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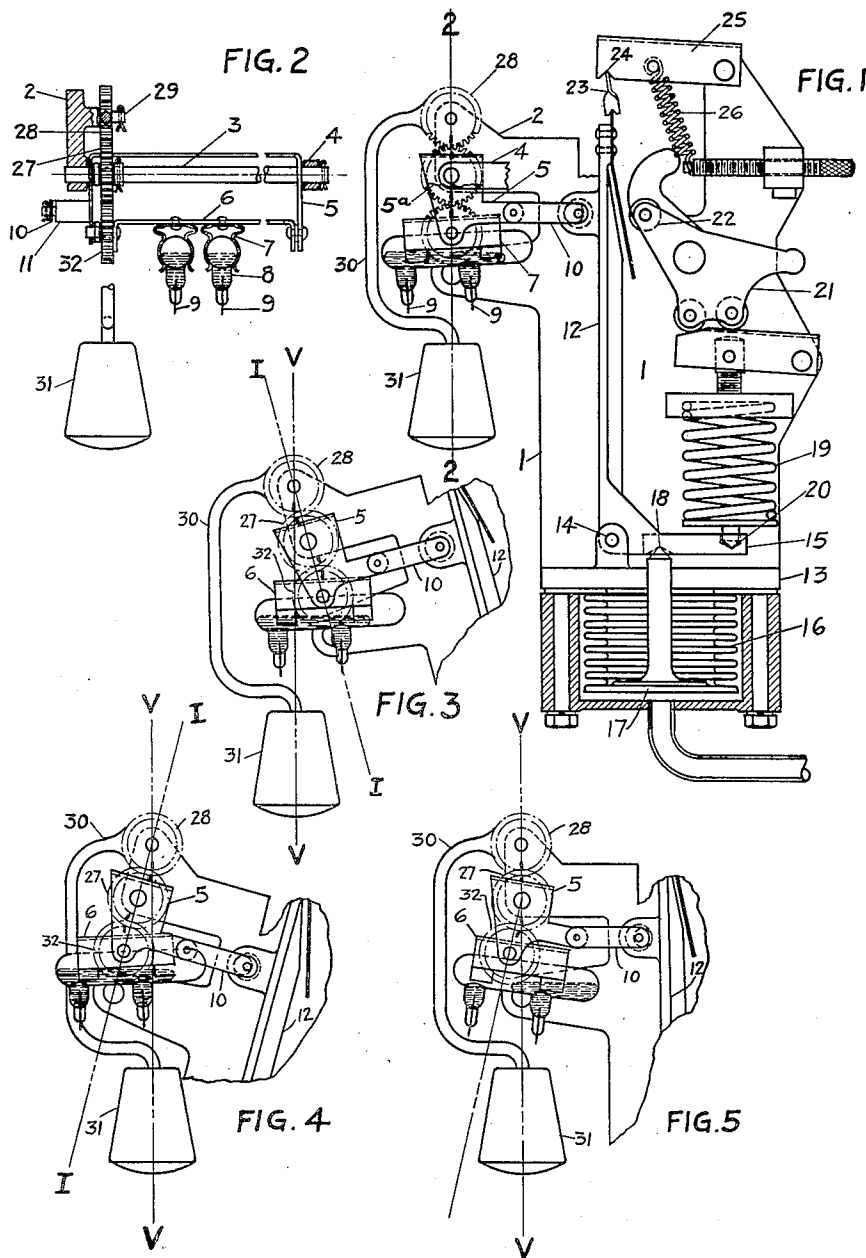
R. L. JEWELL

