Nov. 10, 1925.

1,561,228

J. H. HAMMOND, JR

CAPACITY COMPENSATING DEVICE

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Fig. 2

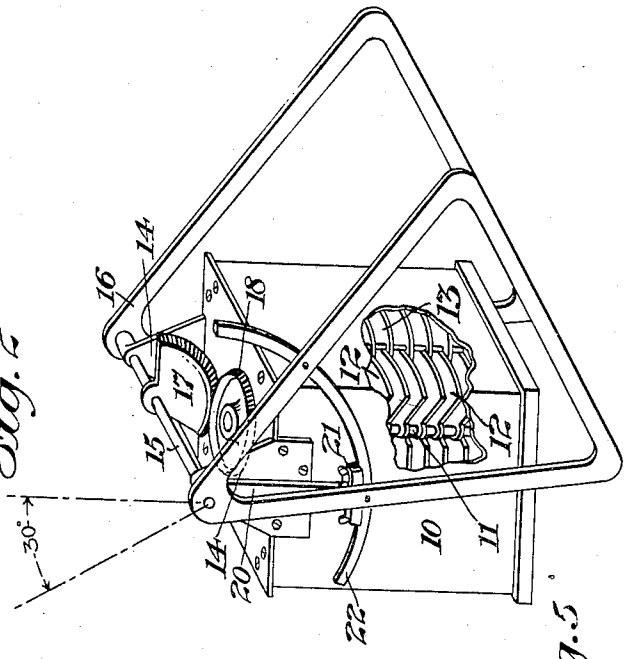


Fig. 5

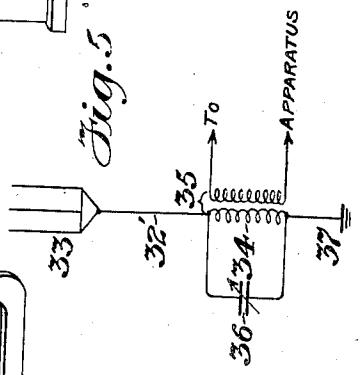
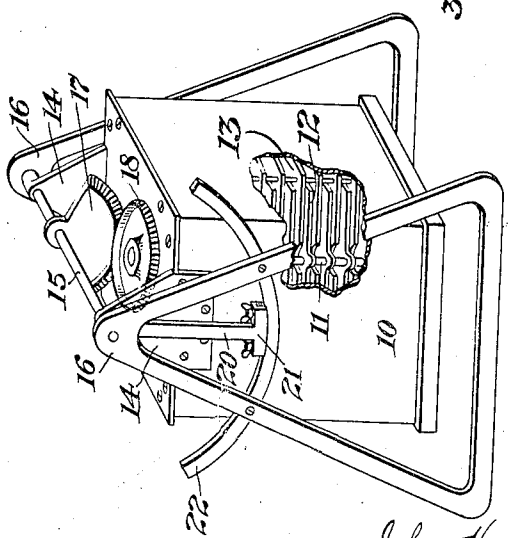


Fig. 1



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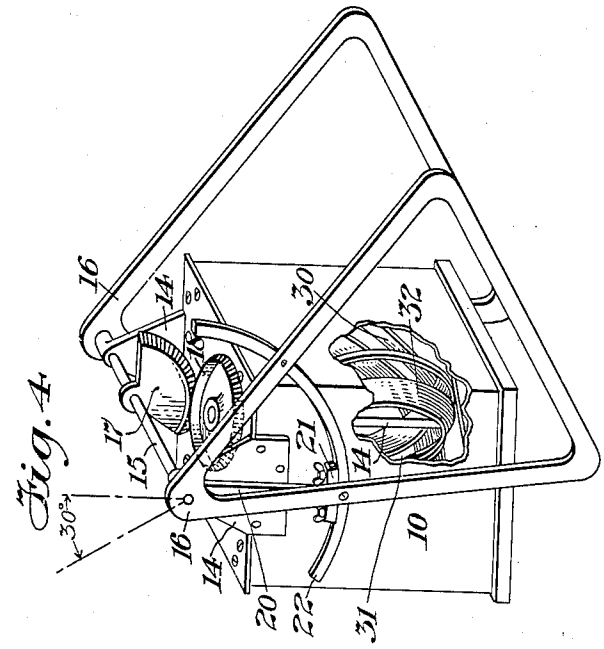


