

July 15, 1941.

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2,249,180

AUDIBLE SIGNALING DEVICE FOR USE WITH TANKS

Filed Sept. 26, 1939

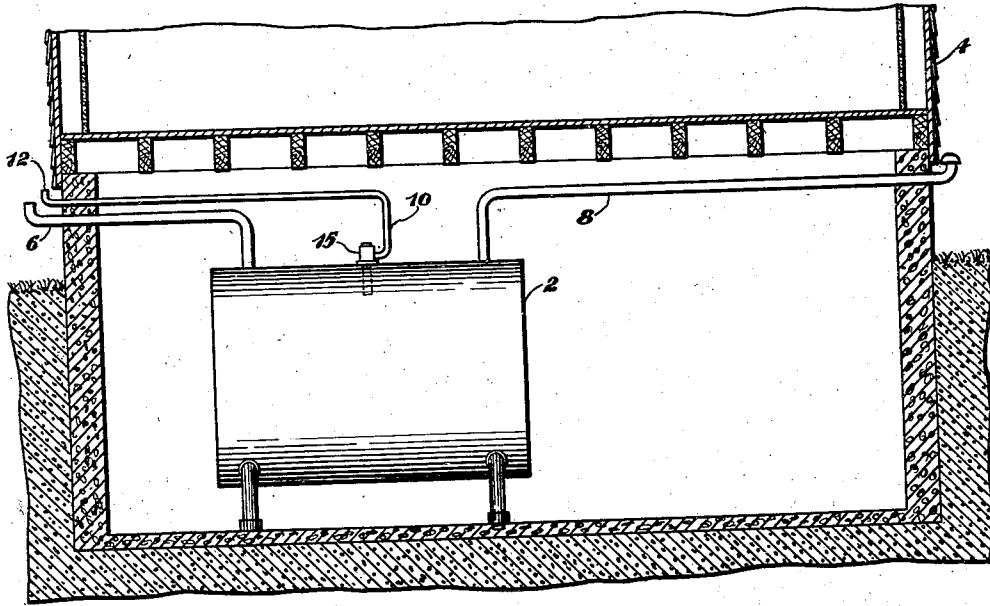


Fig. 1

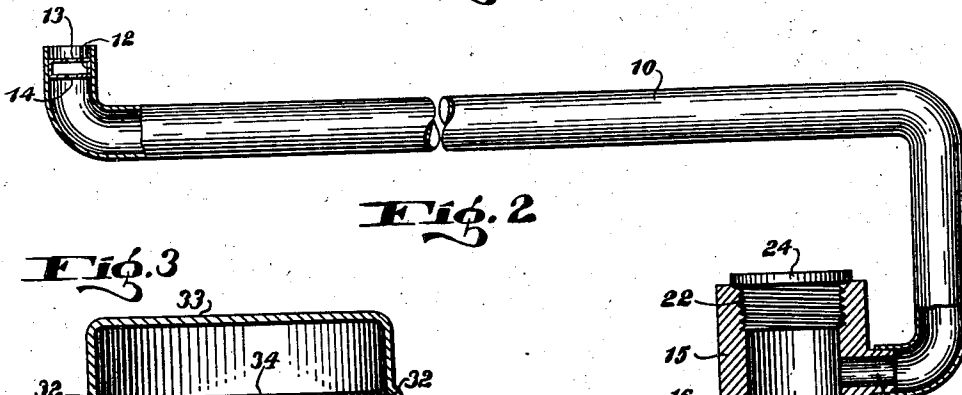


Fig. 2

Fig. 3

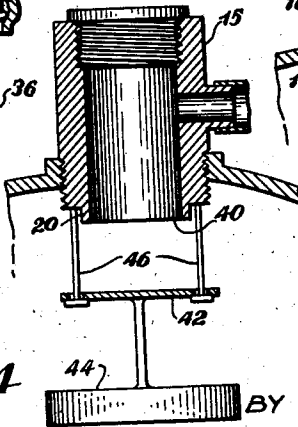
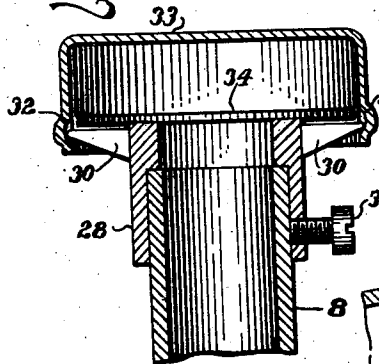
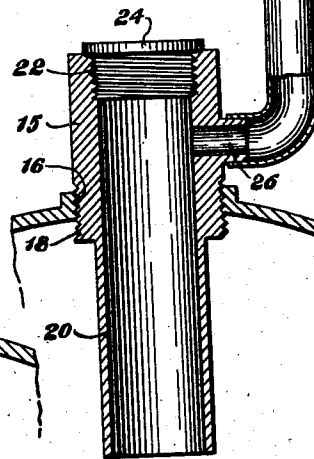


Fig. 4



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2,249,180

AUDIBLE SIGNALING DEVICE FOR USE WITH TANKS

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Application September 26, 1939, Serial No. 296,554

14 Claims. (Cl. 137-79)

This invention relates to means for indicating the liquid level in a tank during the filling thereof.

One of the objects of our invention is to provide audible indicating means which may be attached to an existing installation of a construction which would preclude the utilization of other signaling means at present available.

In the art of audible signaling means for indicating the point of a rising liquid level in a tank it is now common to utilize audible signaling means in which there is a whistle operated by the gases being expelled from the tank during the filling operation, but at the same time to make full provision for continued venting after the whistle has been rendered inoperative or operative, as the case may be, after the liquid level has risen to the predetermined point.

In the ordinary installation, whether domestic or commercial, the fill pipe and vent pipe, which are connected to the tank, terminate in generally the same location so that if a signaling device is positioned in the vent pipe, the operator at the fill pipe will be sufficiently close to the vent pipe to hear readily the signaling sound.

In some instances, however, either by intent or because of local ordinances, the vent pipes have been terminated at a point remote from the fill pipes so that any signaling device positioned in the vent pipe would give off a sound so remote from the operator at the fill pipe that it could not be heard. Hence in those situations it is necessary to provide other means which will produce an audible signal which can be heard by the operator.

