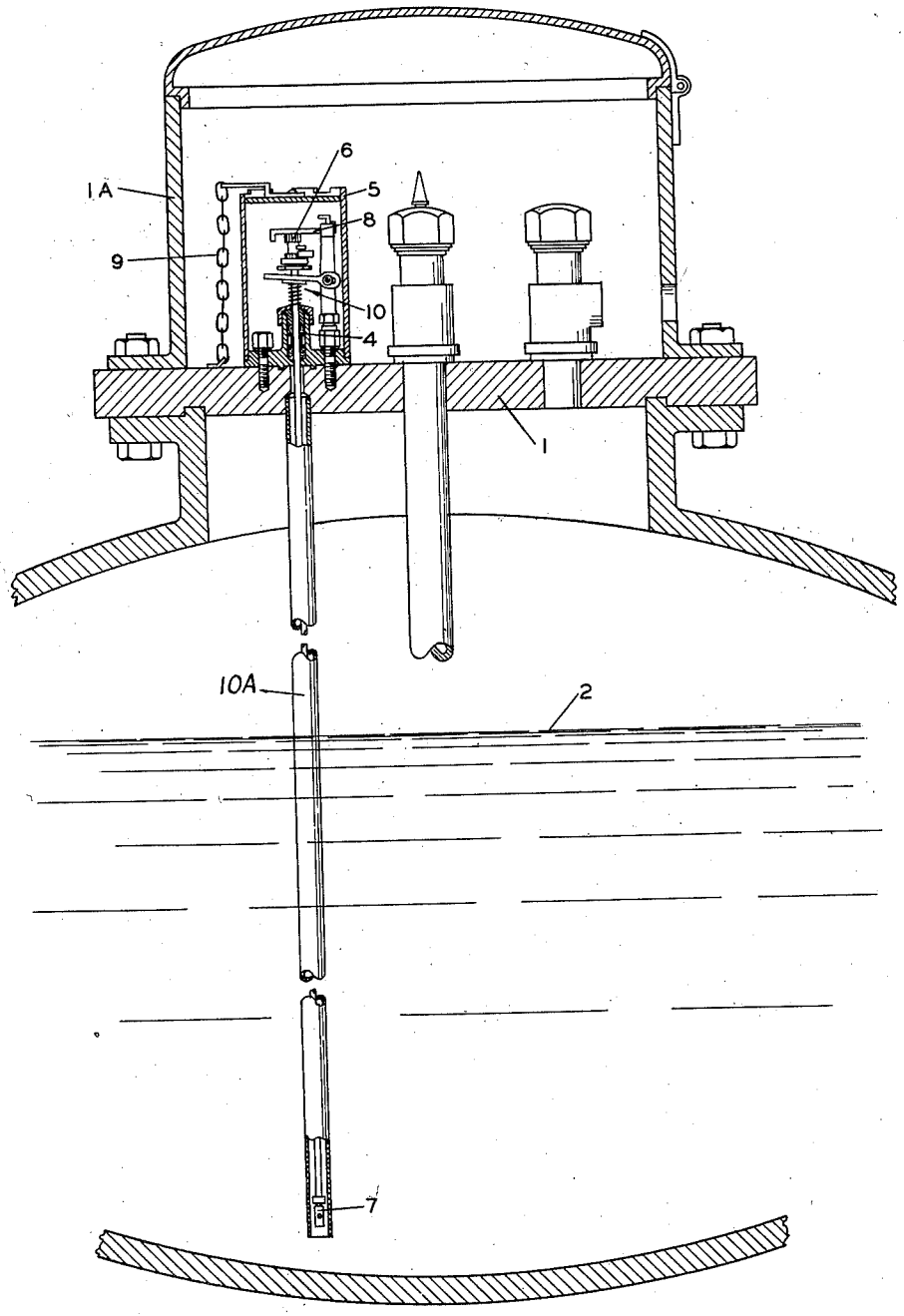


FIG. 1

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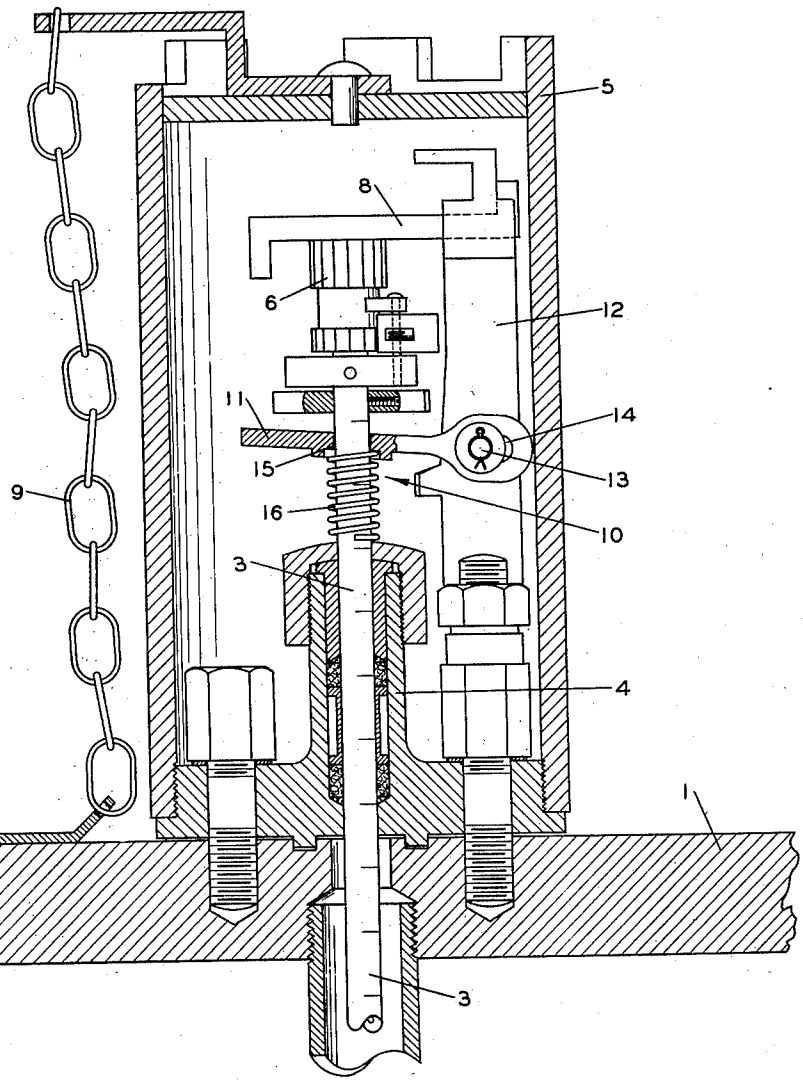


FIG. 2

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UNITED STATES PATENT OFFICE

2,361,872

TUBE GAUGE SAFETY DEVICE FOR HIGH PRESSURE TANKS

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Application December 20, 1941, Serial No. 423,840

4 Claims. (Cl. 73—298)

This invention pertains to a safety device for application to slip-tube outage gauges, as are used on high pressure liquid tank cars and storage vessels.

In recent years the marketing of high vapor pressure hydrocarbons, such as propane and butane, has become a very active phase of the petroleum industry. These fuels are transported in liquid form, under high pressures, by means of specially constructed railroad tank cars.

In order to determine, when necessary, the amount of liquid hydrocarbon product contained in a tank car, so-called "liquid level slip-tube gauges" have been widely used. These devices consist of a hollow tube, slidably entering the shell of the tank car through a suitable packing gland in the dome of the car. This tube is fitted at its lower end with a check valve having a small orifice, and at its upper end with a shut-off valve. The outside of the tube is marked off in inches and fractions of inches, and a suitable reference pointer is attached to the shell of the car, or to its dome. A gauge of the sort referred to is disclosed by Frazier in U. S. Patent No. 1,827,574.

Since the slip tube is subjected to high pressure within the car, and to atmospheric pressure outside the car, there is a very strong unbalanced force which tends to eject the slip tube from the tank. Therefore, the tube must be securely held down while the car is in transit. When it is desired to gauge the content of the car at the destination, it is necessary to release the hold-down lock, permitting the slip tube to slide upwardly. The valve at the top of the tube is opened slightly, permitting escape of a small stream of the commodity contained in