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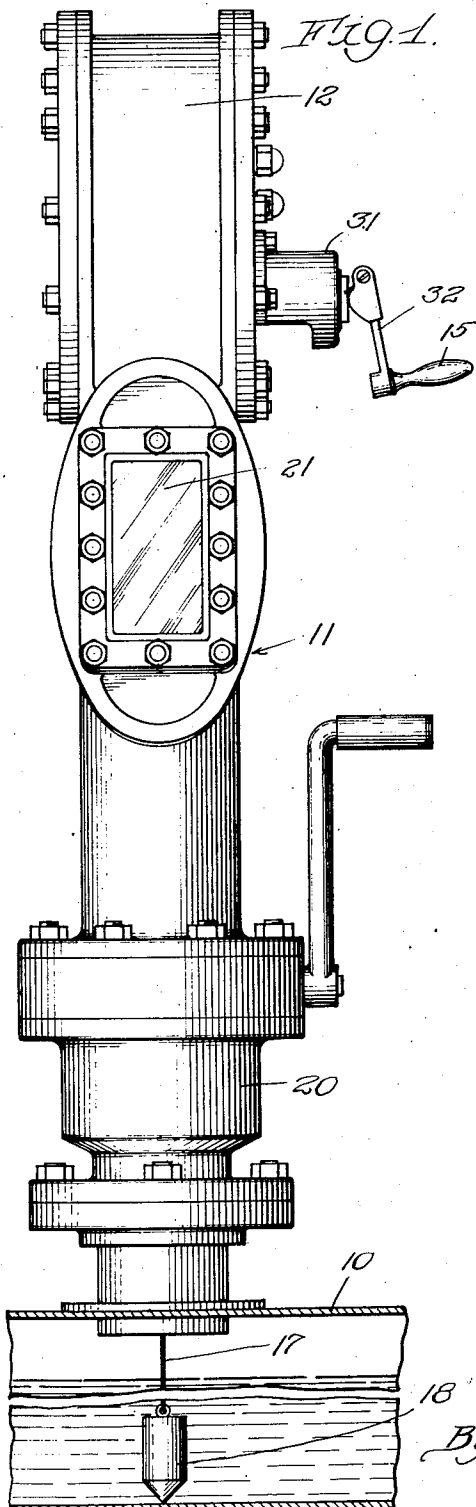
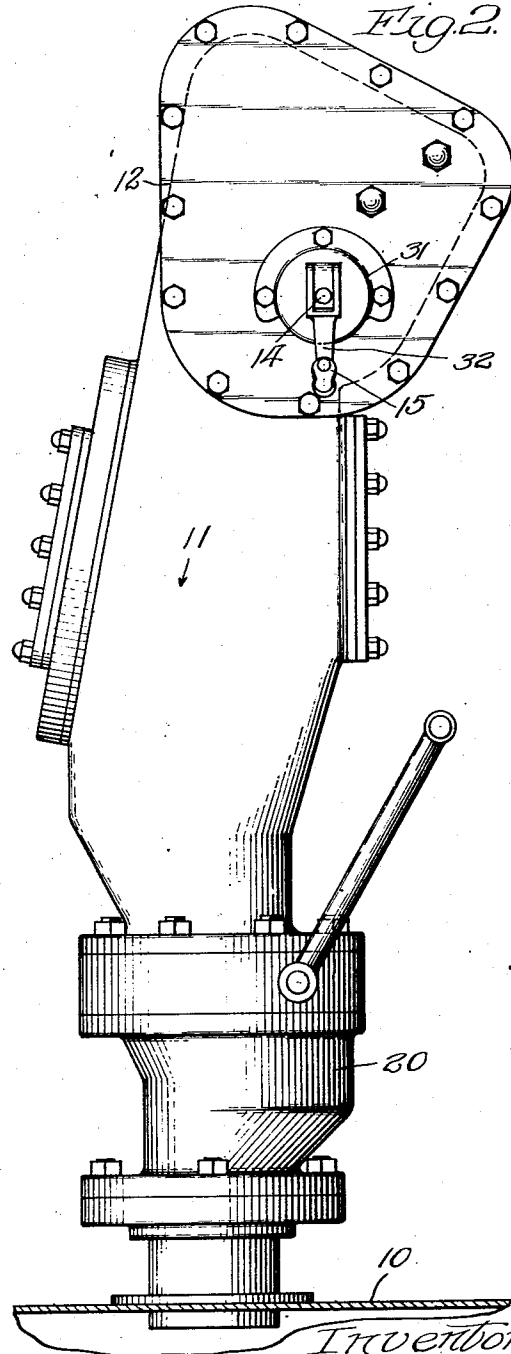
D. E. LARSON