Our invention is therefore directed to the provision of signaling means which may be used in connection with existing equipment in which the fill pipe and vent pipe terminate at widely separated points. It is further contemplated that the signaling means may be installed without alteration of the tank and without any substantial installation difficulties with respect to the building in which the tank is located.

These and other objects of our invention will appear more fully as the explanation proceeds with the aid of the accompanying drawing in which:

Fig. 1 is a diagrammatic view of an oil tank and the filling, venting and signaling connections in relation to the building in which the tank is positioned.

Fig. 2 is a detail of the signaling unit and of the fitting utilized to connect the tank with the signaling mechanism.

Fig. 3 is a detail of the relief valve on the vent pipe.

Fig. 4 shows a modified construction for cutting off the venting gases to the signaling unit.

In Fig. 1 a tank 2 is shown positioned in the cellar of a building 4. Extending from the tank to the outside of the building are the fill pipe 6 and the vent pipe 8. In the ordinary situation in which this arrangement is found, the location of the fill pipe at 6 is so remote from the end of vent pipe 8 that if a signaling device were positioned in pipe 8, the sound emanating therefrom could not be heard by the operator at fill pipe 6.

Connected to a third opening in the tank is a pipe 10 having therein an audible signaling device or whistle such as 12, shown in Fig. 2. This whistle is of the button type, with upper and lower apertures 13 and 14, and constructed to produce adequate sound at low pressures.

In order that pipe 10 may be readily connected to the tank 2, we have provided a fitting 15 of the type shown in Fig. 4. In the average oil tank of this type, in addition to the filling and venting connections there is a third opening called a "stick hole," through which may be inserted a stick for the manual measurement of oil in the tank, as at 16 in Fig. 2, which it is customary to close by a screw plug, and a fourth opening, not shown, usually having therein an oil level gauge, also not shown. Into opening 16 is screwed the fitting 15, which is generally tubular in form, threaded at 18 for engagement with the threads on the tank, and has a tube 20 extending downwardly therefrom. The length of this tube controls the time at which operation of the whistle ceases. The upper end of the fitting 14 is internally threaded at 22, and the opening is closed by a screw plug 24.