the car. By raising and lowering the tube and noting the point where the flowing material emitting from the valve changes from liquid to vapor and vice versa, the surface of the liquid may be located and at this position of the tube a reading of the liquid level is obtained by means of the graduations outside the tube.

The act of releasing the hold-down lock and raising the slip tube is a very hazardous one for the operator. The tube sometimes "sticks" in the packing gland at the lowest position of the tube, requiring the operator to pull violently upward upon the tube to break it loose. As soon as it is freed, however, the tube tends to be ejected forcibly by the gas pressure within the car, requiring the operator to suddenly reverse his actions so as to retard the ejection. If the operator gets in the way of one of these tubes, at the same time losing control of its upward progress, a serious and even fatal accident is likely to result.

The principal object of this invention then is to provide a means whereby the upward travel of the slip tube may be easily and positively controlled, both as to amount of traverse and rate of traverse, and without requiring the possession of great physical strength by the operator.

Another object is to provide hold-down means for slip tubes of a simple and serviceable nature; and to provide such hold-down means in combination with the usual stuffing boxes and other tank equipment.

Another object is to provide resiliently urged friction hold-down means in which the friction may be relieved by a force applied in a straight line.

Numerous other objects and advantages will be apparent to those skilled in the art after reading the following specification and claims and studying the accompanying drawings.

In the drawings, Figure 1 is a fragmentary vertical section of a high pressure tank car, in which my invention and other necessary valves and accessories appear in outline. Figure 2 is an enlarged detail of my invention and other parts closely related thereto. Like parts are referred to by like numerals in the two figures.

