

A TANK LIQUID LEVEL INDICATOR

FIELD OF INVENTION

The present invention relates to a tank liquid level indicator and in particular
5 although not solely to a tank liquid level indicator which can be used in applications
without the need for electronics or pressure gauges.

BACKGROUND

Many methods or systems for determining liquid level in an enclosed tank
10 where the liquid level in the tank is not visible from outside the tank are known. A "U-
Tube" configuration or derivations there from are common. The provision of a sight
glass to the tank is another means of achieving the same result. A more complex
method is one system called a bubbler tube system as for example disclosed in EP
0626570. In such a system, electrical or mechanical means are used in conjunction
15 with the bubbler tube in gauging, measuring or determining the liquid level in the
water tank. Such systems however will be undesirable for use in locations or premises
where electrical systems are not available or desirable or where blackouts may be
common. Such may for example be on board a ship.

In some instances, the liquid tank may by necessity be inconveniently located.
20 Direct measurement of the liquid level by sight glass or "U-Tube" may hence not be
possible. Indeed it may be desirable to have a system where measurements of tank
levels (eg such as ballast tanks) can be obtained from a remote location such as in a
control room.

Hence, it is accordingly an object of the present invention to provide a tank
25 liquid level indicator which addresses the abovementioned disadvantages or which will
at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

Accordingly in a first aspect the present invention consists an system for determining the reaching of a level (herein after "the level to be determined") of a changing (whether reducing or increasing) level of liquid said system including

- 5 a. a primary tank of a kind which includes a gas containing void above said level, said primary tank containing the said liquid the level of which in said tank is the level to be determined, said gas containing void being at least at times under pressurised above atmospheric conditions
- 10 b. an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid
- c. a conduit extending between said indicator tank and said primary tank, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid
- 15 communication with said first opening and positioned below the level of fluid in said indicator tank

wherein during exposure of said first opening to said gas containing void, said gas (pressurised to a pressure sufficient to overcome the static pressure of liquid of said indicator tank in said conduit at or towards said second opening) displaces from

20 said gas containing void via said first opening into said conduit to displace gas from said second opening and

wherein the reaching of said level to be determined by said liquid in said primary tank, changes the flow of gas characteristics from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid

25 in said primary tank.

Preferably wherein upon the reaching of the liquid in said primary tank of a dropping level of liquid in said tank, thereby exposing said first opening to said gas containing void, said gas pressurised to a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said conduit at or towards said second

30 opening will displace gas from said gas containing void via said first opening into said

conduit to displace gas from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid in said primary tank.

Preferably said conduit extends upwardly from said first opening and to a height above said first opening sufficient to prevent liquid from said primary tank from
5 displacing from said first opening to said second opening.

Preferably said conduit extends upwardly from said second opening.

Preferably said conduit is of an inverted U tube configuration, gas being (before the reaching of said level to be determined) entrapped between the first and second openings by liquid in the respective tanks.

10 Preferably said conduit is a pipe.

Preferably said primary tank is a pressure vessel capable of being subjected to internal pressure.

Preferably said primary tank includes a gas inlet to deliver gas into said primary tank to pressure said gas in said void or the pressure in the void can be from its own
15 vapour pressure.

Preferably said indicator tank is an exposed tank open to the atmosphere.

Preferably said second opening is in a fixed relationship with said indicator tank and the level of said liquid in said indicator tank remains constant.

Preferably said second opening is placed below the level of liquid in said
20 indicator tank and said indicator tank includes a sight glass region making visible from the side of said indicator tank the location of said second opening to allow the viewing of gas flowing from said second opening.

Preferably said indicator tank includes at least one side wall which is or incorporated a transparent wall section to allow the viewing of said liquid in said
25 indicator tank at least at the region thereof proximate to said second opening.

Preferably said indicator tank includes a background colour to said transparent wall section which is of contrasting colour to the gas.

Preferably said pressure sufficient is determined by the depth at which said second opening is positioned in said indicator tank.

30 Preferably said first and second openings are at the same elevation.

Preferably said indicator tank is at most half the depth of said primary tank.

Preferably said indicator tank is at most one third the depth of said primary tank.

5 Preferably said indicator tank is at most one tenth the depth of said primary tank.

Preferably said indicator tank is at most half the depth of said primary tank.

Preferably said indicator tank is a scaled down replica of said primary tank.

Preferably at least one other said conduit is provided, the first opening of said at least one other conduit positioned at a different level in said primary tank for the purposes of indicating the reaching of a second level of liquid in said primary tank, said at least one other conduit having its said second opening in said liquid of said indicator tank.

