Jan. 12, 1932. R. STAR 1,840,748

TANK GAUGE

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Fig. 1.

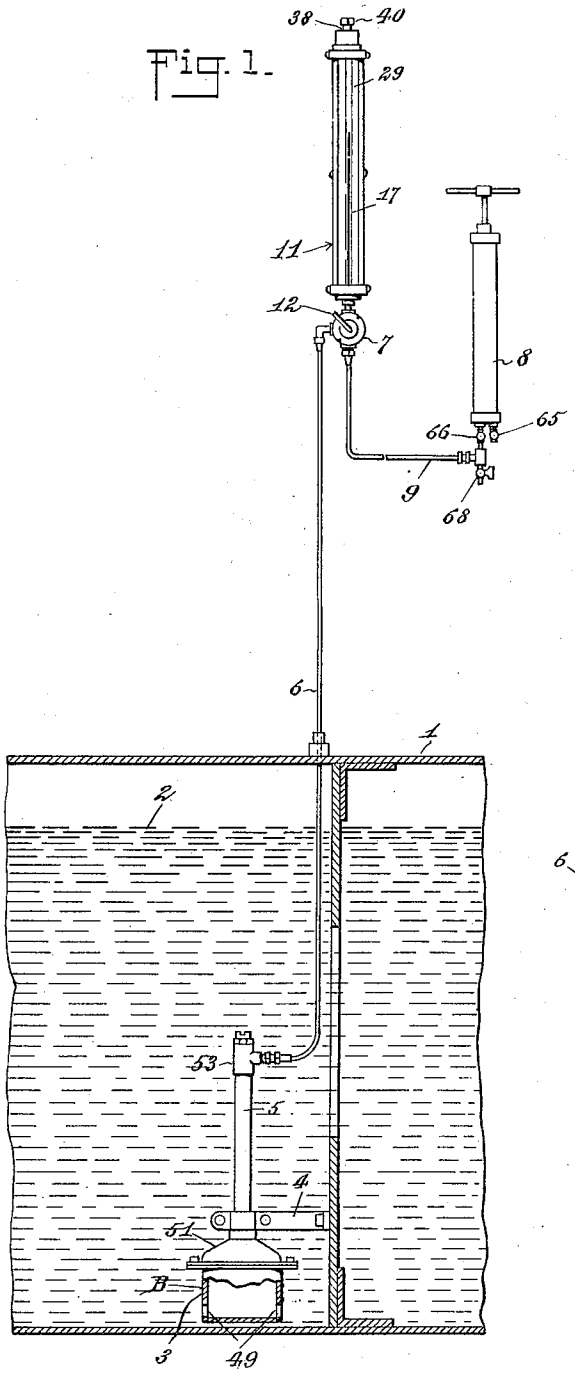


Fig. 4.

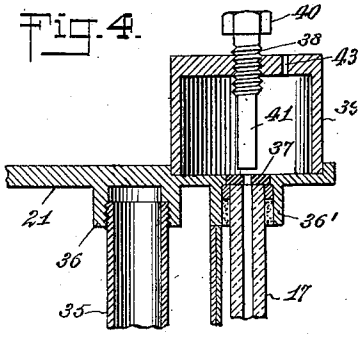


Fig. 5.

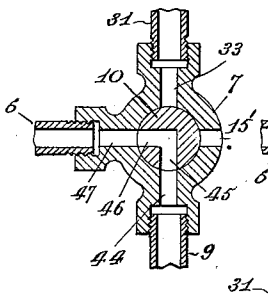


Fig. 6.

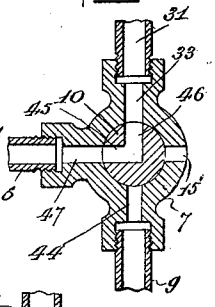
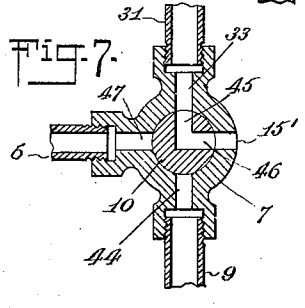


Fig. 7.



