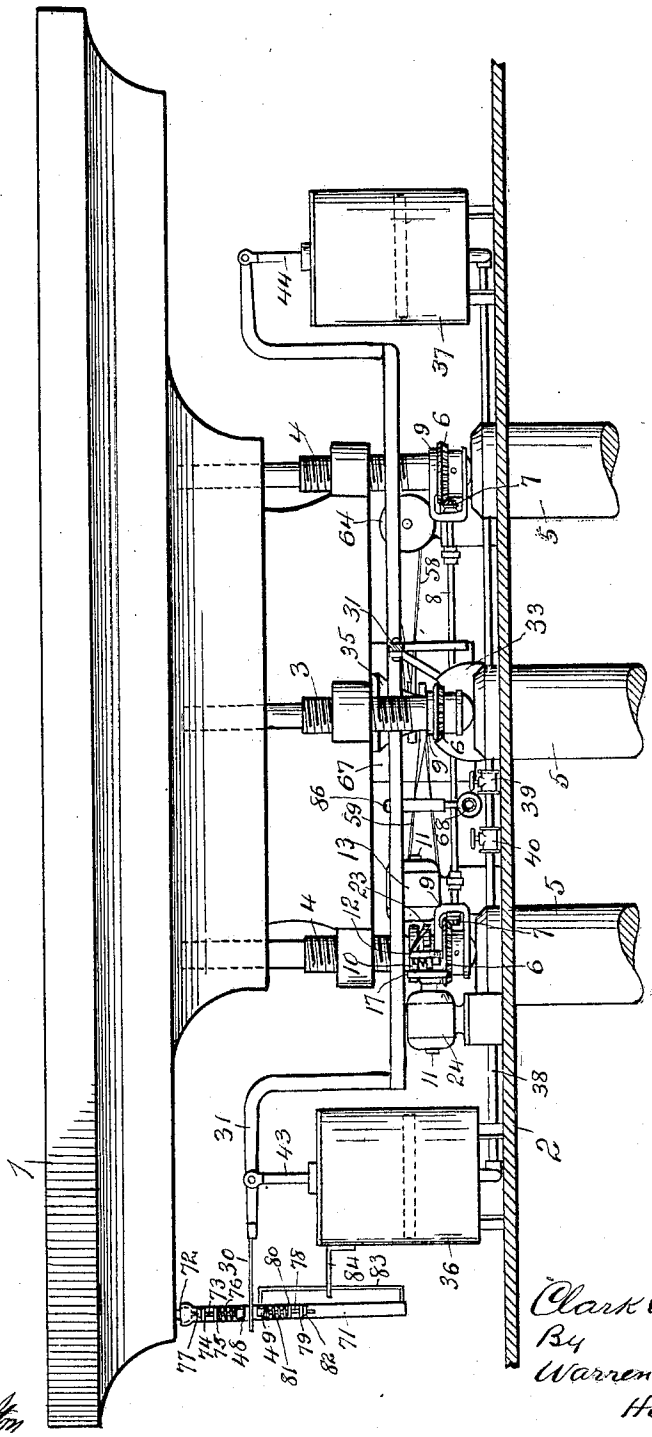
April 22, 1924. 1,490,904

C. ANDERS

AUTOMATIC LEVELING DEVICE

Filed April 26, 1922 5 Sheets-Sheet 1

Fig 1



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