2,265,736

TANK GAUGE

Filed Dec. 30, 1940

2 Sheets-Sheet 1



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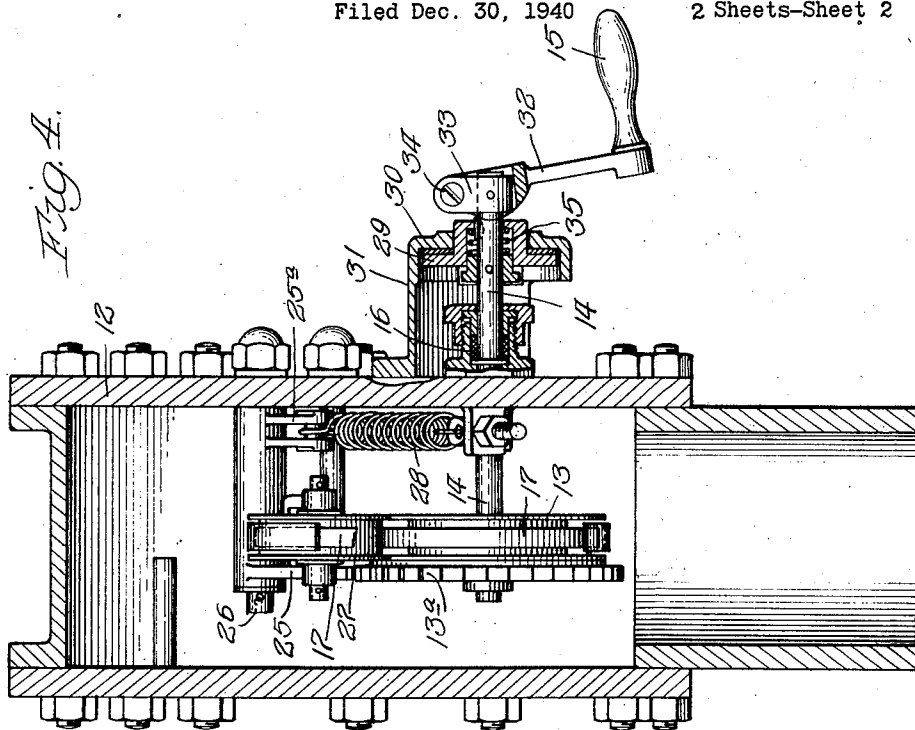
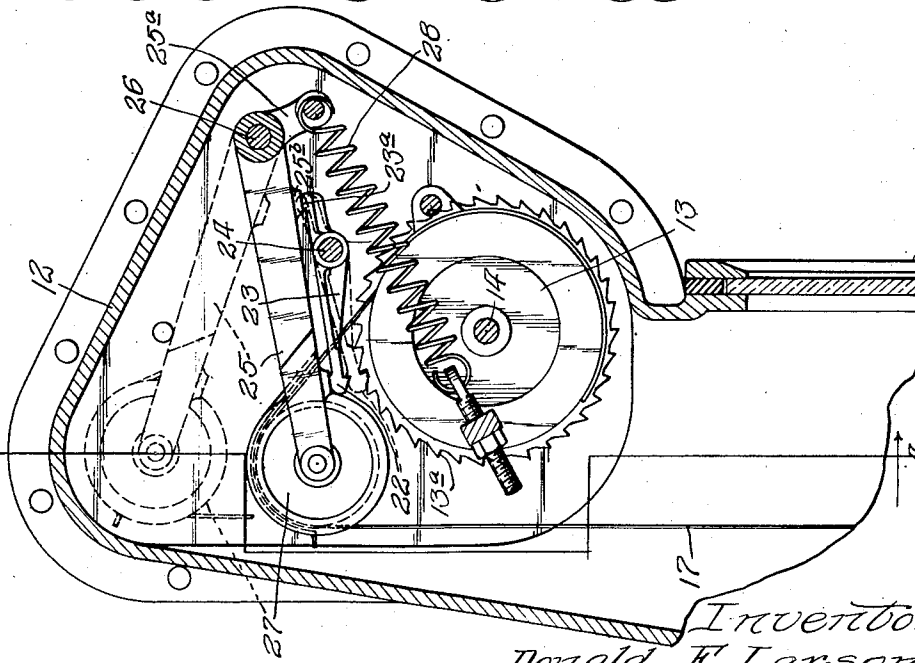
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TANK GAUGE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,265,736

TANK GAUGE

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9 Claims. (Cl. 33—126.6)

This invention relates to improvements in tank gauge and more especially such a device for measuring the height of liquid in a container. The invention is particularly applicable for use in connection with oil storage tanks and more especially closed tanks. For example, gasoline and similar volatile hydrocarbon oils are frequently kept in closed containers under pressure. My device can be used with such a container and operated at all times without releasing the pressure or venting the gas from the container.