WITNESSES

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TANK GAUGE

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Fig. 2.

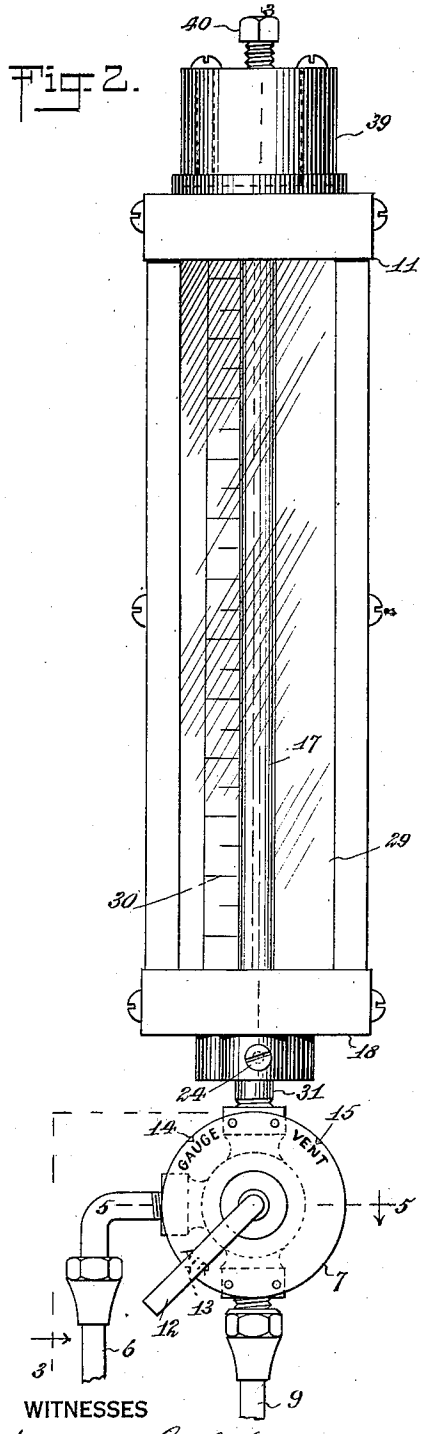
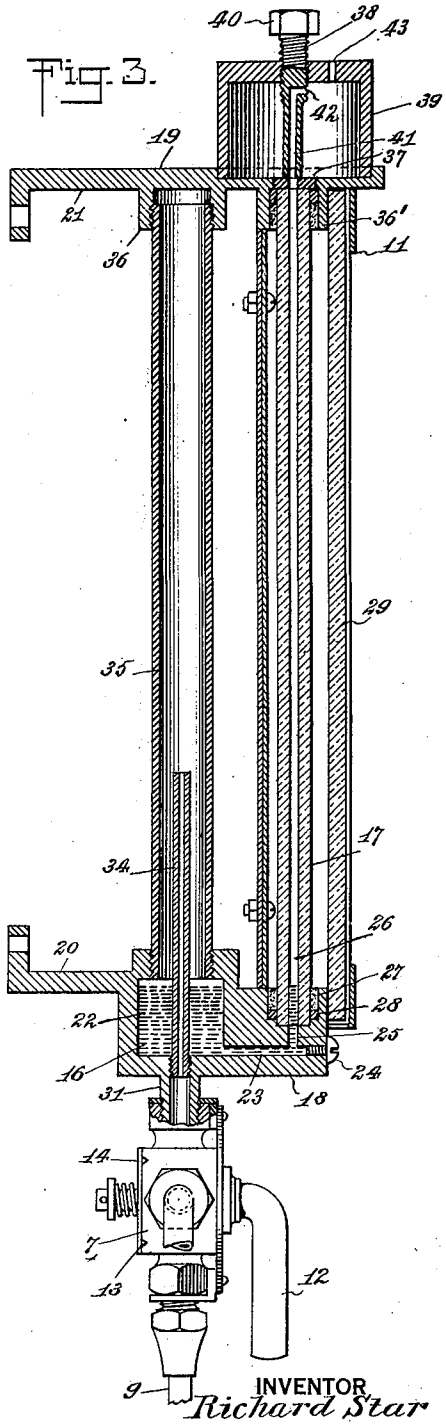


Fig. 3.