AUTOMATIC LEVELING DEVICE

Filed April 26, 1922 5 Sheets-Sheet 2

Fig 2

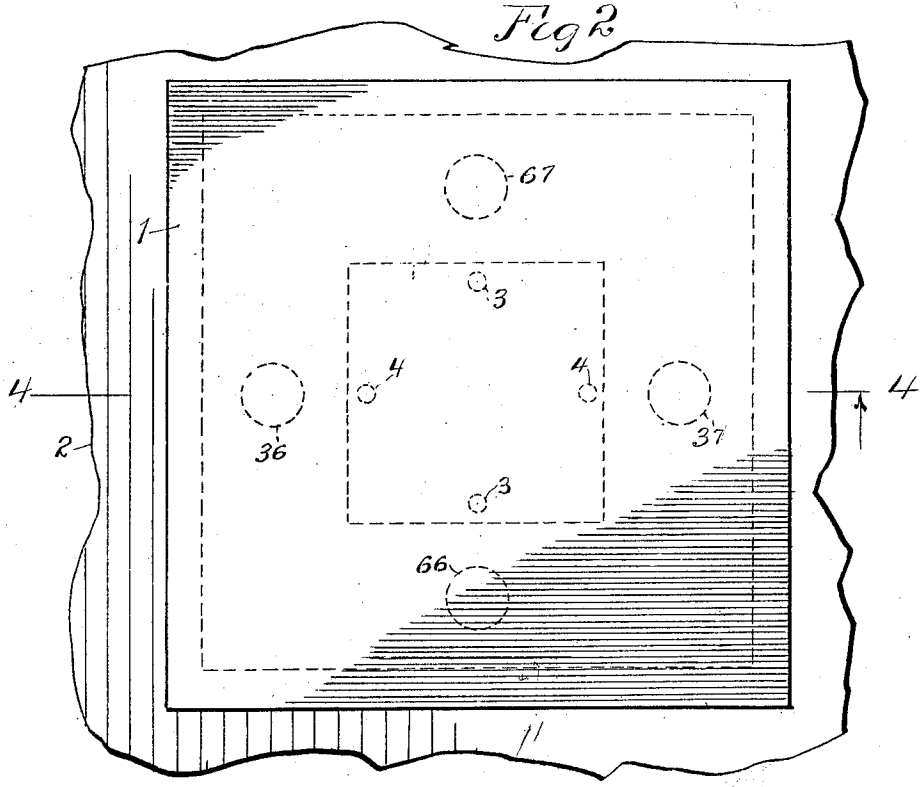
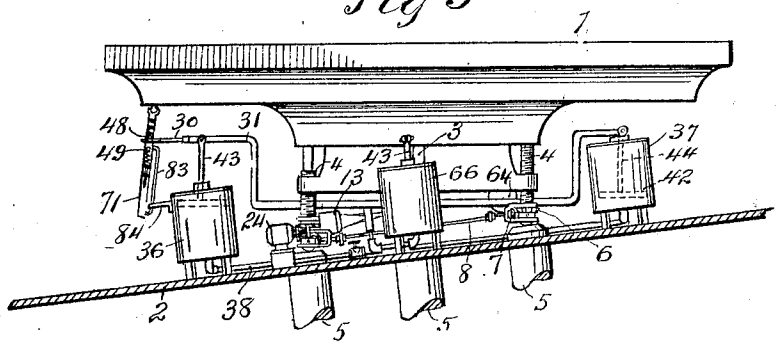


