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OIL GAUGE FOR TANKS

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Fig. 1.

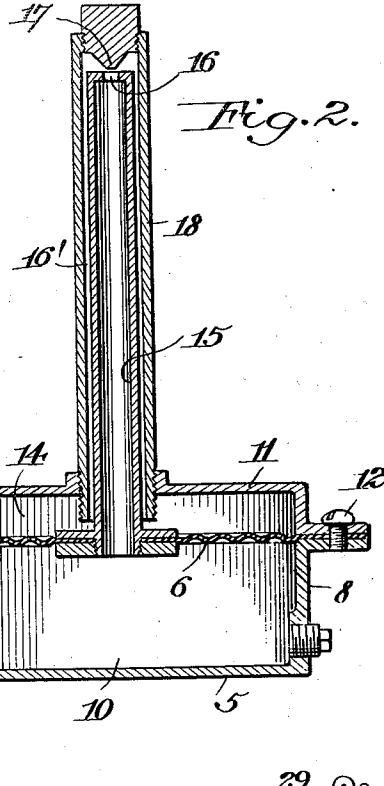
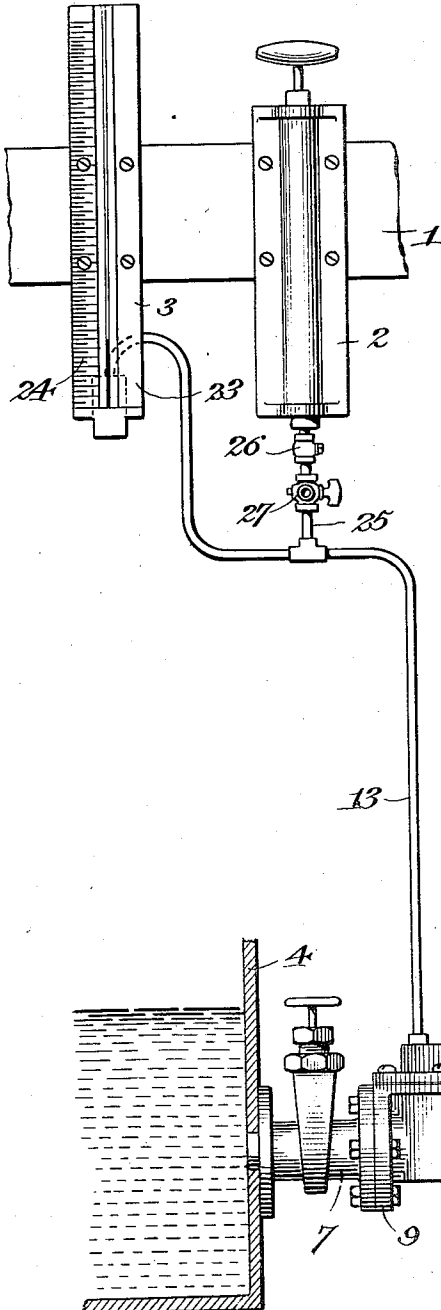
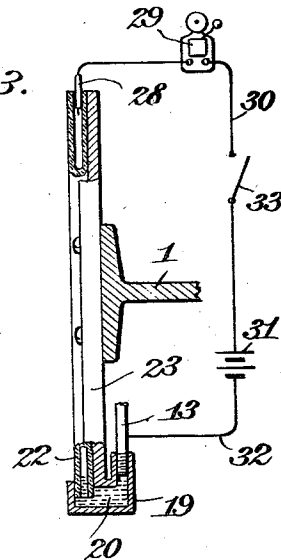


Fig. 3.



WITNESSES:

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OIL GAUGE FOR TANKS.

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This invention relates to gauges for indicating the level of liquid in the tanks or other containers and has for an object to provide an improved construction over my

co-pending application, Serial No. 724,328. Another object of the invention is to provide a liquid level gauge wherein the actuating structure may be arranged interiorly or exteriorly of a tank or container carrying the

oil. A further object of the invention is to provide an oil gauge wherein the structure is such that the indicating mechanism may be arranged at any desired point while the actuating structure may be positioned in the oil carrying receptacle or removably connected thereto exteriorly.

