Sept. 17, 1935. J. M. KNIGHT 2,014,739

GAUGING DEVICE FOR CAR TANKS

Filed May 13, 1933 3 Sheets-Sheet 1

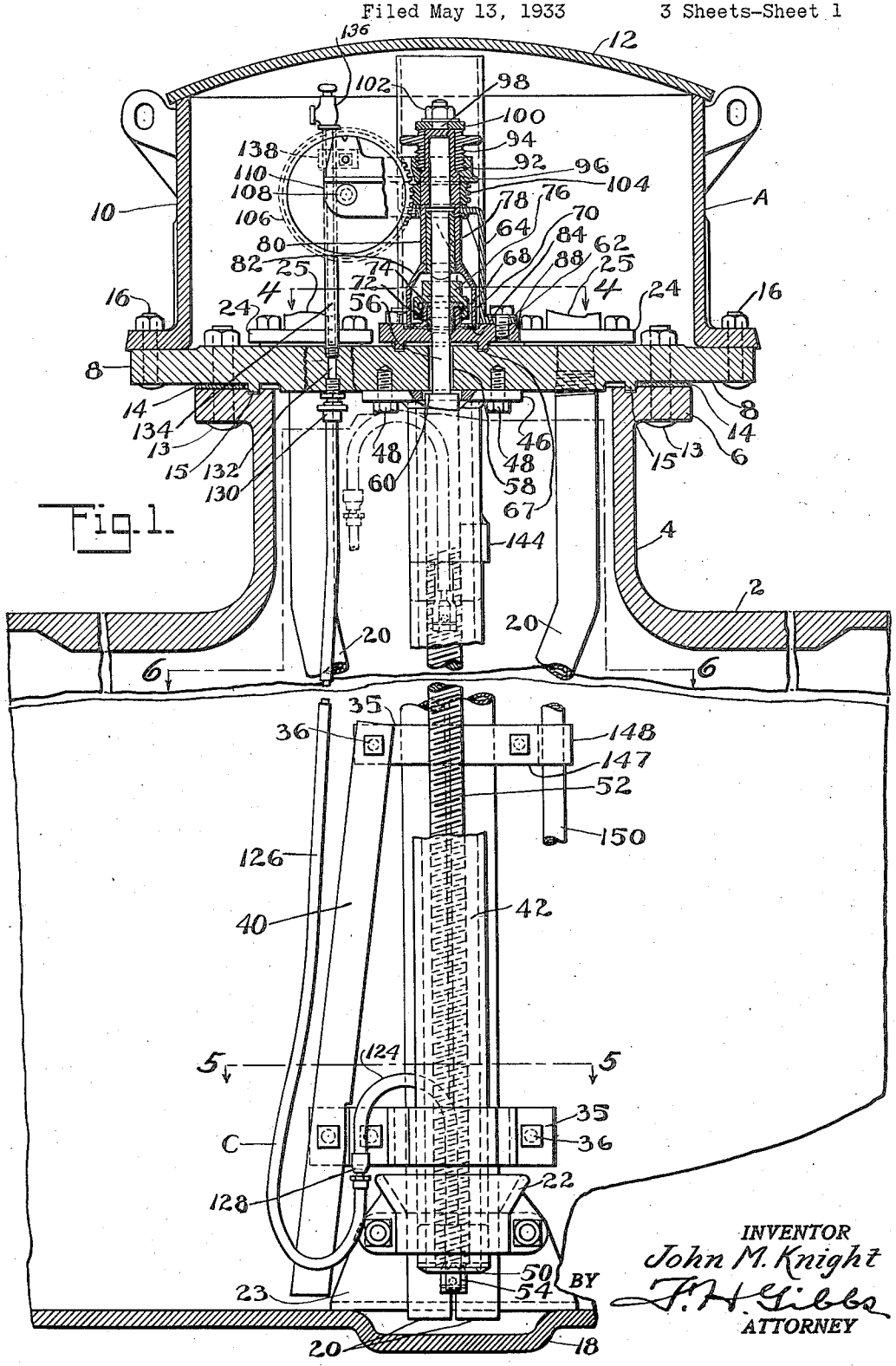

Fig. 1.