Fig 3



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AUTOMATIC LEVELING DEVICE

Filed April 26, 1922 5 Sheets-Sheet 3

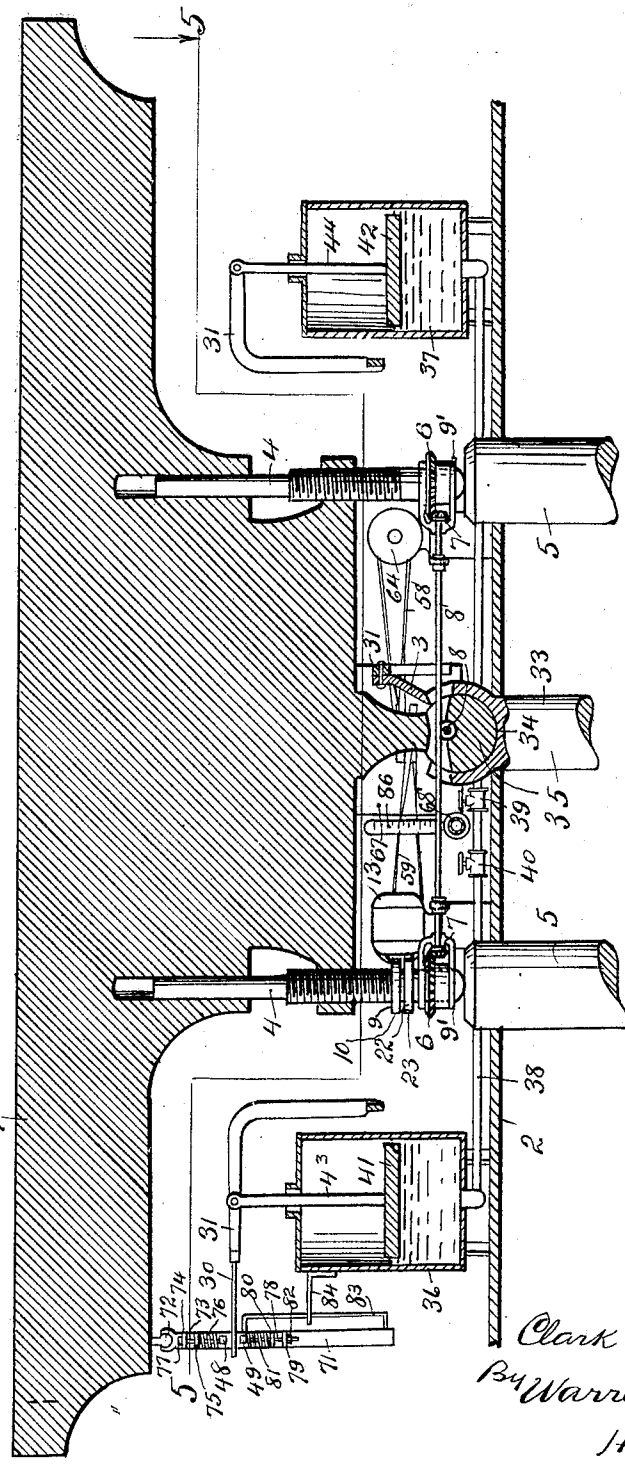


Fig 4

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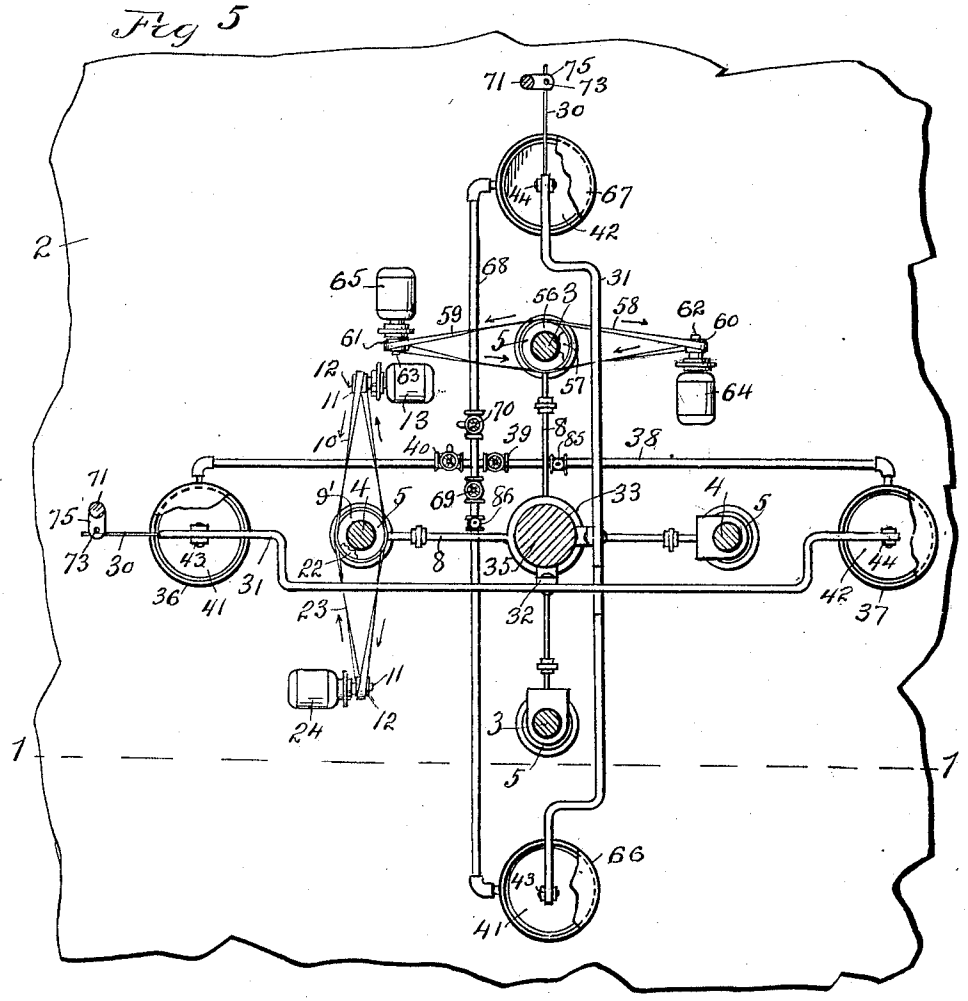
April 22, 1924. 1,490,904