2,214,556

LEVEL MAINTAINING DEVICE

Filed Jan. 14, 1939

2 Sheets-Sheet 1



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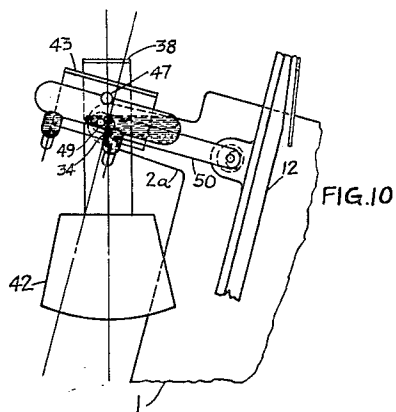
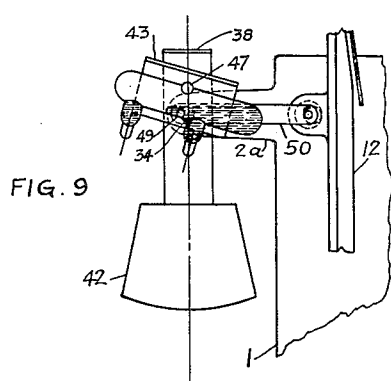
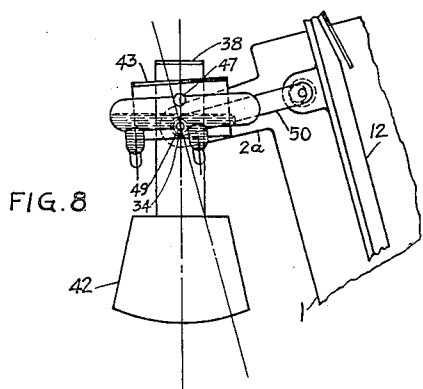
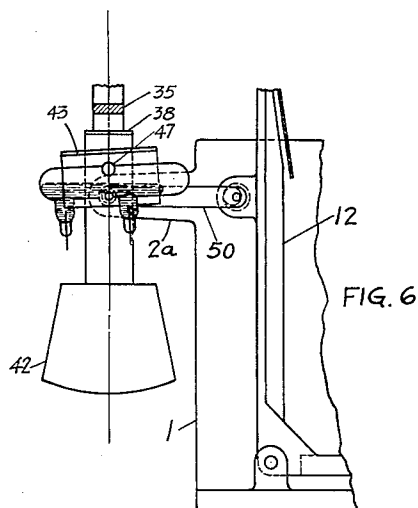
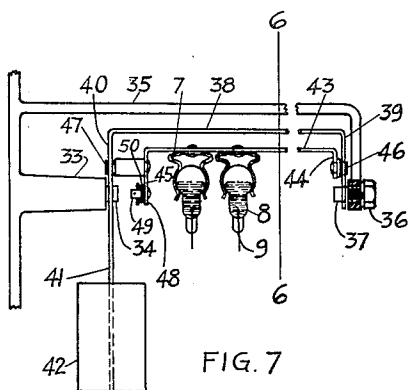
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LEVEL MAINTAINING DEVICE .

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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,214,556

## LEVEL MAINTAINING DEVICE

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Application January 14, 1939, Serial No. 251,018

12 Claims. (Cl. 200—83)

The present invention is designed to maintain the level of a member, the support of which is subjected to variations of movement. The invention is exemplified as maintaining the level of a mercury switch, the support of which, such as a boat, tends to vary the level of the switch. In carrying out the invention, it is desirable to provide means whereby the switch may be adjusted (turned on or off) and still leave it subject to the control of the leveling means, and the present invention contemplates such means. Features and details of the invention will appear from the specification and claims.

Preferred embodiments of the invention are illustrated in the accompanying drawings as follows:

Fig. 1 shows an elevation, partly in section, of a switch element and controls therefor, the parts being in a vertical position, and with the switch in the on position.

Fig. 2 shows a section on the line 2—2 in Fig. 1.

Fig. 3 shows a view of a switch similar to Fig. 1, but with the support inclined as indicated in the line I—I, V—V indicating the vertical line as related to the switch member.

Fig. 4 a similar view with an opposite inclination from that of Fig. 3.

Fig. 5 a similar view with the support and switch members in vertical relation, but with the switch in off position.

Fig. 6 a front elevation, partly in section on the line 6—6 in Fig. 7.

Fig. 7 a side elevation of the switch controlling mechanism.

Fig. 8 is a view similar to Fig. 6, but showing the support 1 inclined.

Fig. 9 a view similar to Fig. 6, but with a tilted adjustment of the switch tubes.

Fig. 10 a view showing the adjustment of the tubes similar to Fig. 9, but with an inclination of the support.

In the structure as shown in Figs. 1 to 5, 1 marks the frame of the switch support. This has a projection 2 on which the switch member is mounted. A pin 3 is fixed in the projection 2, the opposite end of the pin being supported by an arm 4 extending from the frame. A mounting 5 is pivoted on the pin 3. This mounting as shown, is U shaped with two downwardly extending arms between which a tilting holder 6 is pivoted. The outer one of the arms is shown broken away at 5a.

The tilting holder is provided with a series of clips 7, in which the mercury tubes 8 are placed in the usual manner. The usual terminals 9

extend from the mercury tubes, the switch as shown, being closed when the tube is in horizontal position.

A post 11 extends from the mounting 5, and this is connected by a link 10 with a controlling arm 12. The arm 12 is pivoted on the base 13 of the frame by means of a pin 14. The controlling arm has a bell crank arm 15. As shown the switch is subjected to control of a pressure device 16, having its movable pressure element 17 engaging the bell crank arm 15 at 18. A spring 19 opposes the pressure element 16 and engages the arm 15 at 20. The spring 19 may be thrown into operated position by a control member 21, which may be manually actuated for throwing the pressure control in or out of action. As shown, the pressure control is in action, but when the member 21 is rocked, the roller 22, carried by the member, engages the arm 12 directly and thus controls it, through manual manipulation of the member 21.