15 Preferably said second opening of said at least one other conduit is placed in the liquid of said indicator tank at a different depth than the second opening of said first mentioned conduit.

Preferably said at least one other conduit has its first opening placed below said first opening of said first mentioned conduit and said second opening placed below the second opening or said first mentioned conduit in said indicator tank.

20 Preferably said indicator tank has said second openings of said conduits, in depth of positioning in said liquid of said indicator tank, placed proportionally at the same depth as the corresponding first openings of each said conduits in said primary tank.

25 Preferably said indicator tank includes a background to the viewing of said second outlets which has gradations indicated to corresponding to the levels to be measured in said primary tank and proximate to which are corresponding respective second outlets of each said conduits.

Preferably said conduit(s) are valved conduits, a valve provided in said conduits to selectively prevent the displacement of gas from said primary tank.

30 Preferably said valve of a said conduit is operated in a manner to remain closed once the level to be measured by way of said conduit has been reached.

In a further aspect the present invention consist in a method of determining the reaching of a level of liquid in a changing (reducing or increasing) level of liquid in a tank (herein after "primary tank") of a kind which includes a gas containing void above said level, said primary tank containing the said liquid the level of which in said
5 tank is the level to be determined by use of an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid into which a conduit extending between said indicator tank and said primary tank is engaged, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid communication with said first opening and
10 positioned below the level of fluid in said indicator tank, said method including the pressurisation of the gas containing void at least at times at which said level is to be determined to above atmospheric conditions

wherein upon the reaching of the liquid in said primary tank thereby exposing above or submerging below, said first opening, said liquid, said gas being pressurised
15 to a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said conduit at or towards said second opening will change the displacement characteristics of gas from said gas containing void via said first opening into said conduit to change the flow characteristics of gas from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid in said
20 primary tank.

Preferably upon the reaching of the liquid in said primary tank in a dropping level of liquid, thereby exposing above or submerging below, said first opening, said liquid, said gas being pressurised to a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said conduit at or towards said second
25 opening will change the displacement characteristics of gas from said gas containing void via said first opening into said conduit to change the flow characteristics of gas from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid in said primary tank.

Accordingly in a further aspect the present invention consists in an apparatus
30 for determining the reaching of a level (herein after "the level to be determined") of a

reducing level of liquid in a tank (herein after "a primary tank") of a kind which may included a gas containing void above said level and which is at least during measurement of the level is a tank under the influence of a pressurised gas said apparatus including

- 5 a. an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid
- b. a conduit extending between said indicator tank and said primary tank, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid communication
- 10 with said first opening and positioned below the level of fluid in said indicator tank

wherein upon the reaching of the liquid in said primary tank thereby exposing said first opening to said gas containing void, said pressurised gas when of a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said

15 conduit at or towards said second opening will displace gas from said gas containing void via said first opening into said conduit to displace gas from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid in said primary tank.

This invention may also be said broadly to consist in the parts, elements and

20 features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

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BRIEF DESCRIPTION OF THE DRAWINGS

A preferred form of the present invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a schematic view of a setup of the present invention wherein two separate tanks are shown each within which the level of liquid is to be monitored,

Figure 2 is a schematic view of a single primary tank setup and wherein the primary tank is not pressurised from externally.

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DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 1 and with reference to a first of the primary tanks 1, the system of the present invention includes a primary tank 1 which defines a containment region within which a liquid 18 is contained. The liquid may for example
10 be water or fuel or ballast liquid such as sea water or the like. The primary tank may be a tank to contain ballast water, or other liquid such as fuel, drinking water or the like, the level of which is to be monitored at least to the extent that the reaching of the level in the tank (either whilst being emptied or replenished) is signalled. The present invention has particular applications for use on board ships since its operation is not
15 dependent on electronics nor electricity which on ships may not be in continuous supply. During any power outage, the level of liquid to be ascertained within a primary tank can still occur despite any such power outage.

The primary tank 1 will have a drainage outlet which via a valve controlled conduit 17 can allow for the liquid within the primary tank 1 to be dispensed
20 therefrom. The drainage outlet will be provided for the purposes of allowing the delivery of the liquid to be discarded or for particular use such as for combustion.

A replenishing inlet 19 may be provided to supplement the liquid 18 within the primary tank 1. The flow of liquid to replenish that within the primary tank 1 is preferably dependent on the state of the volume of liquid 8 within the primary tank 1.
25 If the tank 1 is reaching a limit towards being empty the operation of the inlet conduit 19 and its control valve can allow for liquid to be replenished within the primary tank 1.