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AUTOMATIC LEVELING DEVICE

Filed April 26, 1922 5 Sheets-Sheet 4

Fig 5



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AUTOMATIC LEVELING DEVICE

Filed April 26, 1922 5 Sheets-Sheet 5

Fig 6

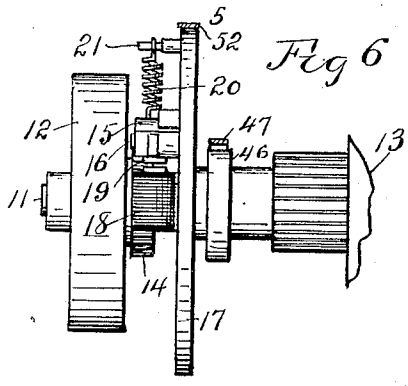


Fig 7

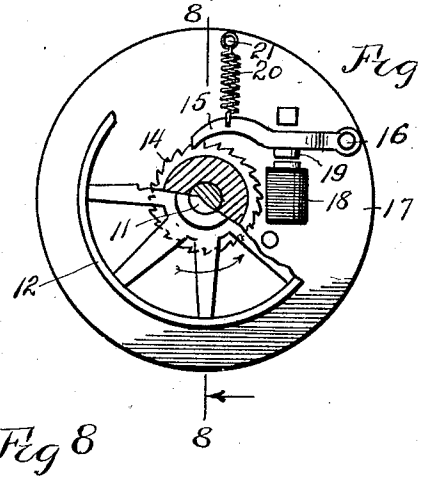


Fig 8

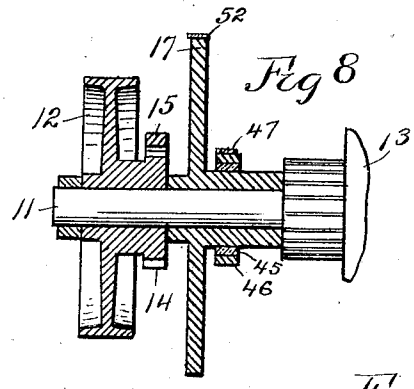
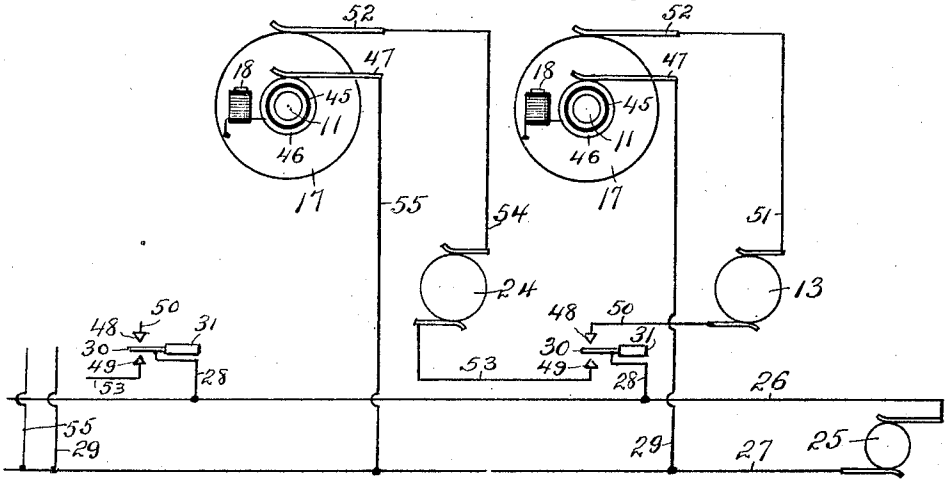


Fig 9



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Patented Apr. 22, 1924. 1,490,904

UNITED STATES PATENT OFFICE.

CLARK ANDERS, OF KANSAS CITY, KANSAS.

AUTOMATIC LEVELING DEVICE.

Application filed April 26, 1922. Serial No. 556,814.

To all whom it may concern:

Be it known that I, CLARK ANDERS, a citizen of the United States, residing at Kansas City, in the county of Wyandotte and State of Kansas, have invented a certain new and useful Improvement in Automatic Leveling Devices, of which the following is a specification.

My invention relates to improvements in automatic leveling devices. The object of my invention is to provide novel means for supporting on an unstable support, such as a deck of a ship or airplane, and in a level condition, a platform or emplacement adapted for the support of a gun, billiard table or article which it is desired to retain in a level condition notwithstanding the tilting or pitching of the ship.

A further object of my invention is to provide novel leveling means automatically actuated by the tilting of the vessel for retaining the platform in a level position. In the use of the word "platform" in the specification and claims, I mean to include any frame which can be utilized as a support for the article that is to be held in the level position.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings, which illustrate the preferred embodiment of my invention,

Fig. 1 is a vertical sectional view on the line 1—1 of Fig. 5, showing my improved leveling device as applied to the deck of a vessel.

Fig. 2 is a plan view of the same.