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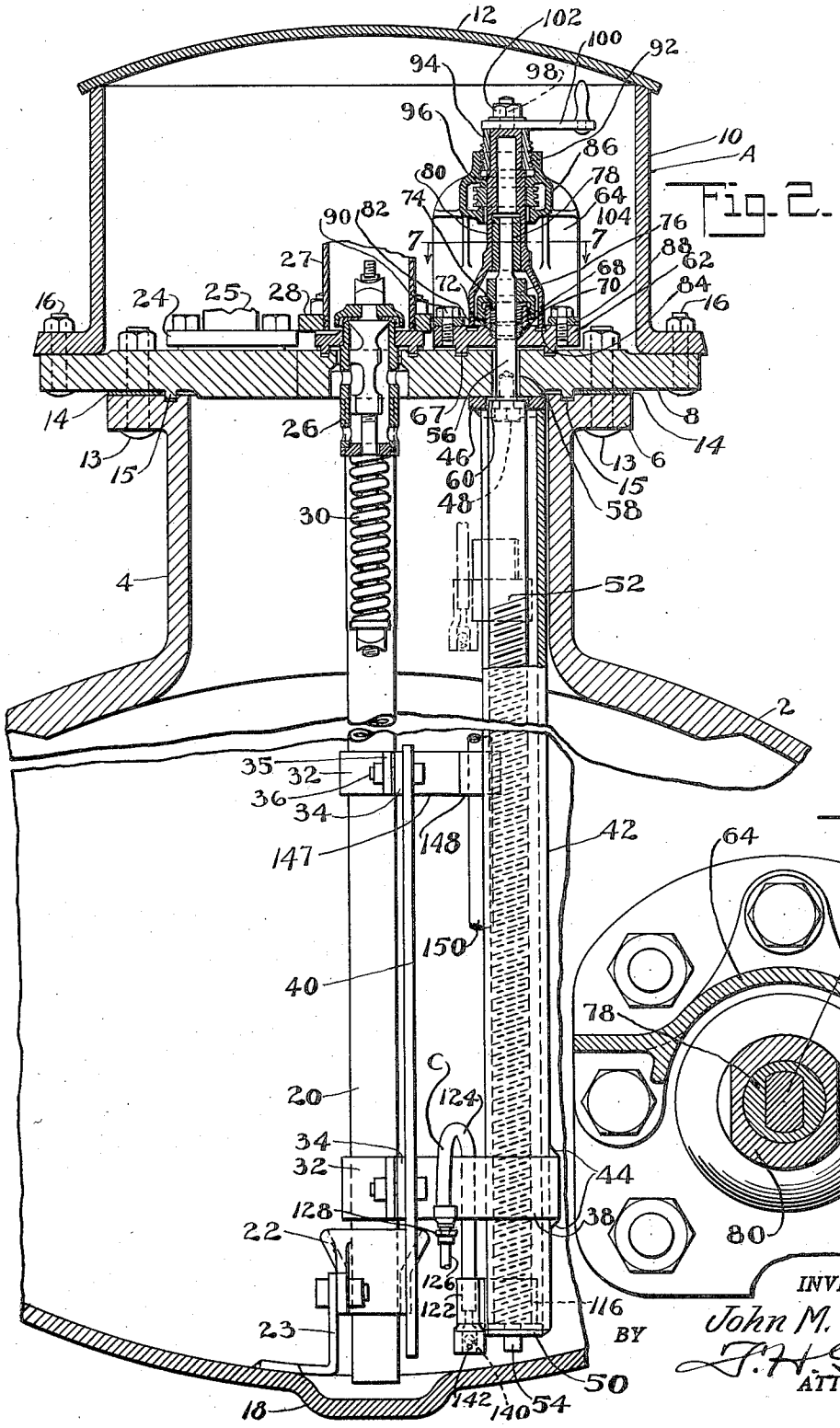

Fig. 2.

Fig. 7.

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Fig. 3.