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TANK GAUGE

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Fig. 8.

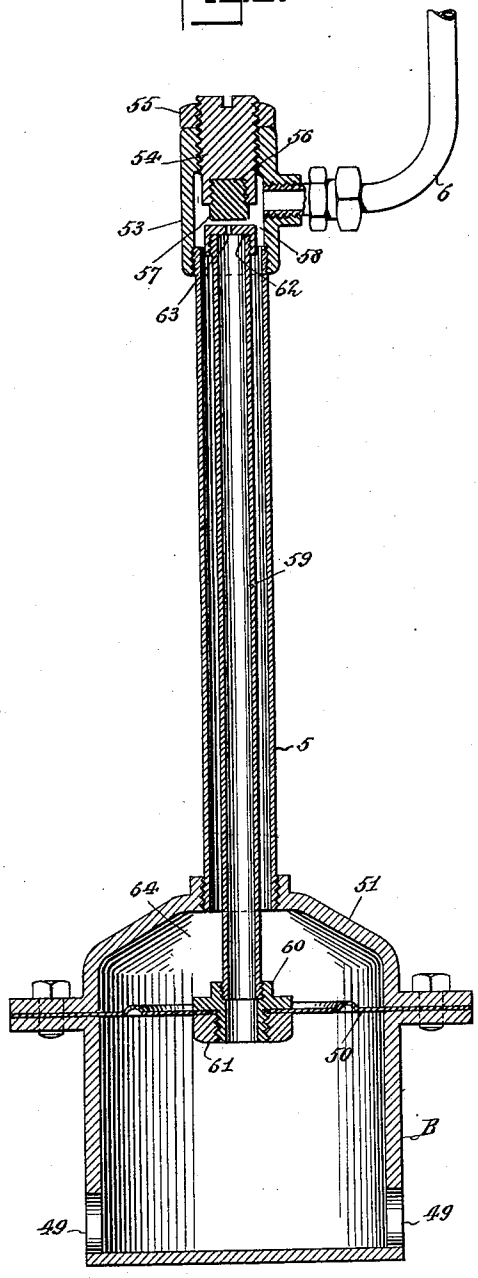
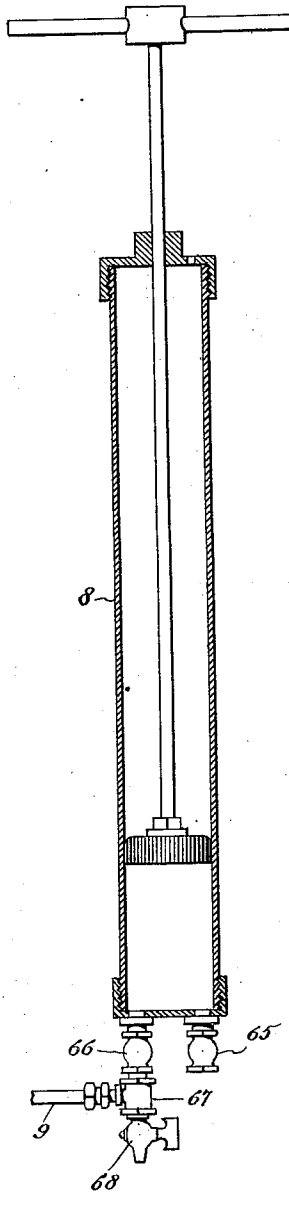


Fig. 9.



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Patented Jan. 12, 1932 1,840,748

UNITED STATES PATENT OFFICE

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TANK GAUGE

Application filed October 18, 1929. Serial No. 400,684.

This invention relates to tank gauges, and has for an object to provide an improved construction wherein an accurate reading may be secured at any time and without danger of losing any of the mercury or other liquid used in the device.