A passage 26 extends through the side of the fitting and is adapted for connection with pipe 10. It will be apparent from this construction that if it is desired to measure the depth of the oil by inserting a stick into the tank in the customary manner, the screw plug 24 may be removed and the stick inserted through the fitting into the tank.

The location of whistle 12 in pipe 10 is immaterial as any sound emanating therefrom can be heard readily whether the whistle be near the outer end of pipe 10, as shown, or closer to the tank. Means, not shown, would normally be provided to keep rain from entering the ends of pipes 6 and 10.

On the outer end of vent pipe 8, which, before the application of our device, is normally open,

is applied a normally closed relief valve the purpose of which will be hereinafter explained more fully. This relief valve and associated parts consist of a collar 28 having spiders 30 extending therefrom which engage in depressions 32 of protective cap 33. Resting on the upper end of collar 28 is a disk 34, and these parts together form a relief valve. Collar 28 closely fits and is attached to the end of vent pipe 8 by a set screw 36. The weight of disk 34 is such that it may be forced upwardly from its seat under the influence of relatively low tank pressures. By relatively low tank pressures are meant pressures which would not exceed what is considered safe practice with respect to oil tanks during the filling thereof and also pressures of such low degree as to be insufficient to force liquid out through whistle tube 10 after the lower end of tube 20 has been trapped by rising liquid level.

The operation of this construction is as follows. The operator commences filling the tank through fill pipe 6. As the level in the tank rises, the gas displaced must be vented. Normally it would vent through pipe 8, but due to the fact that disk 34 closes the end of pipe 8 until such time as the pressure exceeds a predetermined point, the gas follows the path of least resistance through intrusion tube 20, passage 26, pipe 10 and whistle 12 to the atmosphere. Thus, immediately upon the commencement of filling through pipe 6, whistle 12 comes into operation. As long as the liquid level is below the lower end of intrusion tube 20, gas will continue to pass out through the whistle, indicating to the operator that the level is still below the final desired point.

Immediately, however, that the liquid level reaches the lower end of intrusion tube 20, the tube will be trapped so that no gas can escape through pipe 10 and whistle 12. Thus whistling ceases at that point and the operator is at once advised that the tank has been filled to the desired level. However, in order that further venting may be permitted if necessary and to preclude any dangerous pressures developing, venting may thereafter take place through vent pipe 8 as soon as the pressure of the gas above the liquid level, increased through continued filling, reaches that point necessary to force disk 34 from its seat on the end of vent pipe 8.

By this arrangement, should the operator fail to discontinue the supply of liquid after the level reaches the lower end of tube 20, the remaining gas and thereafter the liquid may be successfully vented through pipe 8 without the development of dangerous pressure conditions within the tank.

The relief valve indicated in Fig. 3 may be of any suitable type of gravity operated valve. A simple form has been shown, but it is appreciated that other styles might be used, the only requirement being that it be operative at the pressure for which it is set so that free venting thereafter may take place.

Likewise the whistling mechanism used in connection with pipe 10 may be of any form. The style shown is a whistle of the button type which produces a good sound at very low pressures.

In the ordinary case it is preferable to cut off the venting gas to the whistle by interception of the intrusion tube 20 by the rising liquid. In some cases, however, it may be preferable to provide a positive means for cutting off the gases passing through pipe 10 so that no matter what pressure may thereafter be developed in the tank, no liquid or gas may escape through the signaling vent. In any event, however, the intention is

that when the liquid level rises to the predetermined level, the gas theretofore flowing through the signaling pipe and the whistle will be cut off, diminished, altered or otherwise affected so that whistling will cease, and the principal volume of air escaping from the tank thereafter will pass through the remote vent pipe 8.

A construction to accomplish this result is shown in Fig. 4 in which the fitting 15 terminates in a valve seat 40. This seat is adapted to be engaged and closed by valve 42, which is controlled by float 44 connected thereto. Thus, as the liquid level rises, upon reaching float 44 the latter will be moved upwardly, thereby raising valve 42 to close fitting 15 and pipe 10. Upon this happening, further venting of gas must take place through pipe 8. Valve 42 is guided in its movement by any convenient means, such as guide rods 46.

While we have shown and described preferred forms of our invention, we wish it to be distinctly understood that we do not intend to be limited thereby, but only by the appended claims.