The primary tank 1 is preferably of a pressurisable enclosure. As can be seen with reference to Figure 1 the primary tank 1 includes a liquid containing region 18
30 and a gaseous region 5 above the liquid containing region 18. The total containment

region of the primary tank 1 is enclosable in order to allow for an increase in pressure above atmospheric pressure. This is preferably achieved by way of delivery of pressurised gas into the region 5.

Positioned remote from the primary tank 1 is the indicator tank 16. The indicator tank 16 is the tank at where the reaching of a level of the liquid within the primary tank 1 may be determined. The indicator tank is preferably open to atmospheric conditions.

A conduit 3 extends between the primary tank 1 and the indicator tank 16. The conduit 3 is a conduit via which a fluid may pass and includes a first opening 10 within the containment region of the primary tank 1 and a second opening 12 within the containment region of the indicator tank 16. In order to allow, from the indicator tank 16, the determination of the reaching of the liquid 18 within the primary tank 1 to a certain level, the first opening 10 of the conduit 3 is positioned at such a level.

As can be seen with reference to Figure 1, the primary tank 1 has the conduit 3 extending into its containment region and the first opening 10 positioned at a particular and fixed level relative to the primary tank 1. As the liquid 18 within the primary tank 1 drains the level of liquid drops. As soon as the first opening 10 of the conduit 3 becomes exposed by the dropping of the level of liquid 18 within the primary tank 1, to the gas 5, a dynamic fluid connection is established between the gas containment region 5 of the primary tank 1 and the second opening 12 via and of the conduit 3. The conduit 3 extends to its second end 12 placing its second end within a liquid contained within the indicator tank 16. The second opening 12 of the conduit 3 extends below the surface 20 of the liquid 15 within the indicator tank 16. Dependent on the depth of the opening 12 below the level 20 of the liquid within the indicator tank 16, will depend on the resistance to any flow of gas from the gas containment region 5 of the primary tank 1 will encounter in order to allow for such gas to be displaced via the second opening 12 of the conduit 3. The level of the liquid within the indicator tank 16 is preferably maintained at an even level above the opening 12 of the conduit 3. Accordingly a fixed pressure is required to be established before which any gas will flow from the second outlet 12 of the conduit 3. By having sufficient

pressure within the gas containment region 5 of the primary conduit, as soon as the first opening 10 of the conduit 3 become exposed by a dropping of the liquid level within the primary tank 1, the gas from the primary tank will flow via the conduit 3 to the second opening 12 and will generate a flow of bubbles from the second opening 12
5 thereby indicating that the liquid level in the primary tank has fallen below a certain height. The indicator tank 16 may include a graphical illustration of a scaled down version of the primary tank 1 by way of background indicia 2. The indicator tank 16 may be made to include a clear side wall made for example from a Perspex such that a viewing of the tank from a side can allow for the second opening 12 and indicia 2 to be
10 visible and for the bubbling effect to be seen from the side of the indicator tank 16. The indicator tank 16 may for example be made defining a thin width container which is mounted against an instrument panel of an engine room or similar.

The positioning of the second opening 12 of the conduit 3 may proportionally (as per its depth within the respective tanks) be in correspondence with the location of
15 the first opening 10 within the primary tank 1.

With reference to Figure 1, the primary tank 1 includes a second conduit 30 extending into the containment region of the primary tank 1. The second conduit 30 includes its first opening 11 provided at a different height within the containment region of the primary tank 1. In the example as shown in Figure 1, the first opening 11
20 of the second conduit 30 is still within the level of the liquid 4 whilst the first opening 10 of the first mentioned conduit 3 is clear from the liquid 4. Since the first opening 11 of the second conduit 30 is below the level of the liquid, pressurised gas cannot be passed via the second conduit 30 to its second opening 13 within the indicator tank 16. Accordingly no bubbles in the condition as shown in Figure 1 will flow from the
25 second opening 13 of the second conduit 30. This thereby indicates that the level of liquid within the primary tank 1 has not fallen below the location at where the first opening 11 of the second conduit 30 is provided. The accurate of the level of the liquid within the primary tank 1 is to be determined over its range of liquid volume containing capacity can determine the number of conduits such as conduits 3 and 30
30 are to be provided. A plurality of conduits each with their first openings positioned at