Fig. 4

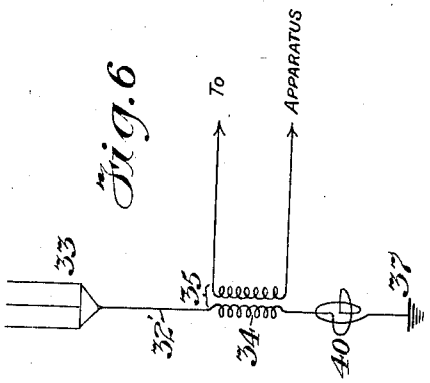


Fig. 6

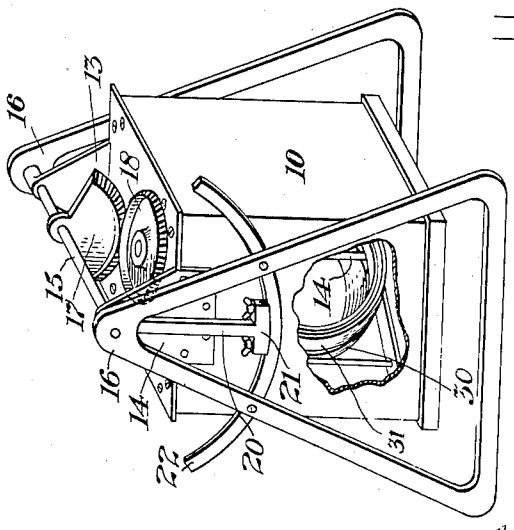


Fig. 3

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UNITED STATES PATENT OFFICE.

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CAPACITY COMPENSATING DEVICE.

Application filed February 16, 1921. Serial No. 445,498.

To all whom it may concern:

Be it known that I, JOHN HAYS HAMMOND, Jr., a citizen of the United States, and a resident of Gloucester, county of Essex, and State of Massachusetts, have invented certain new and useful Improvements in Capacity Compensating Devices, of which the following is a specification.

Some of the objects of the present invention are to provide means for compensating for variations in the capacity of an antenna circuit caused by changes in the effective height of the antenna due, for example, to the roll or tipping movement of a ship or other body on which the antenna is mounted; to provide means for automatically varying the capacity of part of an antenna circuit to compensate for changes in the capacity of the antenna caused by changes in its position; to provide means for automatically varying the inductance of an antenna circuit to offset the change in its value due to a change of capacity caused by movement of the antenna as, for example, by the roll of a ship varying the proximity of the antenna to the water; and to provide other improvements which will hereinafter appear.

In the accompanying drawings, Fig. 1 is a perspective view in normal position of one form of the present invention arranged to compensate for variations in the capacity of an antenna circuit caused by the roll of a vessel supporting the antenna; Fig. 2 represents the same apparatus under the influence of a roll through an angle; Fig. 3 represents in perspective another form of the invention in normal position and arranged to change the inductance of an element of an antenna circuit to compensate for variations in capacity of the antenna caused by the roll of a vessel; Fig. 4 represents the same apparatus as Fig. 3 in a position caused by a roll through an angle; Fig. 5 is a diagram of an antenna circuit in which the present invention may be embodied in the form of a capacity compensating device; and Fig. 6 is a similar diagram showing a circuit wherein compensation is obtained by means of a variable inductance element.

Referring to the drawings, the form of the present invention shown in Figs. 1 and 2 includes a condenser of any well-known form enclosed within an instrument box 10. As shown, the condenser has a shaft 11 by which the movable plates 12 of the condenser may be rotated with respect to the fixed plates 13.

In order to maintain the box 10 in a substantially vertical position at all times irrespective of angular swing of the body on which it is mounted, it is provided with a pair of apertured ears 14 fixed at opposite sides respectively of the box 10 and pivoted for swinging movement upon a rod 15 extending transversely above the box 10 and rigidly secured at its ends to side frames 16. The frames 16 are secured to any suitable fixed part of the body of a ship, vessel or other movable body provided with an antenna of a wireless system. The construction is such that when the vessel rolls to one side or the other the frames 16 will likewise roll, but the box 10 will remain in its normal suspended position owing to its pivoted connection with the frames 16.

For operating the movable plates 12 of the condenser upon such relative movement of the box 10 and the frames 16 a gear segment 17 is rigidly fastened to the rod 15 so that any swinging movement of the frames 16 will be transmitted to the segment 17. The gear segment 17 is positioned to mesh with a bevel gear 18 which is fast to the projecting end of the shaft 11.