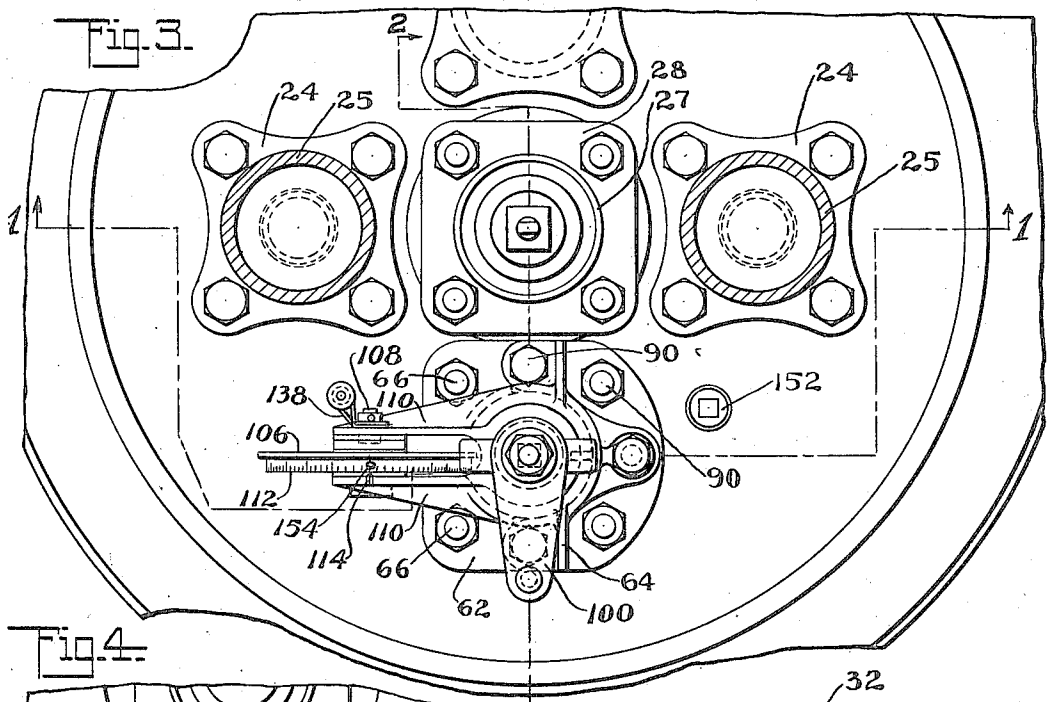
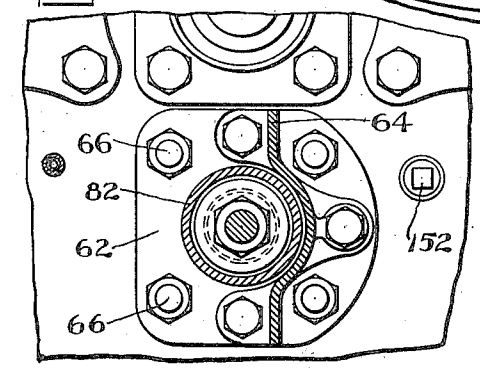


Fig. 4.



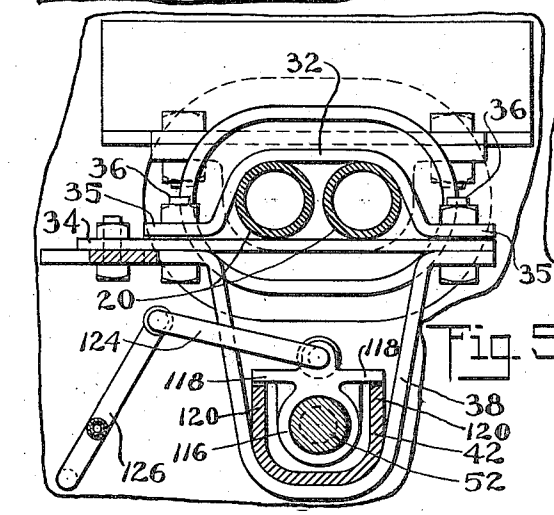
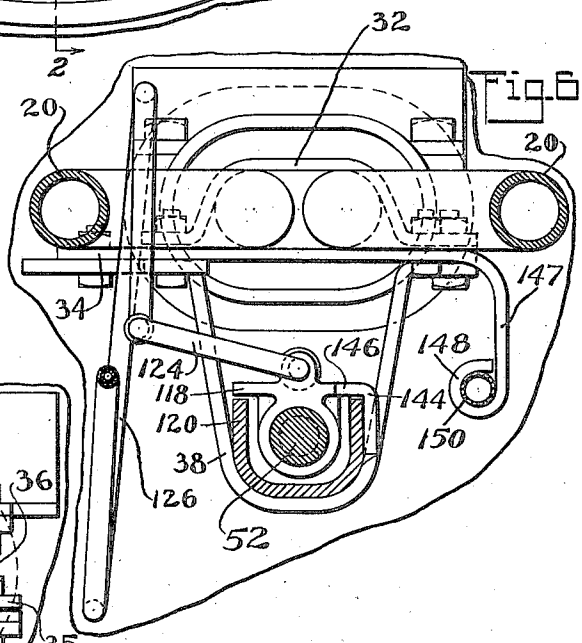


Fig. 5.

Fig. 6.



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2,014,739

GAUGING DEVICE FOR CAR TANKS

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15 Claims. (Cl. 73—120)

This invention relates generally to gauging devices and has particular reference to a device of this character adapted for use with railway car tanks and, in the instance shown, forming a part of the tank car fittings.