Another object of the invention is to provide a gauge to be used with tanks in oil burning ships or to be used with the double bottom of oil burning ships, the arrangement being such that the gauge member may be positioned at the desired point on the ship and by proper manipulation caused to indicate the depth of oil in the tank to which it is connected.

A further object of the invention is to provide an improved construction which is substantially fool-proof both in its operation and in its formation to prevent loss of mercury or other gauging liquid.

In the accompanying drawings,—

Figure 1 is a schematic view partly in section and partly in elevation disclosing an embodiment of the invention as the same appears when in use;

Figure 2 is a front view of the gauge shown in Figure 1, the same being on an enlarged scale;

Figure 3 is a sectional view through Figure 2 on the line 3—3;

Figure 4 is a view similar to the upper part of Figure 3 but showing the parts adjusted to permit the mercury to flow back into the gauge.

Figure 5 is a detail fragmentary sectional view through the valve shown in Figure 2, the same being shown positioned to permit the air to pass to the air system connected with the gauge;

Figure 6 is a view similar to Figure 5 but with the key of the valve turned to direct the air from the air system into the gauge;

Figure 7 is a view similar to Figure 5 but showing the key of the valve turned to vent or exhaust the air from the gauge;

Figure 8 is a longitudinal vertical sectional view through the inverted cup and associated parts shown in Fig. 1, the same being on an enlarged scale;

Figure 9 is a vertical sectional view on an enlarged scale of the pump shown in Fig. 1.

Referring to the accompanying drawings by numerals, 1 indicates the double bottom of an oil burning ship, said double bottom being adapted to carry a supply of oil 2. Arranged in the double bottom is an inverted cup-shaped member 3 supported by suitable bracket 4 and carrying a comparatively large pipe 5. A small tube 6 extends from pipe 5 to the valve 7 and a similar small tube extends from valve 7 to the pump 8, the tube 9 being preferably of the same size as tube 6, though it could be made larger, if desired. The tube 6, pipe 5 and member 3 form an air system which is adapted to be filled with air from pump 8, and when filled with air the pressure of said air will be equal to the pressure of oil 2. As soon as pump 8 has filled the air system just described, valve 7 is actuated so that the key 10 will be moved from the position shown in Figure 5 to that shown in Figure 6, in order that the air from the system may act upon the gauge 11. After a suitable reading has been taken key 10 is moved from the position shown in Figure 6 to the position shown in Figure 7, whereby the air from the gauge will be vented. It will be noted that the key 10 is provided with a handle 12 which is adapted to be brought over any of the indicating notches 13, 14 and 15, which notches have suitable legends indicating the relative position of key 10, as shown in Figures 5 to 7 inclusive. As the air pressure in the air system is the same as the pressure of oil 2, it will, therefore, be evident that the pressure of air admitted to the gauge 11 will act to move the mercury 16 so that the same quantity will flow upwardly through the gauge tube 17 as if the oil were directly acting thereon. As shown in Figure 3, the gauge 11 is provided with what may be termed a base 18 and a top 19, said base and top being formed of metal and provided with extending brackets 20 and 21, whereby the gauge may be mounted on a wall or other support. Base 18 is provided with a comparatively large chamber 22 discharging at the lower end into a passageway 23 which is closed at the end by a screw 24 and which also merges into a verti-

cal passageway 25 positioned to register with the bore 26 of the tube 17. A suitable packing 27 is fitted into the recess 28, whereby the tube 17 is firmly held in place mechanically and is also held liquid-tight at this point. Tube 17 is of glass and is arranged in back of the glass window 29, which window, if desired, may have graduations 30 formed thereon. Base 18 is preferably formed with a hollow threaded extension 31 to which valve 7 is secured by being screwed thereon, whereby air passing through passageway 33 of the valve will enter the hollow extension 31 and thence will pass through the comparatively small pipe 34 and be discharged into a comparatively large pipe 35. Pipe 35 at one point is screwed into base 18 and opens into chamber 22, while the opposite end is screwed into the internally-threaded extension 36 of the top 19. It will, therefore, be seen that when air is discharged from the valve 7 into tube 34 it will fill tube 35 and then press on the mercury 16 in chamber 22. This pressure will cause the mercury to flow through passageway 23 and 25 into bore 26, and the amount of mercury passing into bore 26 will be in direct proportion to the air pressure. The graduations 30 are properly spaced to indicate by the level of the mercury in bore 26, the depth of oil 2.