different levels within the containment region of the primary tank 1 can be provided and where their second openings are provided within the indicator tank 16 in a manner to allow for their identification to be determined and with correspondence to the height or a range of heights at which the level of liquid in the primary tank 1 will be at. In order for such determination to be more convenient, the second openings of each of such conduits are positioned to correspond with the primary openings within the primary tank. Accordingly with reference to Figure 1 the primary opening 10 of the first conduit in the primary tank is above the first opening 11 of the second conduit. Such corresponds with the second opening 12 of the first conduit within the indicator tank and the second opening 13 of the second conduit 30 within the indicator tank. Since the distance between the second outlet 13 of the second conduit 30 is further below the surface 20 of the liquid within the indicator tank 16, the resistance to the flow of gas via the second outlet 13 via the second conduit 30 is greater than that for the first conduit 3. Accordingly the gas pressure within the primary tank 1 may need to be sufficiently high to allow for the flow of gas to occur (once exposed) from the deepest positioned second opening of the conduits within the indicator tank 16. With the appropriate mathematical calculations, knowing the density of the liquid which is for example water, within the indicator tank 16, such resistance can be determined to thereby allow for the supply of the appropriate level of gas pressure within the primary tank 1. Since the gas within the conduits 3 and 30 is compressible, a dropping of the level of liquid in the primary tank 1 may cause for liquid to be sucked up through the second openings of the conduits in the indicator tank 16. Accordingly the height to which the conduits 3 and 30 extend above the level of liquid both in the primary and indicator tanks needs to be sufficient to prevent the transferral of liquid between the two tanks. With reference to the second primary tank 102, such height 7 can be calculated by standard static fluid theory.

In Figure 1 there is shown two primary tanks 1 and 101. The second primary tank 101 concludes the conduits 103 and 130 extending to for example the same indicator tank 16 but having a different indicia 102 graphically representing the second primary tank 101. Alternatively a second indicator tank (not shown) may be provided

for the indication of the level of liquid in the second primary tank 101. Pressurisation of the gas within the gas containment region 5 of each of the primary tanks is preferably provided by a gas pressurisation means 120. Such a gas pressurisation means may include a compressor and accumulator which via valves 121, a pressure gauge 122 and a pressure relief or regulator means 123 and via the conduit 6 and further control valve 8 can deliver pressurised gas to the gas containment region 5. Such is preferably to maintain gas at a suitable level to allow for gas to be displaced via the conduits extending between the primary tank 1 and the indicator tank 16 to initiate a bubbling of such gas in the indicator tank 16. All of the conduits may also include shutoff valves 109, 9. In the configuration as shown in Figure 1 wherein two conduits per primary tank are provided, it may only be the conduit 3 which is exposed first to the gas containment region which may include a shutoff valve. Such a shutoff valve may be closed once bubbling has been detected thereby knowing that the level of liquid within the primary tank 1 has reached the location at which the first opening is provided. The shutoff valve 9 may then be closed to prevent any further discharge of the gas from the primary tank thereby reducing the need for the gas pressurisation means 120 to remain continuously operational.

The height to which the conduit should extend above the level of the liquid may be determined by the formula $H > P/p \cdot g$ where P = pressure of gas in the gas contained region and p = the density of the liquid in the actual tank and g =gravity.

The conduit is preferably set up as an inverted "U-tube" such that the regions of the conduit extending from the first and second openings in upwardly away from the respective openings. In other words, the openings are the lower most distal regions of the conduit.

With reference to Figure 2 there is shown an arrangement where means to pressurise such as that defined by means 120 need not be included. The primary tank 201 includes a liquid 204 and a gas region 205. A means to drain fluid from the primary tank 201 is provided by a valve operated conduit 217. The primary tank 201 can be replenished via conduit 219. The liquid within the containment region of the primary tank 21 may be of a kind which can vaporise and wherein the gas provided in

the gas containment region 205 above the level of the liquid 256, is vaporised liquid. Such vaporised liquid can ensure that the pressure within the gas containment region 205 is maintained at a pressure sufficient to allow for it to become displaced via one or both of the conduits 203 or 230. The indicator tank 216 includes an indicia means to
5 mimic the primary tank 201 by way of 202 which is disposed within the liquid 215 contained within the indicator tank 216.