One object of this invention is the provision of a device for gauging the contents of a tank.

Another object of this invention is the provision of a gauging device for tanks having registering means associated therewith for visually indicating the amount of lading within the tank.

Still another object of this invention is the provision of a gauging device for car tanks which is permanently attached to the tank or to a dome closure element therefor, which device is provided with registering means for visually indicating the contents of the tank.

A further object of this invention is the provision of a tank gauging device which is easy and comparatively inexpensive to manufacture and which is strong and durable in operation.

Other objects and advantages of this invention will be apparent from the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is a sectional view through a car tank having the present invention applied thereto, the view being taken on the line 1—1, Fig. 3.

Fig. 2 is also a sectional view through a car tank showing the present invention applied thereto, the view being taken on the line 2—2, Fig. 3.

Fig. 3 is a top plan view showing the interior of the dome closure unit.

Fig. 4 is a sectional view on the line 4—4, Fig. 1.

Fig. 5 is a sectional view on the line 5—5, Fig. 1.

Fig. 6 is a sectional view on the line 6—6, Fig. 1, and

Fig. 7 is a sectional view on the line 7—7, Fig. 2.

The drawings disclose portions of a railway car tank comprising a body 2 having a dome 4, the upper edge portion of the latter being provided with an annularly recessed horizontally arranged supporting flange 6 upon which a dome closure unit indicated generally at "A" is supported. As clearly shown in Figs. 1 and 2 this dome closure unit "A" is substantially of box-like form having a bottom 8, a side wall 10 and a top or cover 12, the latter being secured to the wall 10 in any suitable or desired manner as by being hingedly connected therewith or bolted thereto.

The dome closure unit "A" is secured to the flange 6 of dome 4 by suitable fasteners 13 and the bottom 8 of said unit "A" is provided with a depending annular rib 15 which fits into the recess formed in the flange 6 as clearly shown in Figs. 1 and 2. For sealing purposes a gasket 14 is interposed between the flange 6 and the bottom 8 of closure unit "A". The wall 10 of the closure unit "A" is secured to the bottom 8 by suitable fasteners such as the bolts 16.

Formed in the lower portion of the tank body 2 is a sump 18 into which the lower end portions of pipes 20 project, the pipes 20 extending through a guide or positioning element 22 secured to a bracket 23 fastened as by welding to the lower portion of the tank as clearly shown in Fig. 2. The pipes 20 may each be used for filling or discharging purposes and they extend upwardly in the tank and their upper end portions are offset from the lower end portions so as to be relatively widely separated, and the upper ends of the pipes 20 are secured within openings formed in the bottom 8 of the dome closure unit "A". As shown clearly in Figs. 1, 2 and 3 the openings in the bottom 8 in which the upper ends of pipes 20 are secured are closed by the base plates 24 of valve units 25, the valve units being only partially shown inasmuch as the valve portions thereof may be conventional. Suffice to say, that when either of the valves are opened the tank may be filled therethrough, the lading passing into the tank through either of the pipes 20. For discharging the lading from the tank either or both of the pipes 20 with their associated valve units 25 may be utilized. Secured to the bottom 8 of the dome closure unit "A" and, in the instance shown, arranged between the offset portions of the pipes 20 is a safety valve indicated generally at 26, the upper end portion thereof being arranged within a tube 27 secured to the attaching plate 28 for the safety valve. The safety valve 26 is not being described specifically inasmuch as any preferred or desired form of valve may be used, the one illustrated in the drawings being spring pressed by means of the spring 30.

The pipes 20 are retained against relative movement by spaced brackets each formed of members 32 and 34 respectively (see Figs. 5 and 6) between which the pipes 20 are clamped at spaced intervals (see Figs. 1 and 2) member 34 comprising a substantially straight bar, while member 32 is substantially U shaped in plan and provided with flanged end portions 35 through which bolts 36 or other suitable fasteners extend; the bolts 36 of the lower bracket serving also to secure a guide support 38. As will be

apparent the lower bracket constitutes an attaching element for the guide support 38 and the respective brackets are connected together by a tie strap 40, as shown more clearly in Fig. 1.

The guide support 38 is adjacent the lower end portions of pipe 20 and is substantially of flange V shape in plan and serves to support a channel-shaped guide member 42 welded to the guide support as shown in Fig. 2 at 44.