As a means for damping the effect of the aforesaid swinging action, an arm 20 carried by the box 10 has its outer free end provided with a friction tracker 21 of any suitable form and material arranged to ride upon a curved track 22 fixed to one of the side frames 16. The track 22 is of suitable length to allow for any angular movement within the normal limits and has its center of curvature coincident with the rod 15.

In the operation of this form of the invention, it will be obvious that any roll of the

vessel, for example, through an angle of 30°, as indicated in Fig. 2, will cause the frames 16 and rod 15 to swing relative to the box 10 and thereby cause the gear segment 17 to turn the bevel gear 18, which operates the shaft 11, to vary the capacity of the condenser in the box 10 and thereby compensate for the change in the capacity of the antenna circuit caused by the roll of the vessel bringing the antenna closer to the surface of the water.

Another form of the present invention is shown in Figs. 3 and 4, wherein the compensating mechanism is the same as that heretofore described except that the shaft 11, in this instance, is connected to the movable coil or elements 30 of a variometer 31 of the type having a fixed coil or element 32 with which the movable coil has an interfitting relation, so that any variation in the height of the antenna caused by the roll of the vessel will be accompanied by a compensating change in the inductance of the variometer, so that a constant wave length of the aerial circuit will be maintained, regardless of changes in the capacity of the antenna due to its movement.

In Figure 5, an open, aerial circuit 32′ is shown including an antenna 33, a primary coil 34 of a transformer 35, a condenser 36 and a ground connection 37. This circuit is inductively coupled to a secondary circuit and operates in a well-known manner. The condenser 36 is arranged to be controlled by the compensating means in the form of the invention shown in Figs. 1 and 2. The remaining portions of the system are of any well known form and need not be specifically described here.

In Figure 6, the circuits are generally similar to those shown in Figure 5, but here an inductance 40 is employed in accordance with the form of the invention shown in Figures 3 and 4, and the compensation for variations in the height of the antenna is effected by variation of this inductance 40.

Having thus fully described my invention, I claim:

1. In a wireless apparatus, an antenna operatively mounted upon a movable body, a circuit including said antenna, and means for automatically compensating for variations in capacity of said antenna circuit due to movement of said body.

2. In a compensating device, an antenna operatively mounted upon a vessel, an aerial circuit including said antenna, and means for automatically compensating for variations in the capacity of said antenna.

3. In a compensating device, an antenna operatively mounted upon a vessel, an aerial circuit including said antenna, and means operated by the roll of said vessel for compensating for variations in the capacity of said antenna circuit resulting from variations in the height of said antenna caused by the roll of said vessel.

4. In a compensating device, an antenna operatively mounted upon a vessel, an aerial circuit including said antenna and means for automatically varying the electrical characteristics of said circuit in accordance with variations in the capacity of said antenna to ground so as to keep the wave length of the antenna circuit substantially constant.

5. In a compensating device, an antenna operatively mounted upon a vessel, an aerial circuit including said antenna and means operated by the roll of said vessel for varying the electrical characteristics of said circuit in accordance with variations in capacity of said antenna caused by the roll of said vessel so as to keep the wave length of the antenna circuit substantially constant.

6. In combination with an antenna movable relatively to the earth's surface, an aerial circuit including said antenna and means operated in synchronism with the movement of said antenna for varying the electrical characteristics of said circuit so as to keep the wave length of said circuit substantially constant.

7. In combination with an antenna movable with respect to the earth's surface, a circuit controlled thereby and means operated in synchronism with the movement of said antenna for keeping the circuit tuned to a substantially constant wave length.

8. In combination with a movable antenna arranged to intercept radiant energy, a circuit tuned to the frequency of desired received oscillations and means operated in synchronism with the movement of said antenna for varying the electrical characteristics of said circuit so as to compensate for variations in capacity of said antenna caused by the movement thereof.

9. In a compensating device, an antenna operatively mounted upon a movable body, an aerial circuit including said antenna and means for automatically varying the electrical characteristics of said circuit in accordance with variations in the capacity of said antenna to ground so as to keep the wave length of the antenna circuit substantially constant.

10. In a compensating device, an antenna operatively mounted upon a movable body, an aerial circuit including said antenna and means operated upon movement of said body for varying the electrical characteristics of said circuit in accordance with variations in capacity of said antenna caused by said movement so as to keep the wave length of the antenna circuit substantially constant.