As the arm 12 is moved, either by the pressure device or manually through the member 21, this movement is communicated through the link 10 to the mounting 5, and the switch member or holder is tilted so as to throw the switch off or on. A push member 23 extends from the upper end of the arm and engages at 24 a swinging bar 25 mounted on the frame 1. A spring 26 yieldingly holds the bar 25 in its lower position. The action of the push pin 23 is such that as the arm 12 moves off or on, the push pin tends to carry it past the center and to its final adjustment through the urge of the spring 26.

These parts so far as described, are substantially those illustrated and described in Patent 1,991,940 issued on February 19, 1935, on my application. In that patent the device is utilized for controlling a sterilizer, and in placing such an instrument or any similar instrument, on ship board or on supports having varying movement, the movement of the support is sufficient to interfere with the proper functioning of the switch. The present invention is designed to maintain the switch in its adjusted position, notwithstanding the rolling or moving of the support and at the same time permitting an adjustment of the switch without interfering with such control.

An intermediate gear 27 is journaled on the pin 3. This gear meshes with a gear 28, journaled on a pin 29 extending from the projection 2 of the frame. An arm 30 extends from the gear 28 and a weight 31 is suspended by

the arm 30 and thus swings with the gear on the pin 29. This weight maintains its vertical position with relation to the pin 29 through the gravity pull on the weight. A gear 32 is fixed on the tilting holder 6 and centered with its axis and meshes with the intermediate gear 27. It will be seen that the gear 29 as it swings, communicates its movement to the gear 32 and thus swings the tilting holder, moving it the same number of degrees that the support swings from the perpendicular maintained by the weight and indicated by the lines VV. This is accomplished because the gears 32 and 28 have the same diameter and respond with equal turning movements. When the mounting 5 is swung on the pin 3 through the action of the link 10 and arm 12, the gear 32 rolls around the gear 27 to the new adjustment giving to the mercury tubes or switch member, its proper inclination. This movement is made without effecting any movement of the gear 29 and consequently places the gear 32 in its new position in such relation as to respond to the movements of the support with relation to the weight, or in other words, to maintain a constant level of the switch member as adjusted, either on or off regardless of the movement to which the support may be subjected.

While I have illustrated the invention, I am having a preferred relation to a mercury switch. It is, in its broader terms, applicable to any device, the level of which it is desired to maintain.

While I have shown gear wheels or gear segments involving rolling teeth, it will be understood that any positively engaging rotative parts communicating motion in the general manner of gears accomplish the purpose, and in referring to gears I do not wish to be limited to the ordinary tooth wheel.

In the modification shown in Figs. 6 to 10, arm 2a extends from the frame 1 and a post 33 projects from the arm 2a and is provided at its end with a pintle 34. An arm 35 extends from the projection 2a and a screw 36 extends through the arm and is provided with a pintle 37 at its end, said pintle being concentric with the pintle 34. A tilting frame 38 has side arms 39 and 40, which are pivoted on the pintles 37 and 34 respectively. The arm 40 has an extension 41 on which the weight 42 is mounted. A tube carrying plate 43 has the downwardly extending arms 44 and 45. These arms are secured on pintles 46 and 47 mounted in the arms or plates 39 and 40 respectively. The clips 7, tubes 8, and terminals 9 are mounted on the plate 43 and form the elements of the mercury switch. The arm 45 has the extension 48 and this extension is connected by a pivot pin 49 with a link 50, the link 50 being connected to the rock arm 12 in the manner of the link 10 in the structure shown in Figs. 1 to 5. The operating lever 12 is operated in the same manner as in the preceding figures and provides the adjustment of the switch in the same manner through the link 50.

In the operation of the modification, it will be noted that if the switch is closed with the mercury tubes in horizontal position as shown in Figs. 6, 7 and 8, the tubes remain at right angles to the arm 40, 41 and as the arm 40, 41 is maintained in a vertical direction through the gravity acting on the weight, the tubes remain horizontal and in closed position. This is accomplished because the pivot pin 49 and pintle 34 are concentric so that the relation between the arms 40, 41 and the tubes is not disturbed

by any movement such as the inclination of the support as indicated in Fig. 8. When the arm 12 is moved to open the switch, the link 50 acting on the extension 48 swings the plate 43 to effect the inclination of the tubes, as shown in Fig. 9. This throws the pintle 49 slightly out of concentric position relatively to pintle 34 but inasmuch as the line connecting the pivots of the link 50 passes through the axis of the pintle 34, the variation of inclination of the tubes due to swinging the support as shown in Fig. 10 is very slight and does not effect a closure of the switch as the support is inclined and the relative position of the parts are changed through the maintenance of the vertical position of the arm supporting the weight. While, therefore, there is a slight movement of the parts in the open position of the switch and thus lacks the complete neutralizing of such movement as in the structure shown in Figs. 1 to 5, the modification presents a practical structure satisfactory for most installations and with fewer parts and cheaper construction.