The guide member 42 faces toward the brackets and its upper end portion is provided with an apertured bearing plate 46 which is welded or otherwise suitably attached thereto and bears against the under surface of the bottom 8 of the dome closure unit "A". This bearing plate 46 is attached to the bottom 8 by suitable fasteners such as the screw bolts 48 as shown clearly in Fig. 1. The lower end portion of the guide member 42 is provided with a bottom closure 50 which constitutes a bearing member for the lower end of a screw shaft 52; the lower end portion of the screw shaft being reduced in diameter to provide a pin 54 which projects through an aperture in the bearing plate 50 to position the screw shaft as will be obvious.

The upper end portion of the screw shaft 52 is reduced in diameter to provide a stem 56, which projects through an opening 58 in the bottom 8 of the closure member "A", the reduction in diameter providing an annular shoulder 60 which underlies the bottom 8 of the closure member "A" at the opening 58 whereby to prevent excessive vertical movement of the screw shaft 52.

The stem 56 of the screw shaft 52, in addition to extending through the bottom 8 of the closure unit "A" also projects through the base portion or supporting plate 62 of a bracket 64, this bracket being secured to the upper surface of the bottom 8 by means of suitable fasteners such as screw bolts 66 as shown in Fig. 3. In the instance shown in the drawings the base plate 62 of the bracket 64 is a member independent of the remainder of the bracket but this is merely by way of example as obviously the bracket and base plate may be formed as an integral unit. As shown clearly in Figs. 1 and 2 the base plate 62 is provided with a depending rib 67 which fits into a correspondingly shaped recess formed in the upper surface of the bottom 8 and, if desired, a suitable packing may be placed in the recess for sealing purposes to prevent leakage of gas from beneath the base plate 62 to the interior of the dome closure unit "A". The base plate 62 is provided with an annular exteriorly threaded flange 68 and a depressed portion 70; the stem 56 extending through the depression 70 and being surrounded by the flange 68. Arranged within the depression 70 is suitable packing 72 to form a part of a stuffing box, said packing being adapted to be compressed by a stuffing box gland 74 surrounding the stem 56 and held in position by a check nut 76 threaded to the flange 68 and encircling the stem 56. The upper end portion of the stem 56 has oppositely arranged flattened surfaces positioned within a bushing 78 arranged within the hollow tubular portion of a sleeve 80 the lower end portion of which latter is flared or bell shaped as shown at 82 with its lower edge normally engaged within an annular recess 84 formed in the upper surface of the base plate 62. If desired, suitable packing may be arranged within the recess 84 for sealing purposes.

The sleeve 80 constitutes the operating means for the screw shaft 52, as will be presently described, and passes upwardly through a pocket or hollow hub 86 formed integral with the bracket 64 as more clearly shown in Fig. 2. As mentioned hereinbefore, the bracket 64 and supporting plate 62 are independent members and, in the instance shown, the bracket 64 is provided with horizontally arranged supporting flanges 88 which rest upon the upper surface of the base plate 62 and receive suitable fasteners such as the screw bolts 90 whereby the bracket 64 is rigidly retained in position. Extending upwardly from the hub 86 is an interiorly threaded annular flange 92 which receives a holding nut 94 encircling the upper end portion of the sleeve 80, the latter having its upper end portion reduced in diameter to provide a shoulder 96 with which the lower end of the nut 94 is adapted to engage to urge the sleeve in a downward direction and hold the lower end thereof normally in the recess 84. Projecting upwardly from the upper end portion of the sleeve 80 is a stem 98, squared to receive an operating handle 100 secured in position by a nut 102.

Mounted on the sleeve 80 and arranged within and supported by the hub 86 is a worm 104 which is in mesh with a register gear 106 rotatably mounted on a shaft 108 carried by arms 110 which are preferably formed integral with and which project laterally from the upper portion of the bracket 64 as shown in Figs. 1 and 3. The gear 106 is provided with a graduated scale 112 the individual elements of which cooperate with a fixed indicating mark 114 formed on one of the arms 110 (see Figs. 1 and 3) whereby the extent of rotative moment of the gear 106 may be readily determined. It will be apparent that upon actuation of the handle 100 the sleeve 80 will rotate the screw shaft 52; rotation of the sleeve 80 causing operation of the worm 104 and operation of the register gear 106, thus the extent of the rotative movement of the screw shaft 52 will be visually indicated by the gear 106 and may be accurately determined by the movement of gear 106 relative to the indicating mark 114. In practice, the gear 106 indicates the extent of vertical movement of a slide nut 116 carried by the screw shaft 52 and so formed as to provide oppositely directed flanges 118 which overlap the legs 120 of the guide 42 as shown clearly in Figs. 5 and 6.