In the accompanying drawing—

Figure 1 is a fragmentary view partly in elevation and partly in section, disclosing one embodiment of the invention.

Figure 2 is a vertical sectional view through the actuator shown in Figure 1.

Figure 3 is a fragmentary view partly in section showing the indicating structure illustrated in Figure 1 together with a signal mechanism associated therewith.

Referring to the accompanying drawing by numerals, 1 indicates part of a ship, as for instance, a beam to which the pump 2 is connected and also an indicating member 3. Arranged at a convenient point on the ship is a tank 4 to which the actuator 5 is operatively connected. If desired, this actuator could be positioned interiorly of the tank 4 and the pipe 13 caused to extend through a stuffing box in the bulkhead of the tank. It is evident that the actuator 5 could not only be applied to tank 4 as shown in Figure 1 but could be connected to the tank at some other point and function in the same manner. In case of ships having double bottoms with oil therein, the actuator 5 could be arranged in the double bottom and caused to function in its usual manner, namely, by the pressure of the oil compressing the air in the lower chamber 10 of the actuator, forcing the air through hole 16 and passage 16' into the upper chamber 14 and from thence into pipe 13 forcing up the mercury in the indicator.

When the parts are arranged as shown in Figure 1, the flange 9 is bolted or otherwise rigidly secured to the valve 7 so that whenever valve 7 is open oil may freely flow into the chamber 10 formed by casing 8. Posi-

tioned on top of casing 8 is a diaphragm 6 which is clamped in position by an inverted cup-shaped top or cover 11, said top or cover being in turn held in place by suitable screws 12. The pipe 13 is in free communication with the upper air chamber 14 while the chamber 10 is always in free communication with the interior of tank 4 when valve 7 is open. A tube 15 is clamped at its lower end to the center of diaphragm 6 and communicates with the lower chamber 10 while the upper end is closed except for a vent opening 16, which under certain circumstances, is closed by the valve member 17 rigidly secured to the tube 18, which tube is secured to the cover 11 but is sufficiently large to provide an open chamber around the tube 15. From Fig. 2 it will be seen that the tube 18 is in communication with the upper chamber 14.

When the actuator 5 is in position as shown in Figure 1 and valve 7 is open, oil will immediately flow into the chamber 10 and force part of the air contained therein out through pipe 15 until the pressure on both sides of the diaphragm 6 is equal. Where a pipe 13 has been broken or where the device has been left alone for a long time and the air has escaped out of the system, the oil in chamber 10 will gradually move upwardly until it engages the diaphragm 6 and will then gradually raise the diaphragm and pipe 15 until the valve 17 closes the opening 16. By this action, none of the oil from the tank 4 can escape in view of this structure, even if pipe 13 is broken. By this construction and arrangement, oil cannot flow out through pipe 15 though air may freely do so. The upper end of pipe 13 is connected to a well 19 as shown in Figure 3, which well is normally filled with mercury 20 and into which the glass tube 21 projects, said tube being open at the top and bottom. This tube forms part of the indicator 3, which indicator is also provided with a supporting plate 23 having suitable graduations 24 which are of the proper kind to indicate the amount of oil in tank 4. These graduations will indicate inches, feet or pounds.

The pump 2 is also connected to pipe 13 through a suitable connecting pipe 25 which is provided with a check valve 26 and a valve 27. The check valve 26 permits the air to flow from pump 2 into pipe 13 but prevents any return movement. When the cock 27 is positioned as shown in Figure 1, the air may

freely flow from the pump 2 into pipe 13 but if the cock was turned ninety degrees, the valve would be closed and air could not pass back from pipe 13.