The present invention can be set up by the testing of the setup empirically or mathematically. Empirical establishment of the indicator tank to illustrate the level at which the fluid in the primary tank has reached can allow for the bubbles to be
10 established within the indicator tank 16 thereby indicating that the level of liquid within the primary tank 1 has reached a certain location. Since the primary tank is normally operated in a mode whereupon initial charging it will be discharged and it is the dropping level which by the indicator tank is to be maintained a track of. Accordingly any liquid which may exist within the portions of the conduit 3 extending
15 from its first end 10, which does not correspond with the level of the liquid within the primary tank 1, is not going to significantly effect the accuracy of the system. Any such liquid extending into the conduit 3 from the first opening 10 upon the level of the liquid exposing the opening 10, will allow for such liquid in the conduit 3 to drain therefrom. Such draining will be virtually instantaneous with the allowing of gas to be
20 displaced via the conduit 3 through the opening 10 to cause bubbles to be generated within the indicator tank 10. Accordingly while mathematical establishment of the system may not be an accurate model of what is happening in terms of accuracy necessary for the operation of the system, it may be sufficient. Alternatively or in combination empirical setup testing may be used for the purposes of establishing
25 suitable accuracy.

The system of the present invention can be used regardless of whether the liquid in the primary tank is being pumped out (or in), drained out, pressed out by the gaseous medium or due to vaporisation of the fluid.

In addition, the current invention may also be used to signal the reaching of a
30 specific liquid level in the primary tank in the event of inlet 19 introducing fluid into

the system in tank 1. For the system depicted in Figure 1 for the case when the liquid level of tank 1 is increasing (and therefore may at a time be below the level of the conduit inlet of 10), use of the pressurisation facility of 120 (with valve 8 closed) will continue to allow gaseous media to enter the conduit inlet of tube 10 and exit into the indicator tank 16. Upon the liquid in tank 1 reaching the inlet to the conduit 10, and therefore disallowing further pressurised gas entry, delivery to the remote indicator tank 16 will be interrupted and the bubbles generate in the liquid contained by tank 16 will reduce in flow rate, decay and/or seize to continue. For the system described by Figure 2, the pressurisation of the primary tank 201 during such increasing levels will be due mainly to the formation of gaseous vapour given from the contained liquid.

CLAIMS

1. An system for determining the reaching of a level (herein after “the level to be determined”) of a changing (whether reducing or increasing) level of liquid said system including

- 5 a. a primary tank of a kind which includes a gas containing void above said level, said primary tank containing the said liquid the level of which in said tank is the level to be determined, said gas containing void being at least at times under pressurised above atmospheric conditions
- 10 b. an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid
- c. a conduit extending between said indicator tank and said primary tank, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid
15 communication with said first opening and positioned below the level of fluid in said indicator tank

wherein during exposure of said first opening to said gas containing void, said gas (pressurised to a pressure sufficient to overcome the static pressure of liquid of said indicator tank in said conduit at or towards said second opening) displaces from
20 said gas containing void via said first opening into said conduit to displace gas from said second opening and

wherein the reaching of said level to be determined by said liquid in said primary tank, changes the flow of gas characteristics from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid
25 in said primary tank.

2. A system as claimed in claim 1 wherein said conduit extends upwardly from said first opening and to a height above said first opening sufficient to prevent liquid from said primary tank from displacing from said first opening to said second opening.

3. A system as claimed in claims 1 and 2 wherein said conduit extends upwardly
30 from said second opening.

4. A system as claimed in any one of claims 1 to 3 wherein said conduit is of an inverted U tube configuration, gas being (before the reaching of said level to be determined) entrapped between the first and second openings by liquid in the respective tanks.
- 5 5. A system as claimed in any one of claims 1 to 4 wherein said conduit is a pipe.
6. A system as claimed in any one of claims 1 to 5 wherein said primary tank is a pressure vessel capable of being subjected to internal pressure.
7. A system as claimed in any one of claims 1 to 6 wherein said primary tank includes a gas inlet to deliver gas into said primary tank to pressure said gas in said
10 void.
8. A system as claimed in any one of claims 1 to 7 wherein said indicator tank is an exposed tank open to the atmosphere.
9. A system as claimed in any one of claims 1 to 8 wherein said second opening is in a fixed relationship with said indicator tank and the level of said liquid in said
15 indicator tank remains constant.
10. A system as claimed in any one of claims 1 to 9 wherein second opening is placed below the level of liquid in said indicator tank and said indicator tank includes a sight glass region making visible from the side of said indicator tank the location of said second opening to allow the viewing of gas flowing from said second opening.
- 20 11. A system as claimed in any one of claims 1 to 10 wherein said indicator tank includes at least one side wall which is or incorporated a transparent wall section to allow the viewing of said liquid in said indicator tank at least at the region thereof proximate to said second opening.
12. A system as claimed in claim 11 wherein said indicator tank includes a
25 background colour to said transparent wall section which is of contrasting colour to the gas.
13. A system as claimed in any one of claims 1 to 12 wherein said pressure sufficient is determined by the depth at which said second opening is positioned in said indicator tank.