The slide nut 116 is provided with a nipple 122 to which one end of a liquid conveying conduit "C" is connected. In the instance shown in the drawings this conduit comprises a gooseneck 124 formed of material which is inflexible, and a flexible conduit 126 coupled to the gooseneck 124 as shown at 128, the flexible conduit 126 having its upper end portion connected to a coupling 130 secured within the bottom 8 of the dome closure "A" at an opening 132. Also connected at the opening 132 and rising upwardly from the bottom 8 within the dome closure unit "A" is an escape pipe 134 having an escape valve 136 at its upper end. For securing the pipe 134 means such as a strap 138 or other fastener is provided which is connected to one of the arms 110 as shown in Figs. 1 and 3. The nipple 122 provides the inlet fitting for fluid to the conduit just described and said nipple is provided with a check valve 140 supported by a pin 142, said valve 140 normally permitting free passage of fluid from within the tank through the nipple 122 to the conduit formed of the portions 124 and 126. In practice, this valve 140

is of metal and, under normal conditions, with the valve 136 open for the purpose of ascertaining the contents of the interior of the tank, either gas or liquid will pass by the valve 140 without closing the passageway through the nipple. Under a sudden rush of fluid or gas resulting from abnormal conditions such as the breaking of pipe 134 or valve 136, the valve 140 will close the passage through the nipple to the escape of either fluid or gas.

The slide nut 116, as mentioned before, is movable vertically on the screw shaft 52 upon rotation of the latter. This will be apparent from the construction shown and described. Secured to the guide 42 adjacent its upper portion is a stop or abutment 144 having a portion 146 extending into the path of movement of one of the flanges 118 of the stop nut as shown in Fig. 6 whereby to limit the extent of upward movement of the nut 116 on the screw shaft 52.

Referring to Figs. 1, 2 and 6 it can be seen that the member 34 of the upper pipe clamp unit is provided with an extension 147 arranged at right angles to the member 34 and formed at its end into a loop 148 which holds a thermometer well 150, the upper end portion of the latter extending upwardly into the bottom 8 of the dome closure unit "A" and being provided with an end closure 152, (see Fig. 3).

In use when it is desired to gauge the contents of the tank which is filled to the desired level with fluid the parts are in the position indicated in the drawings with the slide nut 116 in its lowermost position as shown more clearly in Fig. 2. It will be apparent that should the valve 136 be opened with the slide nut in its lowermost position liquid will be forced through the conduit "C" and out of the valve 136. The scale 112 is so arranged on the gear 106 that with the slide nut 116 in its lowermost position the indicating mark 114 will register with a zero mark 154 on the scale 112. Rotation of the handle 100 to turn the sleeve 80 and rotate the screw shaft 52 will cause vertical shifting of the slide nut 116 on the screw shaft 52 and a simultaneous rotation of the worm 104 and the register gear 106, the latter cooperating with the indicating mark 114 to indicate the extent of upward movement of the slide nut 116 within the tank. During this movement opening of the valve 136 will indicate whether the slide nut 116 is within the liquid or above the liquid; if within the liquid in the tank liquid will be discharged from the valve 136 because of the pressure within the tank, while if the slide nut reaches the surface of the liquid gas will be discharged from the valve 136. Thus an accurate gauging of the quantity of liquid within the tank may be readily and easily ascertained.

From the above description it can be seen that the extent of movement of the slide nut 116 is indicated on the scale 112 and the level of the liquid within the tank is accurately determined.

The drawings herein illustrate one embodiment of the invention but it is to be understood they are for illustrative purposes only and various changes in the form and proportions of the construction may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. In a quantity gauging device for liquids under pressure, the combination of a tank, a flexible conduit within the tank having an intake end and a discharge end, rotatable means to which the intake end of the conduit is connected in such a manner as to be elevated and lowered within the tank on and with respect to said means, an escape valve at the upper portion of the tank discharging outside the tank and to which the discharge end of the conduit is connected, and means for registering the extent of movement of the intake end of the conduit operatively connected with the rotatable means.

2. In a liquid level gauge for a tank having a dome closure element, an escape valve supported within the dome closure element, and a gauging device for the tank comprising a flexible conduit suspended from the dome closure element and having its outlet end connected with said escape valve, an inlet fitting secured to the opposite end of said flexible conduit, and rotatable means on which said inlet fitting is non-rotatably supported so as to be elevated above the level of the liquid in the tank upon rotation of said rotatable means whereby said level may be ascertained by the escape of liquid and of gas through the conduit and escape valve.