What I claim as new is:

1. In a device of the character described, the combination of a member to be controlled; a pivotal mounting for the member; a support for the mounting; a weight pivotally hung on the support; means communicating the movement of the weight relatively to the support to the member; and devices adjusting the mounting and with it the control of the member, said means maintaining its operative relation with the member with each adjustment.

2. In a device of the character described, the combination of a member to be controlled; a tilting mounting for the member; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear in driving connection with the tilting mounting; an intermediate gear rotatively mounted on the axis of the pivoted mounting; and a gear in driving connection with the weight, the intermediate gear meshing the other two gears and communicating movement to the tilting mounting corresponding to the relative movement between the weight and support.

3. In a device of the character described, the combination of a member to be controlled; a tilting mounting for the member; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear in driving connection with the tilting mounting; an intermediate gear rotatively mounted on the axis of the pivoted mounting; a gear in driving connection with the weight, the intermediate gear meshing the other two gears and communicating movement to the tilting mounting corresponding to the relative movement between the weight and support; and means adjusting the member to vary its relative position.

4. In a device of the character described, the combination of a member to be controlled; a tilting mounting for the member; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear centered on the axis of the tilting mounting and fixed relatively thereto; an intermediate gear rotatively mounted on the axis of the pivoted mounting; and a gear centered on the axis of the pivot of the weight and fixed relatively thereto, the intermediate gear meshing the other two gears.

5. In a device of the character described, the combination of a member to be controlled; a tilting mounting for the member; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear centered on the axis of the

tilting mounting and fixed relatively thereto; an intermediate gear rotatively mounted on the axis of the pivoted mounting; a gear centered on the axis of the pivot of the weight and fixed relatively thereto, the intermediate gear meshing the other two gears; and means adjusting the member to vary its relative position.

6. In a device of the character described, the combination of a member to be controlled; a tilting mounting for the member; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear in driving connection with the tilting mounting; an intermediate gear rotatively mounted on the axis of the pivoted mounting; a gear in driving connection with the weight, the intermediate gear meshing the other two gears and communicating movement to the tilting mounting corresponding to the relative movement between the weight and support; and means acting on the pivotal mounting adjusting the member to varying relative positions.

7. In a device of the character described, the combination of a tilting switch to be controlled; a pivotal mounting for the switch; a support for the mounting; a weight pivotally hung on the support; means communicating the movement of the weight relatively to the support to the switch; and means adjusting the mounting, said means and devices maintaining substantially their operative relation with the switch in each adjustment as the support is inclined.

8. In a device of the character described, the combination of a tilting switch to be controlled; a tilting mounting for the switch; a pivoted mounting for the tilting mounting; a pivotally hung weight; a gear in driving connection with the tilting mounting; an intermediate gear rotatively mounted on the axis of the pivoted mounting; a gear in driving connection with the weight, the intermediate gear meshing the other two gears; and means acting on the pivoted mounting adjusting the switch to on and off position.

9. In a device of the character described, the combination of a support; a frame pivotally mounted on the support; a weight suspended from the frame; a tilting mounting pivoted on the frame; a member to be controlled carried by the

mounting; and means connected to the mounting moving the mounting for tilting the member, the connection and movement of the means and pivots of the frame and mounting being related to maintain substantially their operative relation as the support is inclined.

10. In a device of the character described, the combination of a support; a frame pivotally mounted on the support; a weight suspended from the frame; a tilting mounting pivoted on the frame; a member to be controlled carried by the mounting; and means connected to the mounting moving the mounting for tilting the member, the connection of the means in one adjustment of the parts being substantially concentric with the pivot of the frame, the connection and movement of the means and pivots of the frame and mounting being related to maintain substantially their operative relation as the support is inclined.

11. In a device of the character described, the combination of a support; a frame pivotally mounted on the support; a weight suspended from the frame; a tilting mounting pivoted on the frame; a member to be controlled carried by the mounting; and means connected to the mounting moving the mounting for tilting the member, the connection of the means in one adjustment of the parts being substantially concentric with the pivot of the frame and the direction of the movement of the connection being across the axis of the frame, the connection and movement of the means and pivots of the frame and mounting being related to maintain substantially their operative relation as the support is inclined.

12. In a device of the character described, the combination of a support; a U shaped frame pivotally mounted on the support; a weight suspended from the U shaped frame; a tilting mounting pivoted between the arms of the frame; an operating arm on the tilting mounting; means connected to the tilting arm for actuating the mounting, said connection being substantially in the axis of the frame; and a member to be controlled carried by the mounting.

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