My improved device is also useful in connection with a container having a flexible roof. The device is mounted on the roof and vertical movement of the latter does not affect the gauging operation.

Other features and advantages of my invention will appear more fully as I proceed with my specification.

In that form of device embodying the features of my invention illustrated in the accompanying drawings, Fig. 1 is a view in front elevation; Fig. 2 is a view in side elevation; Fig. 3 is a vertical sectional view of the reeling mechanism; and Fig. 4 is a view taken as indicated by the line 4 of Fig. 3.

As shown in the drawings, 10 may indicate a roof or top of a tank such as an oil storage tank. 11 indicates in general a casing suitably mounted on the roof in any convenient manner.

The upper part of the casing as indicated by 12 contains reeling means for an elongated flexible element such as a steel tape carrying a weight or bob on the lower end. By means of the reeling mechanism the lower end of the tape may be raised or lowered to raise or lower the weight. As so far described, the gauging mechanism is conventional. It has been the practice to lower the weight until it engages the bottom of the tank and then pull up the tape and note the height of the wet portion. The tape may be suitably coated so that the line between the wet and dry portions can be easily noted. This is all old in the art.

Heretofore, difficulty has been encountered in noting just when the weight engages the bottom of the tank. Unless the weight is very heavy, the differences in tension caused by the weight striking the bottom was not readily ascertainable at the top. The principal feature of my invention is the provision of automatic locking means for the reeling mechanism so that when the weight strikes the bottom the reeling means will be automatically locked. This prevents the lowering of additional tape into the liquid that obviously

would give a false indication of the height of the liquid in the tank.

In general, my invention is accomplished by providing locking means for the reeling mechanism which is normally in locking position and providing in conjunction therewith means operated through the flexible element by the weight when suspended thereby for holding the locking means in release position. When the weight engages the bottom of the tank it no longer holds the locking means in release position and said locking means thereby moves automatically to locking position to hold the reeling means stationary.

13 indicates a reel or drum mounted on the shaft 14 operated by the handle 15. Where the shaft projects from the casing 12 suitable packing is provided as indicated by 16. 17 indicates a steel tape wound on the drum 13 carrying on its lower end the bob or weight 18 adapted to engage the bottom 19 of the tank when in its lowermost position.

The lower part of the casing 11 is provided with a chamber 20 containing closure means (not shown) adapted to close the casing 11 against escape of gas from the tank and yet permit the tape 17 to remain thereon. Such closure means is well known in the art and forms no part of the present invention and consequently need not be shown here in detail. It is ordinarily provided to permit opening of the window 21 in the casing 11, if desired, without permitting escape of gas therefrom.

The drum 13 at one side carries the ratchet wheel 13a, the teeth of which are adapted to be engaged by the claw 22 on the end of the arm 23 pivoted on the stationary pin 24. The arm 23 is provided with a rearwardly extending portion 23a adapted to be engaged by the arm 25 pivoted at 26 and carrying the wheel 27 on its free end over which the tape 17 passes. The arm 25 is provided with an extension 25a in the nature of a bellcrank connected to the tension spring 28 which tends to move the arm 25 into the dotted position shown in Fig. 3; that is, with the wheel 27 raised. When in this position the claw 22 on the small lever 23 falls into locking position or engagement with the teeth on the ratchet wheel 13a. When the arm 25 is pulled down, the projection 25b thereon engages the end 23a of the lever 23 to rock the same clockwise on the pin 24 to disengage the claw 22 from the teeth to release or unlock the ratchet wheel.

Clutch means are also provided for automatically locking the wheel 13 against movement

when the handle 15 is released. 29 indicates a clutch member slidably but non-rotatably mounted on the shaft 14 and normally pressed into engagement with the cooperating clutch member 30 carried by the extension casing 31 on the casing 11 around the shaft 14. The member 30 is stationary in the casing 31. The handle 15 is carried on the crank 32 pivotally mounted to the member 33 on the shaft 14. Normally the members 29 and 30 are in frictional engagement to prevent rotation of the shaft. To release these the crank 32 is swung on its pivot 34 to press the member 29 inwardly against the tension of the spring 35 to release the clutch to permit rotation of the shaft. Upon release of the handle 15 the clutch is automatically engaged.