3. In a liquid level gauge for a tank having a dome closure element, an escape valve supported by said element, and a tank gauging device comprising a flexible conduit having its outlet end connected with said escape valve and its inlet end provided with an inlet fitting, a screw shaft on which said inlet fitting is non-rotatably supported, means for rotating said screw shaft to cause elevation of the inlet fitting above the level of the liquid in the tank whereby said level may be ascertained by the escape of liquid and of gas through the conduit and escape valve, and a register gear correlated to the screw shaft for visually indicating the extent of movement of the inlet fitting.

4. In a liquid level gauge for a tank having a dome closure element, an escape valve supported by said element, and a gauging device for the tank comprising a flexible conduit having its outlet end arranged to discharge into the escape valve, a screw shaft rotatably mounted within the tank and having its upper end portion extended into the dome closure element, an inlet fitting for said conduit including a slide nut non-rotatably mounted on the screw shaft, means for rotating said screw shaft to effect elevation of the slide nut thereon whereby said inlet fitting may be elevated above the level of the liquid in the tank so that said level may be ascertained by the escape of liquid and of gas through the conduit and escape valve and a register gear operative in response to actuation of said screw shaft rotating means to visually indicate the extent of movement of said slide nut.

5. A gauging device for car tanks comprising a rotatable screw shaft arranged vertically within the tank, a dome closure unit through which the shaft projects, a fluid inlet fitting mounted on the screw shaft, a guide within which said screw shaft is mounted, said guide and inlet fitting being relatively so formed and arranged as to prevent rotation of the inlet fitting relative to the screw shaft upon rotation of the latter, but to cause vertical shifting of said inlet fitting on said screw shaft, a flexible conduit having one end portion thereof connected with the inlet fitting and its opposite end arranged to discharge out of the tank, and means for rotating said screw shaft to elevate said inlet fitting above the level of the liquid in the tank whereby the level of the liquid may be ascertained by the escape of liquid and of gas through the flexible conduit.

6. A gauging device for car tanks comprising a rotatable screw shaft arranged vertically within the tank, a dome closure unit through which the shaft projects, a fluid inlet fitting mounted on the screw shaft, a guide within which said screw shaft is mounted, said guide and inlet fitting being relatively so formed and arranged as to prevent rotation of the inlet fitting relative to the screw shaft upon rotation of the latter, but to cause vertical shifting of said inlet fitting on said screw shaft, a flexible conduit having one end portion thereof connected with the inlet fitting and its opposite end arranged to discharge out of the tank, means for rotating said screw shaft to elevate said inlet fitting above the level of the liquid in the tank whereby the level of the liquid may be ascertained by the escape of liquid and of gas through the flexible conduit, and registering means cooperatively associated with the screw shaft and operative in response to rotation thereof to visually indicate the extent of movement of the inlet fitting within the tank.

7. In a liquid level gauge for a car tank having a dome closure element, a rotatable screw shaft in the tank, a guide for the screw shaft rigidly supported in the tank, the upper end portion of said screw shaft projecting into the dome closure element, a fluid inlet fitting mounted on the screw shaft and having portions lapping the guide in such a manner that said fitting is restrained against rotation on the screw shaft, a vent pipe in the dome closure element, a flexible conduit connected with the fluid inlet fitting and communicating with the vent pipe, a screw shaft actuator connected with the upper end portion of the screw shaft and having a worm thereon, a register gear in mesh with said worm, and means for operating the actuator to effect rotation of the screw shaft and worm whereby to elevate the inlet fitting and actuate the register gear in accordance with the extent of movement of said fitting.

8. A device for gauging the contents of a tank comprising a vent pipe having an escape valve, a flexible conduit having one end thereof communicating with the vent pipe, a fluid inlet fitting to which the opposite end of said conduit is connected, a rotatable screw shaft on which said inlet fitting is mounted for longitudinal but non-rotative movement and means for rotating said screw shaft to elevate the fitting in the tank above the level of the liquid therein whereby the said level may be ascertained by the escape of liquid and of gas through said conduit and escape valve.

9. In a liquid level gauge for a car tank provided with a dome closure unit having a bottom wall rigidly secured to the dome, a rotatable screw shaft in the tank having its upper end portion reduced in diameter and extended through the bottom wall of said dome closure unit, a guide rigidly positioned within the tank and in which said screw shaft is supported, a flexible conduit depending from the bottom wall of the dome closure unit and discharging therethrough, an inlet fitting secured to the opposite end portion of said conduit, said fitting being mounted on the screw shaft and having portions lapping the guide whereby to be restrained against rotation relative to the screw shaft, a bracket supported by the bottom wall of the dome closure unit and through which the upper end portion of the screw shaft projects, said bracket having a hub portion, an actuator mounted in the bracket and having its lower end portion so formed as to cooperate with the bracket in a sealing manner to prevent leakage of gas into the dome closure unit, said actuator being connected with the projecting end portion of the screw shaft, a worm secured to the actuator and arranged within the hub of said bracket, and a register gear in meshing relation with said worm and means for rotating said actuator to effect actuation of the worm and register gear and screw shaft to cause elevation of the inlet fitting in the tank.