We claim:

1. In combination, a tank having a fill pipe and a vent pipe, means external of said tank separating the end of said fill pipe from the end of said vent pipe so that a normally audible sound such as might be produced by gas venting from said tank through a whistle in said vent pipe would be inaudible in the neighborhood of said fill pipe, a valve normally closing said vent pipe but adapted to open at a predetermined pressure, and a signaling pipe connected to said tank normally open and having an audible signaling device in series therewith, said signaling pipe having its outer end in such location that sounds emanating therefrom may be heard in the neighborhood of said fill pipe, and means associated with the inner end of said signaling pipe for altering the whistle when the liquid has risen to a predetermined level.

2. In combination, a tank having three pipes connected thereto, one pipe for use in filling said tank, a second pipe for the primary venting of gas from said tank during the filling thereof up to a predetermined level, and a third pipe for venting gas from said tank as the liquid level rises beyond said predetermined level, said second pipe having an audible signaling device contained therein and operable during filling to said predetermined level, means for altering said signal when the liquid has reached said predetermined level, said third pipe having a valve maintaining said pipe normally closed but operable to open when the pressure in said tank exceeds a predetermined degree, said second pipe having its terminal end in proximity to said filling pipe and said third pipe having its terminal end at a point so remote from said filling pipe and said second pipe as to be out of hearing distance of the signaling sound issuing from said second pipe in proximity to said filling pipe during filling operation.

3. The combination in a closed tank having filling and vent openings, of a liquid level indicator comprising a tube projecting downwardly from the vent opening, an audible signal in communication with the tube and designed to be continuously actuated until the lower end of the tube is trapped by rising liquid level, and relief means located above the lower end of the tube and designed to independently permit the escape of gases and vapor when the rising liquid level has trapped the lower end of the tube, the outer ends of said filling opening and re-

relief means being widely separated while the outer end of said tube and audible signal is in proximity to said filling opening.

4. The combination with a closed fluid tank, of a supply conduit leading into the tank, a vent tube leading out of the tank with its inner open end at a predetermined distance below the top of the tank, an audible signal device communicating with the vent tube and designed to be continuously actuated by the escape of gas or vapor therethrough until the inner open end of the tube is trapped by rising liquid level, and an automatically operable independent vent from the tank above the inner end of the vent tube normally operable to cause venting through the tube and audible signal until rising liquid level traps the end of the tube, and thereafter with rising liquid level operable to permit continued venting and relief of excessive pressure, the outer ends of said supply conduit and said independent vent being widely separated while said vent tube and audible signal terminate in proximity to said filling opening.

5. In combination, a tank having three pipes connected thereto, one pipe for use in filling said tank, a second pipe for primary venting of gas from said tank during the filling thereof, means operable by buoyant means controlled by the rising liquid level for altering the venting capacity of said second pipe, and a third pipe for venting gas from said tank as the liquid level rises beyond the level at which the venting capacity of said second pipe is altered.

6. The combination as set forth in claim 5 in which said second pipe has an audible signaling device contained therein operable during filling until said buoyant means is moved by a rising liquid level and in which said third pipe has a valve maintaining said pipe normally closed, said valve operable to open when the pressure in said tank exceeds a predetermined point.

7. In combination, a building structure, a tank therein, a fill pipe connected to said tank and extending through a wall of said building, a signaling pipe connected to said tank and extending through a wall of said building to a point in proximity to said fill pipe, a whistle in said signaling pipe, a vent pipe connected to said tank and extending through a remote wall of said building at a point out of hearing distance of said whistle, means for altering the flow of venting gas through said signaling pipe when the liquid level in said tank has risen to a predetermined point, and a pressure operable valve normally closing said vent pipe but operable to open when the pressure in said tank exceeds a predetermined degree.

8. In combination, a building structure, a tank therein, a fill pipe connected to said tank and extending through a wall of said building, a vent pipe connected to said tank and extending through a remote wall of said building, a signaling pipe connected to said tank and extending through a wall of said building to a point in proximity to said fill pipe, a signaling device positioned in said signaling pipe exterior of said building, means for altering the flow of gas through said signaling pipe when the liquid level in said tank has risen to a predetermined point, and a pressure operable valve closing said vent pipe.