Referring to Figures 1 and 2, the numeral 1 refers to a central section of the tank shell, which is filled with liquefied petroleum gas to the level denoted by the surface 2. The gauge tube 3 slidably enters the top of the tank through the lantern gland 4, and its upper end extends into the gauge housing 5. At the upper extremity of the tube the gauging valve 6 is provided for withdrawal of small quantities of liquid or vapor. (That space within the tank which lies above the liquid level 2 will always contain vapor from the liquid product.) The gauging valve itself is the subject of Griffith application Serial No. 326,767, filed March 29, 1940. At the bottom end of the gauge tube is fitted an excess flow valve 7 which serves to prevent excessive leakage from the tank in the event of breakage of the gauge tube or any part thereof which is outside the tank. The hold-down arm 8 is mounted so as to be capable of rotation in a horizontal plane. A horizontal edge of the arm 8 may serve as a reference pointer in determination of liquid level from the graduated gauge tube. In transit, this arm is locked by suitable means so as to position it over the valve 6, thus retaining the gauge tube substantially within the interior of the tank.

Upon arrival of the car at its destination, the chain 9 is unfastened, the gauge housing 5 is removed, and the hold-down device 8 is swung aside so as to permit raising of the gauge tube. At this point, my safety device indicated generally in Figure 1 by the numeral 10 becomes effective. Other valves necessary to the use, maintenance and protection of a typical tank car are shown within the dome housing 1—A, but are not referenced numerally, since they are not part of the subject of this application. A steadying guide tube 10A may be provided similar in all respects to guide tube 85 of U. S. patent to Frazier 1,827,574 mentioned above, but this guide tube 10A is no part of my invention. Obviously guide tube 10A is perforated near its top so the liquid level 2 will always be at substantially the same level inside the tube 10A as outside it.

Referring specifically to Figure 2, the numeral 11 indicates a restraining member which is always in an approximately horizontal position, but nevertheless, is pivotally mounted on the vertical stanchion 12 by means of pin 13 and slot 14. This pivoted mounting permits angular movement in a vertical plane. A hole is provided at 15 having a free sliding fit around the gauge rod 3 when the restraining member is in a horizontal position. The spring 16, however, normally urges member 11 away from the horizontal position, resulting in the introduction of friction and binding between the gauge tube and the restraining member. The extended end of the member serves as a handle or grip.

In operation, the restraining member, being urged by the spring so as to misalign the hole 15 with respect to the gauge tube, causes the tube to bind in the hole and prevents upward movement of the tube. When it is desired to raise the tube, it may be released by pressing downward on the extended end of the restraining member. If the gauge tube tends to eject rapidly from the tank, its progress may be either retarded or checked completely by partially or completely releasing downward pressure on the restraining lever handle. When released, the force transmitted by friction between the gauge tube and the restraining bar acts in the same direction as the spring, thus promoting positive engagement of the tube in the control device.

The particular form of the safety device shown in Figure 1 is a practical one, but it is not my intent to limit the scope of my invention to that one arrangement. While a compression spring is shown in Figure 1, a tension spring properly located would do as well. The fulcrum could be differently arranged, so as to require an upward force on the handle to release the tube rather than a downward one. It would also be within the scope and spirit of my invention to provide an inserted bushing of some soft metal or composition in the tube-engaging hole, so as to minimize wear and eventual obliteration of the calibration markings on the outside of the gauge tube.

With my safety device properly attached to a slip tube gauge device, whether it be on a tank car or a stationary tank, handlers of this equipment need not fear to release the shipping hold-down, as my safety device will positively prevent immediate and forceful ejection of the gauge tube until such time as the operator desires. In the case of stationary tanks, at least, the hold-down lock would not be required.

Having thus described my invention, I claim:

1. In a slip tube type gauge device for pressure tanks, a support, a lever pivoted to said support having an opening formed therein, a tube gauge loosely received in said opening at one end, the opposite end thereof extending into said tank, and means urging the lever into angular frictional engagement with the tube gauge, thereby locking the same against unrestrained vertical movement.

2. In a slip tube type gauge device for pressure tanks, a lever having an opening formed in one end thereof, the opposite end being held against upward movement relative to said tank, a tube gauge extending into the tank and loosely received in the opening defined in said lever and resilient means urging the lever into misalignment with respect to said tube, thereby locking the same against unrestrained vertical movement.

3. In a gauging device for tanks, a tube gauge extending into said tank through a wall thereof and mounted for movement relative thereto, a pivoted locking jaw having an opening formed therein for the reception of said tube gauge, said tube loosely engaging the locking jaw through said opening, the locking jaw being held against upward movement relative to the tank and adapted to be forced into frictional engagement with the tube gauge in response to axial movement thereof.

4. In a gauging device for pressure tanks including a tube gauge extending into said tank through a wall thereof and subjected to internal tank pressure, a locking jaw mounted on said tank for angular movement relative to the tube gauge and having an opening formed therein for the reception of said tube gauge, said tube gauge loosely fitting said opening thereby allowing angular movement of the locking jaw relative to the tube gauge and means forcing said locking jaw into frictional engagement with the tube gauge.

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