10. In a liquid level gauge for a tank having a dome closure unit comprising a box-like structure, and a gauging device for the tank comprising a vent pipe secured within the dome closure unit, a conduit in the tank having one end thereof in communication with the vent pipe to discharge therethrough, an inlet fitting for the opposite end of said conduit, a rotatable shaft arranged in the tank and on which said inlet fitting is mounted, the upper end portion of said shaft projecting into the dome closure unit. a shaft support with which said inlet fitting cooperates in such a manner as to be restrained against rotation on the shaft during rotation of the latter, a bracket secured within the dome closure unit, and means guided by said bracket and connected with the shaft and operable to rotate the latter to cause elevation of the inlet fitting on said shaft above the level of the liquid in the tank whereby said level may be ascertained by the escape of liquid and of gas through the conduit and vent pipe.

11. In a liquid level gauge for a car tank having a dome and a dome closure unit secured to said dome and substantially box-like in form, a gauging device comprising a conduit in the tank, a valved vent pipe in the dome closure unit with which the conduit communicates, a rotatable shaft in the tank having its upper end portion extended into the dome closure unit, an inlet fitting for the conduit mounted on the shaft, a guide in which the shaft is arranged and supported and with which the inlet fitting cooperates to be restrained against rotation relative to the shaft, and means arranged within the dome closure unit and connected with the upper end portion of the shaft and operative to rotate the latter to effect elevation of said inlet fitting above the level of the liquid in the tank whereby said level may be ascertained by the escape of liquid and of gas through the conduit and vent pipe.

12. In a liquid level gauge for a tank having a dome and a dome closure unit secured to said dome and substantially box-like in form, a gauging device comprising a conduit in the tank, a valved vent pipe in the dome closure unit with which the conduit communicates, a rotatable shaft in the tank having its upper end portion extended into the dome closure unit, an inlet fitting for the conduit mounted on the shaft, a guide in which the shaft is arranged and supported and with which the inlet fitting cooperates to be restrained against rotation relative to the shaft, means arranged within the dome closure unit and connected with the upper end portion of the shaft and operative to rotate the latter to effect elevation of said inlet fitting above the level of the liquid in the tank whereby said level may be ascertained by the escape of liquid and of gas through the conduit and vent pipe, and registering mechanism correlated to the shaft and operative in response to rotation thereof and in accordance with the movement of the inlet fitting to indicate the extent of movement of said fitting.

13. In a liquid level gauge for a tank provided with a dome and means for closing the dome, the combination of a gauging device comprising a conduit having its outlet end arranged to discharge above the dome, rotatable means in the tank with which the inlet end of said conduit is non-rotatably connected so as to be elevated in the tank above the level of the liquid therein upon rotation of said means whereby the level of the liquid may be ascertained by the escape of liquid and of gas through said conduit, and registering means operatively associated with said rotatable means and so arranged relative thereto as to visually indicate the extent of movement of the inlet end of said conduit.

14. In a liquid level gauge for a tank, an escape pipe projecting from the upper portion of the tank and provided with an escape valve discharging outside the tank, and a gauging device for the tank comprising a flexible conduit having an intake end and a discharge end, said discharge end being connected with the escape pipe, and rotatable means to which the intake end of the conduit is secured in such a manner as to be elevated and lowered within the tank on and relative to said rotatable means whereby the liquid level in said tank may be ascertained by the escape of liquid and of gas through the conduit and escape valve.

15. In a liquid level gauge for a tank, an escape pipe projecting from the upper portion of the tank and provided with an escape valve discharging outside the tank, and a gauging device for the tank comprising a flexible conduit having an intake end portion and a discharge end portion, said discharge end portion being connected with the escape pipe, rotatable means in the tank extending to substantially the lower portion thereof and to which the intake end portion of the conduit is connected, and means restraining the intake end portion of the conduit against rotation with the rotatable means, said intake end portion being so connected to the rotatable means as to be elevated and lowered within the tank upon rotation of said rotatable means whereby the liquid level in said tank may be ascertained by the escape of liquid and of gas through the conduit and escape valve.

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