Tube 17 is fitted into a packing gland 36′ which is provided with suitable packing material to make a liquid-tight connection. A washer 37 of leather or other material is mounted on top of tube 17 and is adapted to be pressed or squeezed by the end of the tubular screw 38. This screw is threaded into the inverted cup 39 and is provided with a head 40, whereby it may be actuated at any time. This screw has a longitudinally-extending bore 41 extending from the lower end upwardly and then merging into a passageway 42 which discharges into the cup 39. Cup 39 is provided with a vent 43, but this vent is located at the top so that a violent discharge of mercury through the passageway 42 will strike the side walls of cup 39 and will fall to the bottom of cup 39 and will not pass through vent 43. Under some circumstances the air system may become clogged or something else may occur and the pressure in the system so raised when pump 8 is operated, that the mercury will be projected violently upwardly through tube 17 and out passageway 42. Cup 39 will catch the mercury and after the break-down has been repaired or adjusted, screw 38 may be moved upwardly, as shown in Figure 4, and the mercury will then flow back into tube 17 until the same assumes the position shown in Figure 3. After this has been done the screw 38 is again moved downwardly until it is in tight contact with washer 37. The parts are then in position for use. When the parts are in the positon shown in Figures 2 and 5 air from pump 8 will pass from tube 9 into valve 7, through passageway 44, and thence into the port 45 which merges into port 46. Port 46 discharges through passageway 47 into tube 6. The air in tube 6 will pass downwardly into pipe 5 and into member 3 until the pressure of oil in these members has been overcome. Air is forced through this path until some escapes from member 3. If the pump should be operated several times after this system has been filled, no damage will be done, as the air will merely escape from member 3 and bubble up through oil 2. There will be no pressure in the tank or double bottom created by the escaping air, as the double bottom or tank is vented. When the air system has been filled as just described, handle 12 will be turned from the position shown in Figures 2 and 5 until the handle is opposite the notch 14. This will move the key 10 to a position shown in Figure 6, whereupon the air in the tube 6 and other parts of the air system will escape through passageway 47, ports 45 and 46, and finally out through passageway 33 into the tubular inlet 31. Air from the tubular inlet 31 will pass upwardly through the tube 34 into the large tube 35 and pressure will be immediately created therein which will act in the mercury in chamber 22, so that some of this mercury will be forced through the passageway 23 and also through the passageway 25 into bore 26. The pressure of the air will be in direct proportion to the pressure of oil 2 and the parts are so proportioned that the mercury 16 will be forced upwardly in bore 26 a distance corresponding to the depth of oil 2. In this way the depth of oil 2 may be ascertained at any time. The handle 12 of valve 7 is turned to the position shown in Figure 7 only for the purpose of permitting the mercury to flow down from cup 39 when it is desired to see that there is the proper amount of mercury in reservoir 22.

From Figure 2 it will be noted that the screw 38 is provided with only a short threaded section, whereby it may be quickly applied or removed. In regard to the inverted cup-shaped member 3, it will be noted from Figure 8 that the same is closed at the bottom but provided with side apertures 49, whereby the oil is permitted to flow freely in and out, but sudden changes will not materially affect the action of the device. As shown in Figure 8, the diaphragm 50 is clamped in place by the flanges on the member 3 and on the head 51. A pipe 5 is threaded into the upper end of the head 51 and extends upwardly a desired distance so that the fitting 53 will be an appreciable distance above the inverted cup-shaped member 3. A threaded plug 54 is screwed into the end of the fitting 53 and is locked against accidental movement by nut 55. An internally-threaded aperture 56 is provided in one end of plug 54, and in this aperture is