When it should be desired to ascertain the quantity of oil in tank 4, cock 27 is opened as shown in Figure 1, valve 7 being open. The pump 2 is actuated one or more times or until the air pressure in chambers 10 overcomes the oil pressure and some of the air escapes into the tank 4. As the pumping operation takes place and the air pressure increases, the mercury 20 will gradually move up in the tube 22 until the resistance of mercury is equal to the pressure of the oil. This fact is ascertained by continually operating the pump until the mercury moves up with each stroke of the pump and then quickly moves downwardly. This back and forth movement of the mercury indicates that each stroke of the pump causes air to be forced into chamber 14 and the same amount of air discharged through opening 16 into pipe 15, chamber 14 and into tank 4. When this movement of the mercury is observed, the operation of pump 2 is stopped and as soon as the mercury has become quiet, a reading may be taken. After the reading has been taken, the device may be left indicating the pressure and preferably the cock 27 is turned to a closed position. The device is also used when loading oil for the first time. In order that the engineer may be informed accurately as to when the tank has been filled or when it is almost filled, the end of wire 28 is moved into the bore of the glass tube 22 and downwardly to a desired point which would indicate for instance, that the tank is ninety-five per cent full. The wire 28 is connected with a sounding member, as for instance, an electric bell 29 which in turn is connected through wire 30 to a source of current 31, which current is grounded on the pipe 13 through wire 32. A switch 33 is interposed in the wire 30 and may be closed in order to secure the action of bell 29. When this has been done and the oil is being pumped into tank 4, the air in chamber 10 will begin to pass upwardly and out through pipe 15. It will, of course, be understood that the cock 27 has been turned to a closed position and that there is already sufficient pressure in chamber 14 and pipe 13 to accurately indicate the level of the oil already in the tank. When the parts are set as described, the addition of oil to the tank 4 will cause the pressure in chamber 10 to increase and gradually force the air in the upper part thereof out through opening 6 wherein the pressure in chamber 14 will be increased and the mercury in tube 22 will gradually rise. This action will continue as the oil is being pumped into tank 4 and eventually the mercury 20 will engage the lower end of wire

28 and, consequently, close the circuit of bell 29 which will cause the bell to sound. This will indicate to the engineer that the tank is ninety-five per cent full. After the bell 29 has sounded, the switch 33 is opened.

In constructing the various parts any suitable material may be used. In forming the diaphragm 6, the same is constructed of suitable material, as for instance metal.

What I claim is:—

1. In a liquid level gauge for containers, a valve adapted to be connected to the container adjacent the bottom, an actuator connected with said valve, said actuator including a casing, a cover and a diaphragm arranged between the cover and casing for forming an upper and a lower chamber, said lower chamber being in free communication with said valve whereby when the valve is open the liquid from the container may flow into said lower chamber, a tube extending through and connected with said diaphragm adapted to be raised when said diaphragm is raised, said tube having an opening at the upper end, a stationary valve member carried by said cover and arranged in line with said opening and adapted to project into said opening for closing the same when the tube is raised to a certain point, an indicator, a pipe in free communication with said upper chamber and the indicator whereby the pressure of the confined air in said pipe will cause said indicator to operate, and an air pump connected to said pipe for providing air pressure in said pipe equal to the hydrostatic head in said container.

2. In an oil level gauge, an indicating structure and an actuator for causing the actuation of said indicating structure, said actuator including a casing positioned exteriorly of said container, a tubular structure providing communication between the interior of the container and the interior of the casing, a diaphragm carried by the casing, a cover secured to the casing and with the diaphragm presenting an air chamber, a tubular member extending vertically from said air chamber, a valve member carried at the upper end of said tubular member, and an air tube connected with and extending through said diaphragm and extending loosely into said tubular member, said air tube having an opening at its upper end adapted to be closed by said valve member when the air tube is raised by said diaphragm.

3. In a liquid level gauge for containers, an actuator positioned exteriorly of the container and comprising a casing having an opening, means for connecting the actuator with a container so that the opening will be in communication with the interior of the container, a diaphragm extending across the top of the casing for forming a combined liquid and air chamber, a cover connected

with said casing above said diaphragm for forming with the diaphragm an air chamber, a pipe connected with said cover and having its lower end in free communication with said air chamber and extending upwardly therefrom. a tube connected with said diaphragm having its lower end in free communication with the interior of said casing, said tube having at its upper end a valve opening, and a valve member carried by the upper end of said pipe adapted to close said valve opening when said tube has been elevated by said diaphragm.

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