Fig. 3 is a view, partly in elevation and partly in vertical section of my improved device, the deck being shown tilted with respect to the platform.

Fig. 4 is an enlarged vertical sectional view on the line 4—4 of Fig. 2.

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 4.

Fig. 6 is an enlarged side elevation of one of the motor clutches.

Fig. 7 is an end elevation, partly broken away, of what is shown in Fig. 6.

Fig. 8 is a vertical section on the line 8—8 of Fig. 7.

Fig. 9 is a diagrammatic view showing a part of the electric circuits in which the motors are located.

Similar reference characters designate similar parts in the different views.

1 designates a supporting member adapted for supporting a cannon, billiard table or other article which it is designed to retain in a level position. The support may be a platform, as shown, having a flat upper surface and adapted to be supported on an unstable support, such as a deck 2 of a ship or airplane.

For retaining the platform 1 level on the deck 2, when the latter tilts, the platform is provided with four vertical screw-threaded holes in which are fitted two pairs of screws, one pair of screws 3 being located in a vertical plane disposed at right angles to a vertical plane in which are located the pair of screws 4 located in the vertical plane which intersects the plane of the screws 3 midway between the latter. In like manner, the plane of the screws 3 is located midway between the screws 4. The screws 3 and 4 are respectively mounted on pedestals 5 mounted in and movable with the deck 2.

For preserving the level of the platform 1 when the deck 2 tilts in the plane of the screws 4, means are provided by which, when the screws are threaded in the right direction, one of the screws will be turned in one direction and the other screw 4 will be turned in the other direction, so as to effect a relative swinging movement of the platform 1 on the screws 3.

For turning the screws 4 simultaneously in the opposite directions, each of the screws 4 has attached to it a bevel gear wheel 6, Figs. 1 and 4, which at the inner sides thereof respectively mesh with bevel gear wheels 7 which are rigidly secured to a horizontal central shaft 8, mounted at its ends respectively in two yokes 9, which are respectively mounted on the screws 4, the latter being revoluble in said yokes.

A similar shaft 8 is connected by similar gearing to the two screws 3. For turning one of the screws 4 in one direction, it has secured to it a pulley 9′, Figs. 4 and 5, on which is mounted a belt 10, mounted on a pulley 11, which is rotatable on an armature shaft 12, of a motor 13.

Referring to Figs. 6, 7, and 8, it will be noted that the pulley 12 has rigidly attached to it a ratchet wheel 14 with which engages a pawl 15 pivoted on a horizontal pin 16, which is mounted in a disk 17 which is rigidly secured to and rotatable with the armature shaft 11 and which carries an electromagnet 18 arranged to attract an armature

19 carried by the pawl 15, so that when the magnet 18 is energized, the pawl will be drawn into engagement with the teeth of the ratchet wheel 14. For normally holding the pawl 15 disengaged from the ratchet wheel 14, it has attached to it the inner end of a radial coiled spring 20, the outer end of which is attached to a horizontal pin 21, which is mounted in the disk 17.

When the electro-magnet 18 is energized, it will draw the pawl 15 into engagement with the ratchet wheel 14, and as the armature shaft and disk 17 rotate counter-clockwise, as viewed in Fig. 7, the pawl 15 will rotate the ratchet wheel 14 and the pulley 12 counter-clockwise, as viewed in Fig. 7, whereupon the belt 10 and pulley 9′ will rotate the adjacent screw 4 in one direction, thus raising or lowering the platform 1, depending upon the direction of lead of the thread of the screw 4, which is rotated thereby.

When the magnet 18 is de-energized, the spring 20 will release the pawl 15 from the ratchet wheel 14, thus permitting the latter and the pulley wheel 12 to turn in the reverse direction, without having the armature shaft 11 rotated in said reverse direction.

To reverse the direction of rotation of the screw 4 having attached to it the pulley 9, said screw has attached to it a pulley 22 on which is mounted a belt 23 which is mounted on a pulley 12 rotatable on an armature shaft 11 of an electromotor 24, Fig. 5. The pulley 12 of the motor 24 is connected with the armature of the motor 24 in the same manner as described in connection with the motor 13, and as shown in Fig. 6, Fig. 7, and Fig. 8.