11. In combination with an antenna and a member mounted for free movement relatively thereto, an aerial circuit including said antenna and means operated in synchronism with the relative movement of said

antenna and said member for varying the electrical characteristics of said circuit so as to keep the wave length of said circuit substantially constant.

12. In combination with an antenna and a member mounted for free movement relatively thereto under the action of gravity, a circuit controlled by the antenna thereby and means operated in synchronism with the relative movement of said antenna and said member for varying the electrical characteristics of said circuit.

13. In combination with a variable capacitance arranged to intercept radiant energy, a circuit tuned to the frequency of desired received oscillations and means operated in synchronism with variations of said capacitance for varying the electrical characteristics of said circuit so as to compensate for variations in capacity of said capacitance.

14. In a compensating device, an antenna operatively mounted upon a vessel, an aerial circuit including said antenna, and means including a support fixed to said vessel and a member freely suspended from said support for automatically varying the capacity of a part of the antenna circuit in accordance with variations in capacity of said antenna caused by the roll of said vessel.

15. In an arrangement of the class described, an antenna mounted for tipping movement in a vertical plane, a support movable with the antenna, a variable reactance device electrically connected with the antenna, and connections between the support and the reactance device for adjusting the reactance device to compensate for variations in the capacity of the antenna caused by tipping movement of the antenna.

16. In an arrangement of the class described, a movable antenna, a support mounted for movement with the antenna, a variable reactance device mounted on the support and electrically connected with the antenna, and connections between the support and the reactance device for adjusting the reactance device to compensate for changes in the capacity of the antenna caused by its movement.

17. In an arrangement of the class described, an antenna and apparatus including a support, a reactance device electrically connected with the antenna and comprising relatively movable parts, said device being mounted on the support, and connections between the support and certain of the parts of the reactance device for effecting relative movement of said first-mentioned parts in accordance with movement of the support of a predetermined character.

18. In an arrangement of the class described, an antenna and apparatus comprising a support, a condenser mounted on the support and electrically connected with the antenna, said condenser including relatively fixed and movable plates, and connections between the support and the movable plates of the condenser for moving said last-mentioned plates relatively to the fixed plates in accordance with movement of the support.

19. In an arrangement of the class described, an antenna and apparatus comprising a support, relatively fixed and movable reactance elements electrically connected with the antenna and pivotally mounted on the support so as to retain their normal positions with respect to the earth by gravity regardless of tipping movement of the support, and connections between the support and the movable reactance elements for effecting movement of said elements relatively to the fixed elements in accordance with the extent of tipping movement of the support.

20. In an arrangement of the class described, an antenna and apparatus electrically connected with the antenna and comprising a support, a frame pivotally and loosely mounted on the support so as to retain its vertical position regardless of tipping movement of the support, a condenser comprising plates fixedly mounted in said frame and cooperating plates mounted in the frame for movement relatively in the fixed plates, and connections between the support and the movable plates of the condenser for adjusting the movable plates with respect to the fixed plates upon tipping movement of the support.

21. In an arrangement of the class described, an antenna, and apparatus comprising a support, a frame freely mounted on the support so as to retain a vertical position regardless of tipping movement of the support, a variable reactance device mounted in the frame and electrically connected with the antenna and connections between the support and the reactance device for adjusting the device in accordance with the extent of tipping movement of the support.

22. In an arrangement of the class described an antenna and apparatus comprising a support, a frame freely mounted on the support so as to retain a vertical position regardless of tipping movement of the support, a reactance device electrically connected with the antenna and comprising elements fixedly mounted in the frame and cooperating elements mounted in the frame for movement relatively to the fixed elements, and connections between the support and the movable elements of the reactance device for adjusting the movable elements with respect to the fixed elements upon tipping movement of the support.

23. In an arrangement of the class described, an antenna, and apparatus com-

prising a support, a frame freely mounted on the support so as to retain a vertical position regardless of tipping movement of the support, a variable reactance device mounted in the frame and electrically connected with the antenna, connections between the support and the reactance device for adjusting the device in accordance with the extent of tipping movement of the support, and means for damping movements of the frame relatively to the support.

Signed at New York in the county of New York and State of New York this 14th day of Feby. A. D. 1921.

JOHN HAYS HAMMOND, JR.