9. The combination in a closed tank having a filling conduit and a plurality of venting conduits, of a liquid level indicator, comprising a first venting conduit originating below the top of the

tank, a gas-operated signal in communication with said first venting conduit and designed to be continuously actuated until the tank end of said conduit is trapped by rising liquid level, and a second venting conduit of such resistance to passage of gas therethrough as to divert sufficient gases to the said first venting conduit to actuate said signal until said first venting conduit has been trapped by rising liquid level, said second venting conduit adapted thereafter to vent gases independently, the outer ends of said filling conduit and said second venting conduit being widely separated, while the outer ends of said filling conduit and said first venting conduit are in proximity to each other.

10. In combination, a tank, a fill pipe connected to said tank and extending to a filling position, a vent pipe connected to said tank and extending to a venting position at a point remote from the extended end of said fill pipe, a signaling pipe connected to said tank and extending to a point in proximity to the outer end of said fill pipe, a whistle in series with said signaling pipe, means for changing the flow of gas through said signaling pipe when the liquid level has risen to a predetermined point, the effective distance between the outer ends of said fill pipe and said vent pipe being so great that said whistle could not be heard from one to the other, and means for providing sufficient resistance to the passage of gas in said vent pipe to insure the flow of an adequate volume of gas through said whistle during normal filling to produce a sound audible at the outer end of said fill pipe.

11. The combination in a closed tank having filling and vent openings, of a liquid level indicator comprising a tube and tubular member of which the latter projects downwardly from one of the vent openings, a gas-operated signal in communication with the tube and designed to be continuously actuated until the lower end of the tubular member is trapped by rising liquid level, and relief means located above the lower end of the tubular member designed to independently permit the escape of gases when the rising liquid level has trapped the lower end of the tubular member, the outer ends of said filling opening and relief means being widely separated while the outer end of said tube is in proximity to said filling opening, means for connecting said tubular member with said tank, a liquid-tight cover member at the upper end of said tubular member in removable engagement therewith, and an opening extending laterally through the wall of said tubular member externally of said tank, to which opening said tube is connected.

12. In combination, a tank having three pipes connected thereto, one pipe for use in filling said tank, a second pipe for the primary venting of gas from said tank during the filling thereof up to a predetermined level and a third pipe for venting gas from said tank as the liquid level rises beyond said predetermined level, said second pipe having an audible signaling device contained therein operable during filling to said predetermined level, means associated with the inner end of said second pipe for altering the flow of gas therethrough when the liquid has risen to said predetermined level and thereby to alter the signal given by said signaling device, said third pipe having a valve maintaining said pipe normally closed but operable to open when the pressure in said tank exceeds a predetermined degree, the said predetermined pressure being insufficient to

cause overflow through said second pipe after the latter has been affected as the result of liquid rising to said predetermined level, said second pipe having its terminal end in proximity to said filling pipe and said third pipe having its terminal end at a point remote from said filling pipe and said second pipe so as to be out of hearing distance of the signaling sound issuing from said second pipe in proximity to said filling pipe during the filling operation.

13. In combination, a tank having a filling conduit and a plurality of venting conduits connected thereto, comprising a first venting conduit having a signaling device in series therewith and operable by gas displaced during filling, means within said tank associated with said first venting conduit and functioning upon the rise of liquid within the tank to a predetermined level to alter the indication of said signaling device, a second venting conduit providing continuously available venting means regardless of the liquid level and offering sufficient resistance to the escape of gas therethrough so that during filling up to said predetermined level sufficient gas will be diverted to said first venting conduit to oper-

ate said signaling device, said first and second venting conduits having exists terminating separately in the atmosphere.

14. In combination, a tank, means for filling said tank, a vent pipe, a separate signaling pipe leading from the tank to a point without the tank in proximity to the filling means, signaling means associated with said signaling pipe, said vent pipe providing continuously available venting means regardless of the liquid level and offering sufficient resistance to the escape of gas therethrough so that during filling up to a predetermined point sufficient pressure will be available in said tank to render said signaling means operable to indicate when liquid is entering the tank and while the level of the liquid in the tank is below said predetermined point, said signaling pipe having means associated therewith functioning to restrict access of gas to said signaling pipe upon the rise of liquid level to said predetermined point, thereby to alter said previous indication and to show that the liquid level has risen to said predetermined point.

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