When the motor 13 is in circuit, with a suitable source of current, it will, through the intermediacy of the belt 10 and mechanism connected therewith turn the adjacent screw 4 in one direction and through the intermediacy of the adjacent shaft 8 and connecting gearing already described, it will turn the other screw 4 in an opposite direction to the turning of the first named screw 4. The motor connections and directions of turning of the screws 4 will be such as to tilt the platform 1 relatively to the deck 2 in a direction opposite to the tilting of the latter in the vertical plane of the screws 4. In order that the tilting of the deck may effect simultaneous proper tilting of the platform 1 to retain the latter in the level position, means are provided for alternately placing the motors 13 and 14 in circuit with an electric generator 25, Fig. 9. The latter has connected with its respective brushes the usual feed wires 26 and 27, to which are respectively connected two conductors 28 and 29. The conductor 28 is connected to a vertically movable contact 30, which is carried at one end of a horizontal bar 31, Figs. 1, 4 and 5, which is pivoted centrally on a horizontal axis to a bracket 32, Fig. 5, attached to a central pedestal 33, having a spherical socket 34, in its upper end, in which is pivoted a substantially spherical lower end of a central downwardly extending projection 35 on the under side of the platform 1.

Two tanks 36 and 37 are mounted on the deck 2 at the outer sides of the screws 4 in the vertical plane of the latter. A conductor 38 has its ends respectively connected to the bottoms of the tanks 36 and 37, so that water may flow in both directions from one tank to the other. A shut-off valve 39 is located in the conductor 38 which also contains a drain valve 40 by which the tanks may be emptied.

In the tanks respectively are floats 41 and 42 which are respectively secured to the lower ends of two vertical bars 43 and 44, the upper ends of which are pivoted to the bar 31. As the deck 2 tilts in the plane of the screws 4, the water in one tank will run therefrom through the conductor 38 into the other tank, thereby causing the lifting of one float when the other falls.

Mounted on the hub of each disk 17 and insulated from the hub by an insulating ring 45 is a contact ring 46 on which bears a contact plate 47, Fig. 9. The contact ring 46 is connected with one end of the winding of the adjacent magnet 18, the other end of the winding being connected with the disk 17.

The contact 30 is disposed between an upper contact 48 and a lower contact 49. The contact 48 is connected by a conductor 50 with one brush of the motor 13, the other brush of which is connected by a conductor 51 with a contact plate 52 which bears on the metal disk 17 adjacent thereto.

The contact 49 is connected by a conductor 53 with one brush of the motor 24, the other brush of which is connected by a conductor 54 with the contact plate 52 which bears on the disk 17 carried by the armature shaft of the motor 24, Fig. 9.

When the tank 36 lowers, the bar 31 will swing to bring the contact 30 adjacent thereto against the adjacent contact 48. The current from the generator 25 will then pass as follows:—through the conductors 26 and 28, contact 30 adjacent thereto, thence through the conductor 50 by way of the contact 48, thence through the motor 13, conductor 51, contact plate 52, adajacent disk 17, adjacent magnet 18, adjacent ring contact 46, contact plate 47, and thence by conductors 29 and 27 back to the generator 25. The motor 13 being thus energized will, through the intermediacy of the belt 10 and connecting mechanism, turn the screws 4 so as to tilt the platform 1 in a direction opposite to the tilting of the deck, thereby retaining the platform 1 substantially level.

Thus when the tank 36 lowers, the direc-

tion of rotation of the screws 4 will be such, owing to the threading of the screws and the direction in which they are turned by the motor 13, that the portion of the platform over the tank 36 will rise.

When the tank 36 rises, the bar 31 will bring the contact 30 against the contact 49. The current will then pass from the generator 25 through the conductors 26 and 28, contacts 30 and 49, conductor 53, motor 24, conductor 54, adjacent contact plate 52, adjacent disk 17, adjacent magnet 18, adjacent ring contact 46, adjacent contact plate 47, and thence by a conductor 55 to the conductor 27 and motor 25. The motor 24 will thus be energized and, through the intermediacy of the belt 23 and connecting mechanism will turn the screws 4 in a direction the reverse of that just before described, thereby effecting the lowering of that portion of the platform which is over the tank 36, and leveling the platform.

Thus the motors 13 and 24 will as the deck 2 lowers and rises, alternately be connected in circuit and will effect the alternate lifting and lowering of the platform so as to keep it substantially level.

The valve 39 may be used as a regulating valve to control the flow of water through the pipe 38, or it may be used to close the connection between the tanks 36 and 37 for any purpose.

To preserve the level of the platform 1, when the deck 2 tilts in the plane of the screws 3, the latter are simultaneously turned in opposite directions, being threaded in a like direction, by the central horizontal shaft 8, which is adjacent thereto, and which is at right angles to the shaft 8 connecting the screws 4, through the intermediacy of gears 6 and 7, adjacent thereto, arranged with reference to the screws 3 in the same manner as are the gears 6 and 7, connected with the screws 4.