arranged a washer or plug 57 of leather, fibre or other suitable material. Pipe 6 is connected in a suitable manner to fitting 53 substantially half-way between the ends of the fitting and discharges into the space 58. A pipe 59 is threaded into a clamping member 60, said clamping member accommodating nut 61, whereby the parts are rigidly clamped to the center of diaphragm 50. As diaphragm 50 moves up and down pipe 59 will move up and down, so that the end 62 will move toward and from the plug or backing 57. End 62 is provided with a small aperture 63, and this aperture is normally spaced a very short distance from the plug 57, as for instance, one sixty-fourth of an inch, though this distance could be greater or smaller without departing from the spirit of the invention. When air is forced into the chamber or space 58 the pressure in this chamber will be raised and some of the air will pass downwardly into the chamber 64 and some will pass through aperture 63 into pipe 59. As the pressure increases it will increase in all these chambers and spaces and eventually will so raise the pressure in the inverted cup-shaped member 3 as to force all the oil therefrom. When this has been done a correct reading may be secured, as heretofore mentioned. When the system is vented or when the air leaks therefrom oil will move back into the cup 3 and upward a short distance in pipe 59. As it begins to move upwardly in pipe 59 it will also act on the diaphragm 50 and raise the same somewhat. This raising movement need only be sufficient to press the end 62 against the plug 57 and then the apertures 63 will be closed or sealed. Any further upward movement of the oil will be checked, as the air pressure in the upper part of pipe 59 will prevent its rise. In this way oil is prevented from passing upwardly and out through the aperture 63. When air is being forced through pipe 6 it is preferably supplied by pump 8 shown in Figs. 1 and 9. This pump is provided with a check valve 65 which permits air to freely enter the barrel or pump but prevents its discharge. The air forced from pump 8 passes through check valve 66 which prevents its return into the pump. From check valve 65 the air passes through fitting 67 and thence into pipe or tube 9. Sometimes too much oil is used in pump 9, and when this is the case the same drains downwardly and accumulates in the bottom part of fitting 67 and the upper part of petcock or valve 68. Before starting pump 8 each time the device is operated petcock 68 is opened and any accumulated oil is discharged. Petcock 68 is again closed, and as the pump continues to function air will be supplied to the air system, as heretofore described. It is, of course, understood that the gauge might be used with some other form of pump than the specific form of pump described, but this form of pump is particularly adapted for this use.

What I claim is:—

1. In a tank gauge, a top plate, a hollow base, a gauge tube of glass connecting said top plate and base, said tube being in communication with the interior of said base, a supply of mercury normally arranged in said base, means for directing air under pressure into the upper part of said base for forcing the mercury into said tube, an inverted cup member rigidly secured to said top plate and fitted over the upper end of said glass tube, said inverted cup-shaped member having a vent out of line with said tube but in a parallel plane and a screw carried by said cup and having a bore extending longitudinally thereof for part of the distance and then laterally to the circumference whereby air and mercury discharged therethrough will be discharged at right angles to the vent in the cup so that the air may escape while the mercury will be retained, said screw being positioned to be normally screwed down so as to press said tube and to have the bore therein in communication with the bore of said tube, said screw also being capable of retraction sufficiently to permit the mercury in the cup to flow back into said tube.

2. In a tank gauge, a gauge tube, means for containing mercury, a supply of mercury in said containing means, means for directing air into said containing means for forcing mercury up into said tube when the gauge is functioning, and means coacting with said tube for venting the air from the tube and catching the mercury accidentally discharged through the top of said tube, said means including an apertured washer resting on the top end of said tube, an inverted cup surrounding the top end of said tube and having a vent out of line with the tube, and a screw carried by the cup, said screw having a longitudinally-arranged bore extending from the end adjacent said washer for part of the length of the screw and then laterally to the surface of the screw, whereby the air and mercury, when passing through the screw, will be discharged at right angles to said vent and thus permit the air to pass through the vent while retaining the mercury, said screw being capable of being rotated so as to move away from said washer and permit the mercury to flow back into said tube.

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