In operation, before the gauging is commenced, the parts are in the position shown by the solid lines in Fig. 3. In this position the weight is suspended by the tape 17 and is heavy enough to extend the spring 28 so that the arm 25 is engaging the end 23a of the locking lever 23 to hold the same in released position. The tape is then unreeling slowly until the bob 18 engages the bottom 19 of the tank. As the weight of the bob is then removed from the tape 17 further unreeling causes the spring 28 to raise the arm 25. This permits the claw 22 to drop into engagement with one of the teeth on the wheel 13a and lock the reeling mechanism against further unwinding. The tape is then wound up and the height of liquid thereon noted through the window 21.

It is to be noted further that the device automatically locks the reel and simultaneously insures application of tension to the tape 17 through the action of the spring 28. This tension is not of an exact predetermined value, but it is substantially constant through general limits and is sufficient for ordinary gauge indications. If the top of the tank moves upwardly a small amount after the reel has been locked, this small movement is accommodated by action of the spring 28 to maintain a substantially constant tape tension. If greater upward movement at the top of the tank occurs, then the ratchet 22 unlocks for one or more teeth of the ratchet wheel, thus automatically maintaining tension and insuring that the weight remains in contact with the bottom. Should the top of the tank move downwardly from its initial position, then this movement is accommodated by the relative upward movement of the reel 27 under the action of spring 28.

The action of the spring 28 in conjunction with the ratchet 22 is to automatically apply tension on the tape after the weight has engaged the bottom of the tank, and to maintain tension irrespective of movement of the top of the tank. In other words, the action of the spring 28 in conjunction with the ratchet 22 automatically applies tension on the tape after the weight has engaged the bottom of the tank and maintains tension irrespective of the movement of the top of the tank. It is generally desirable to apply a more or less uniform tension to the tape during the taking of readings in order to prevent inaccuracies. In other words, the spring 28 acts as a biasing means in conjunction with the releasable locking means for automatically applying substantially uniform tension to the tape when the weight rests on the bottom of the tank.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications.

Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art.

What I claim as new and desire to secure by Letters Patent is:

1. A tank gauge, including: an elongated flexible element adapted to extend down into the tank; reeling means adjacent the top of the tank to raise or lower the lower end of the flexible element; a weight carried by the lower end of the flexible element; locking means for the reeling means; means operated through the flexible element by the weight when suspended thereby for holding the locking means in release position; and means for imposing a tension on the flexible element (insufficient to lift the weight) when the locking means is in locked position.

2. A tank gauge, including: an elongated flexible element adapted to extend down into the tank; reeling means adjacent the top of the tank to raise or lower the lower end of the flexible element; a weight carried by the lower end of the flexible element; locking means for the reeling means; means urging the locking means into locking position; and means operated through the flexible element by the weight when suspended thereby for moving the locking means to release position against said urging means, said urging means imposing a tension on the flexible element (insufficient to lift the weight) when the locking means is in locked position.

3. Apparatus as claimed in claim 1, in which the means operated by the weight includes a movable member carrying a wheel over which the flexible element lies.

4. Apparatus as claimed in claim 2 in which the means operated by the weight includes a movable member carrying a wheel over which the flexible element lies.

5. Apparatus as claimed in claim 1 with a handle for operating the reeling means and clutch mechanism for holding the reeling means against rotation, said clutch mechanism adapted to be released by movement of the handle to operative position.

6. Apparatus as claimed in claim 2 with a handle for operating the reeling means and clutch mechanism for holding the reeling means against rotation, said clutch mechanism adapted to be released by movement of the handle to operative position.

7. In combination with a tank having a vertically movable top, a tank gauge, including: an elongated flexible element adapted to extend down into the tank; reeling means adjacent the top of the tank to raise or lower the lower end of the flexible element; a weight carried by the lower end of the flexible element; and means for maintaining substantially uniform tension on the elongated flexible element after the weight touches the bottom of the tank, regardless of vertical movement of the top of the tank within limits.

8. In combination with a tank having a vertically movable top, a tank gauge, including: an elongated flexible element adapted to extend down into the tank; reeling means adjacent the top of the tank to raise or lower the lower end of the flexible element; a weight carried by the lower end of the flexible element; locking means

for the reeling means normally in locking position; and means for automatically maintaining substantially uniform tension on the elongated flexible element after the weight touches the bottom of the tank, regardless of vertical movement of the top of the tank within predetermined limits, and upward movement of the top of the tank beyond a predetermined limit operating to release the locking means.

9. A tank gauge, including: an elongated flexible element adapted to extend down into the tank; a weight carried by the lower end of the

flexible element; reeling means normally free for rotation when the weight is suspended by said elongated flexible element; locking means for the reeling means; means releasable by decreased tension on said elongated flexible element to release said locking means and lock said reeling means, said releasable means operating to impose a tension on the flexible element (insufficient to lift the weight) when the locking means is in locking position.

DONALD E. LARSON.