For turning one of the screws 3, it has attached to it two pulley wheels 56 and 57, Fig. 5, to which are respectively connected belts 58 and 59, which respectively engage pulleys 60 and 61, respectively secured to the armature shafts 62 and 63, of two electric motors 64 and 65. When the electric motor 64 is connected in circuit with the generator 25, it will, in running, turn the adjacent screw 3 in one direction. When the motor 65 is in circuit with the generator 25, it will turn said screw 3 in the opposite direction.

In order that the motor 64 may be energized, to turn the screw 3 to which it is connected, when the deck 2 tilts in one direction, in the vertical plane of the screws 3, float actuated mechanism corresponding in function, construction and operation to that controlling the energizing of the motors 13 and 24, is provided.

Mounted on the deck 2 in the vertical plane of the screws 3, and at opposite sides thereof, are two tanks 66 and 67 which are connected at their bottom by a horizontal pipe 68, corresponding to the pipe 38, and provided with a shut-off valve 69, and a drain valve 70, see Fig. 5. Mounted respectively in the tanks 66 and 67, are floats 41 and 42, carrying respectively two vertical bars 43 and 44, the upper ends of which are pivoted to a transverse bar 31, corresponding in function and construction to the bar 31 already described, but disposed at right angles thereto. One end of the bar 31 which extends over the tank 67 has secured to it a contact 30, which is disposed between and is adapted to strike alternately, as the deck tilts back and forth in the plane of the screws 3, an upper contact 48, and a lower contact 49, disposed one above the other and respectively connected in circuit with the motors 64 and 65, in the same manner as are the other pair of contacts 48 and 49, with respect to the motors 13 and 24, as shown in Fig. 9.

When the deck tilts in the plane of the screws 3, in one direction, the motor 64 will be connected in circuit and will turn the screws in a direction to preserve the level of the platform 1, and when the deck tilts in the opposite direction, the motor 65 will be connected in circuit so as to turn the adjacent screw 3 in the opposite direction so as to keep the platform on a level.

For supporting each pair of contacts 48 and 49, each pair of said contacts may be mounted as follows:—

71 designates a vertical bar, which depends from the platform 1 to which its upper end is connected by a ball joint 72, Figs. 1 and 4. The contact 48 is mounted on the lower end of a vertically slidable pin 73, mounted in two lateral ears 74 and 75, on the bar 71. A coil spring 76 encircles the pin 73 and bears at its lower end against the contact 48, and at its upper end against the ear 75. A nut 77 on the upper end of the pin 73 limits the downward movement of the latter and contact 48.

The contact 49 is mounted on the upper end of a pin 78 vertically slidable in two ears 79 and 80 on the bar 71. A coil spring 81 encircles the pin 78 and bears at its lower end against the ear 80 and at its upper end against the contact 49. A nut 82 on the lower end of the pin 78 is adapted to strike the ear 79 to limit the upward movement of the pin 78.

A guide bar 83 vertically slidable in a bracket 84, which is secured to the adjacent tank 36 or 67, as the case may be, has its ends secured to the bar 71 adjacent thereto and serves to guide the latter as the deck tilts. The springs 76 and 81 are compressed as the contact 30 alternately

strikes the contacts 48 and 49. The nuts 77 and 82 keep the contacts 48 and 49 separated a distance apart sufficient for the proper making and breaking of the circuit by means of the contact 30. This distance may be varied by adjusting the nuts 77 and 82.

The screws 4, as are the screws 3, are located equi-distant from the central projection 35. The tanks 36 and 37, as are the tanks 66 and 67, are located equi-distant from the central projection 35.

From the foregoing, it will be understood that when the deck 2 oscillates in the vertical plane of the screws 4, the latter will be turned, through the intermediacy of the motors 13 and 24, floats 41 and 42, and parts connected therewith, so as to keep the platform from tilting in like directions with the deck. In like manner the screws 3 will be turned by the motors 64 and 65, operating in connection with the floats in the tanks 66 and 67, and parts connected therewith, to keep the platform from tilting in the plane of the screws 3, when the deck tilts in the plane of the latter.

Respectively mounted in the pipes 38 and 68 are two upstanding vertical glass tubes 85 and 86 having open ends and which are disposed respectively adjacent to the center of the platform 1, for indicating the amount of water in the tanks 36 and 37 and the tanks 66 and 67.