14. A system as claimed in any one of claims 1 to 13 wherein said first and second openings are at the same elevation.
15. A system as claimed in any one of claims 1 to 14 wherein said indicator tank is at most half the depth of said primary tank.
- 5 16. A system as claimed in any one of claims 1 to 15 wherein said indicator tank is at most one third the depth of said primary tank.
17. A system as claimed in any one of claims 1 to 16 wherein said indicator tank is at most one tenth the depth of said primary tank.
18. A system as claimed in any one of claims 1 to 17 wherein said indicator tank is
10 at most half the depth of said primary tank.
19. A system as claimed in any one of claims 1 to 18 wherein said indicator tank is a scaled down replica of said primary tank.
20. A system as claimed in any one of claims 1 to 19 wherein at least one other said conduit is provided, the first opening of said at least one other conduit positioned at a
15 different level in said primary tank for the purposes of indicating the reaching of a second level of liquid in said primary tank, said at least one other conduit having its said second opening in said liquid of said indicator tank.
21. A system as claimed in claim 20 wherein said second opening of said at least one other conduit is placed in the liquid of said indicator tank indicator tank at a
20 different depth than the second opening of said first mentioned conduit.
22. A system as claimed in claims 20 or 21 wherein said at least one other conduit has its first opening placed below said first opening of said first mentioned conduit and said second opening placed below the second opening or said first mentioned conduit in said indicator tank.
- 25 23. A system as claimed in any one of claims 20 to 22 wherein said indicator tank has said second openings of said conduits, in depth of positioning in said liquid of said indicator tank, placed proportionally at the same depth as the corresponding first openings of each said conduits in said primary tank.
24. A system as claimed in any one of claims 20 to 23 wherein said indicator tank
30 includes a background to the viewing of said second outlets which has gradations

indicated to corresponding to the levels to be measured in said primary tank and proximate to which are corresponding respective second outlets of each said conduits.

25. A system as claimed in any one of claims 1 to 24 wherein said conduit(s) are valved conduits, a valve provided in said conduits to selectively prevent the
5 displacement of gas from said primary tank.

26. A system as claimed in claim 25 wherein said valve of a said conduit is operated in a manner to remain closed once the level to be measured by way of said conduit has been reached.

27. A method of determining the reaching of a level of liquid in a changing (reducing or increasing) level of liquid in a tank (herein after "primary tank") of a kind
10 which includes a gas containing void above said level, said primary tank containing the said liquid the level of which in said tank is the level to be determined by use of an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid into which a conduit extending between said indicator tank and said primary
15 tank is engaged, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid communication with said first opening and positioned below the level of fluid in said indicator tank, said method including the pressurisation of the gas containing void at least at times at which said level is to be determined to above atmospheric conditions

20 wherein upon the reaching of the liquid in said primary tank thereby exposing above or submerging below, said first opening, said liquid, said gas being pressurised to a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said conduit at or towards said second opening will change the displacement characteristics of gas from said gas containing void via said first opening into said
25 conduit to change the flow characteristics of gas from said second opening to signify in said indicator tank the reaching of said level to be determined by said liquid in said primary tank.

28. An apparatus for determining the reaching of a level (herein after "the level to be determined") of a reducing level of liquid in a tank (herein after "a primary tank")
30 of a kind which may included a gas containing void above said level and which is at

least during measurement of the level is a tank under the influence of a pressurised gas said apparatus including

- a. an indicator tank positioned remote from said primary tank, said indicator tank containing a liquid
- 5 b. a conduit extending between said indicator tank and said primary tank, said conduit including a first opening positioned within said primary tank at the level to be determined and a second opening in fluid communication with said first opening and positioned below the level of fluid in said indicator tank

10 wherein upon the reaching of the liquid in said primary tank thereby exposing said first opening to said gas containing void, said pressurised gas when of a pressure sufficient to overcome the static pressure of any liquid of said indicator tank in said conduit at or towards said second opening will displace gas from said gas containing void via said first opening into said conduit to displace gas from said second opening
15 to signify in said indicator tank the reaching of said level to be determined by said liquid in said primary tank.