By having the central projection 35 mounted in the spherical socket 34, the platform 1 is adapted to swing in any direction with respect to the deck 2. The lower ends of the screws 3 and 4 may be rounded and may rest on flat upper ends of the pedestals 5 so as to permit the screws to slide thereon.

I do not limit my invention to the structure shown and described, as many modifications, within the scope of the appended claims, may be made without departing from the spirit of my invention.

What I claim is:—

1. In a mechanism of the kind described, the combination with an unstable support, such as the deck of a ship, of a platform, two vertical screws having threaded engagement with said platform and supporting the latter and supported by said support, means for simultaneously turning said screws in directions such that one screw will raise and the other screw will lower the platform, and means actuated by the tilting of said support for controlling the operation of said screw turning means, substantially as set forth.

2. In a mechanism of the kind described, the combination with an unstable support, such as the deck of a ship, of a platform, two vertical screws supported by said support and supporting said platform said screws having means when simultaneously turned by which one screw will raise and the other screw will lower said platform when said screws are turned in the proper directions, and means actuated by the tilting of said support for controlling the operation of said screw turning means, substantially as set forth.

3. In a mechanism of the kind described, the combination with an unstable support, such as the deck of a ship, of a platform, two vertical screws threaded in like directions and supporting said platform and supported by said support and having threaded engagement with said platform, means for turning said screws simultaneously in opposite directions, and means actuated by the tilting of said support for controlling the operation of said screw turning means, substantially as set forth.

4. In a mechanism of the kind described, the combination with an unstable support, such as the deck of a ship, of a platform, two screws supported by said support and having vertical engagement with said platform, means intermediate of said screws for pivotally supporting said platform on said support on a horizontal axis at right angles to the vertical plane of said two screws, the screws being arranged to tilt the platform on its axis when the screws are turned in the proper direction, means for so turning said screws, and means actuated by the tilting of said support for controlling the operation of said screw turning means, substantially as set forth.

5. In a mechanism of the kind described, the combination with an unstable support, of a platform, two pairs of vertical screws supported by said support and supporting said platform, said pair of screws being disposed in two vertical planes respectively at right angles to each other, two independent means for respectively turning said pairs of screws in directions such that the screws of each pair will respectively raise and lower said platform, and independent means actuated by the tilting of said support for respectively controlling said two screw turning means, substantially as set forth.

6. In a mechanism of the kind described, the combination with an unstable support, of a platform, a pedestal on said support on which said platform is centrally pivoted, a screw supported by said support and supporting said platform and arranged when respectively turned in opposite directions to raise and lower one end of said platform on said pedestal, two motors, means actuated by said motors for turning said screw in opposite directions respectively, and means actuated by the tilting of said support upwardly and downwardly for alternately effecting the operation of said motors, substantially as set forth.

7. In a mechanism of the kind described, the combination with an unstable support, of a platform, a pedestal on said support on which said platform is centrally pivoted, a vertical screw supporting said platform and supported by said support and arranged when turned in opposite directions to alternately raise and lower one end of said platform on said pedestal, a circuit including said two motors and circuit controlling means by which the current in said circuit can alternately operate said motors, means actuated by said motors for alternately turning said screw in opposite directions, and means actuated by the tilting of said support for actuating said circuit controlling means, substantially as set forth.

8. In a mechanism of the kind described, the combination with an unstable support, of a platform, a pedestal on said support on which said platform is centrally pivoted, a vertical screw supporting said platform and supported by said support, and arranged to raise and lower one end of said platform on said pedestal when the screw is alternately turned in opposite directions, a circuit including two motors and circuit controlling means arranged to alternately connect said motors in circuit, means actuated by said motors for turning said screw alternately in opposite directions, a liquid container on said support in which the level of the liquid is varied when the support tilts, a float carried by the liquid in said container, and means actuated by said float for controlling the operation of said circuit controlling means, substantially as set forth.

9. In a mechanism of the kind described, the combination with an unstable support, of a platform, two pairs of vertical screws disposed respectively in vertical planes at right angles to each other, the plane of one pair being intermediate of the two screws of the other pair, said screws being supported by said support and supporting said platform, each screw being arranged to alternately raise and lower said platform when turned in opposite directions, two means for independently turning the screws of said pairs, each of said screw turning means being arranged to turn the screws of its pair in directions such that one screw of the pair will raise and the other screw of the pair lower the platform, means actuated by the tilting of said support in one vertical plane for effecting the operation of one of said screw turning means, and means actuated by the tilting of said support in a direction at right angles to the last named vertical plane for effecting the operation of the other of said screw turning means, substantially as set forth.

In testimony whereof I have signed my name to this specification.

CLARK ANDERS.