

June 27, 1933.

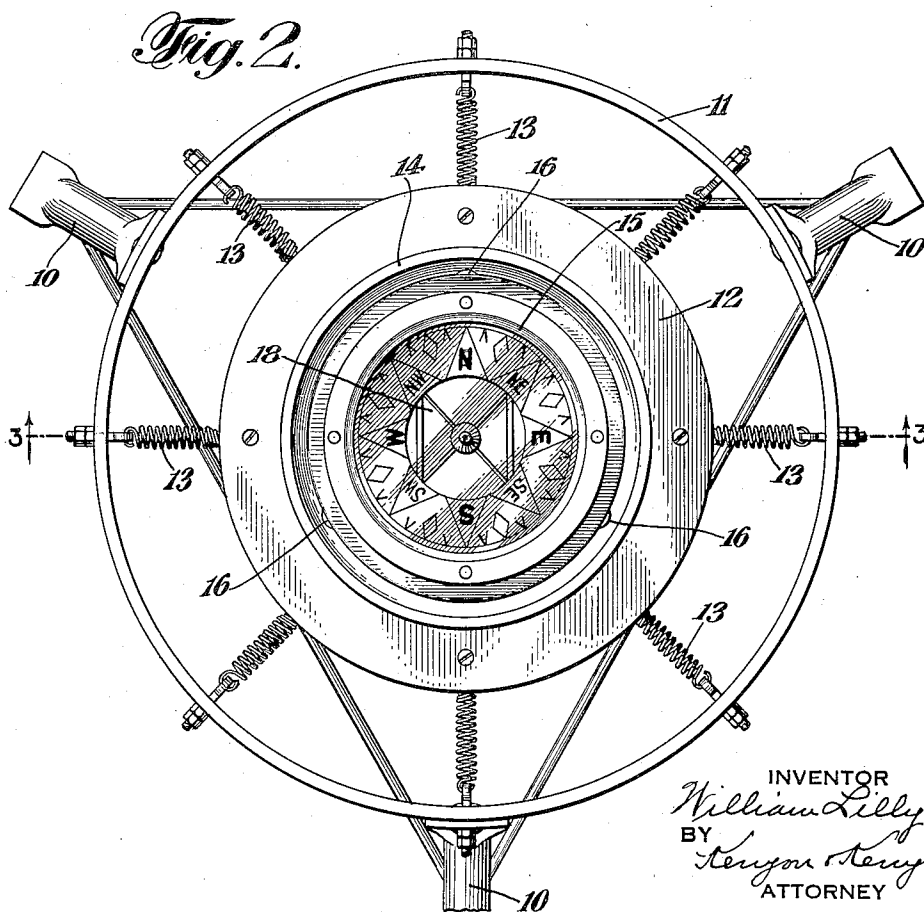
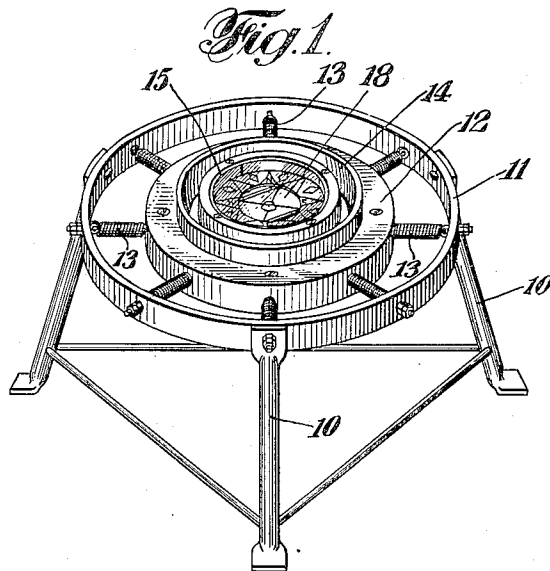
W. LILLY

1,915,466

SELF RIGHTING SUPPORT

Filed June 27, 1930

2 Sheets-Sheet 1



INVENTOR
William Lilly
BY
Henry Henry
ATTORNEY

June 27, 1933.

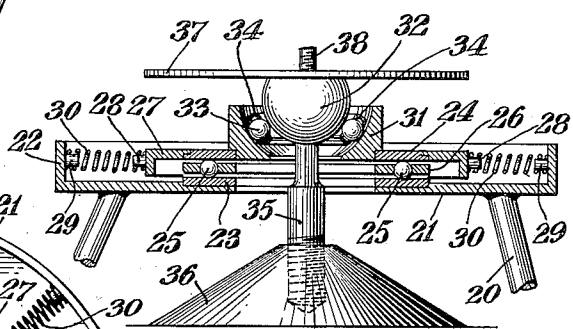
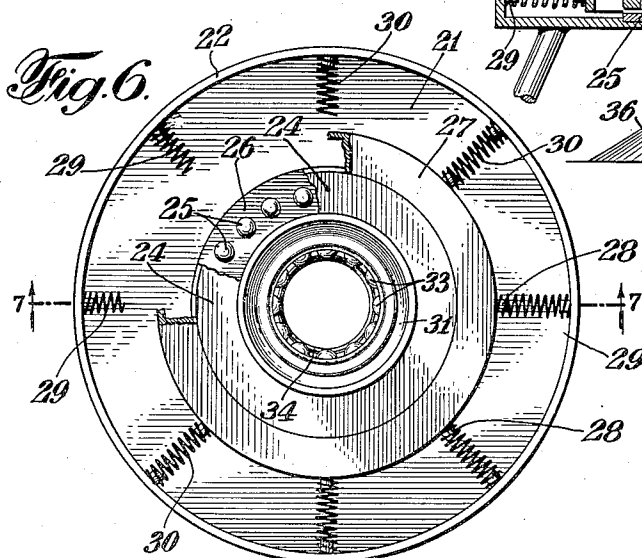
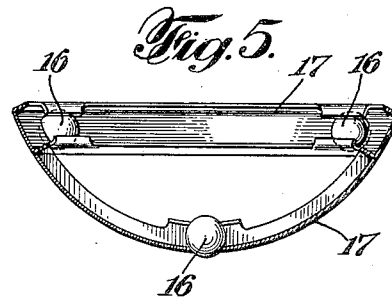
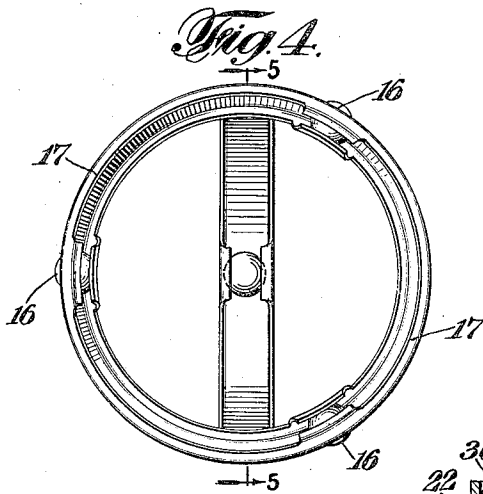
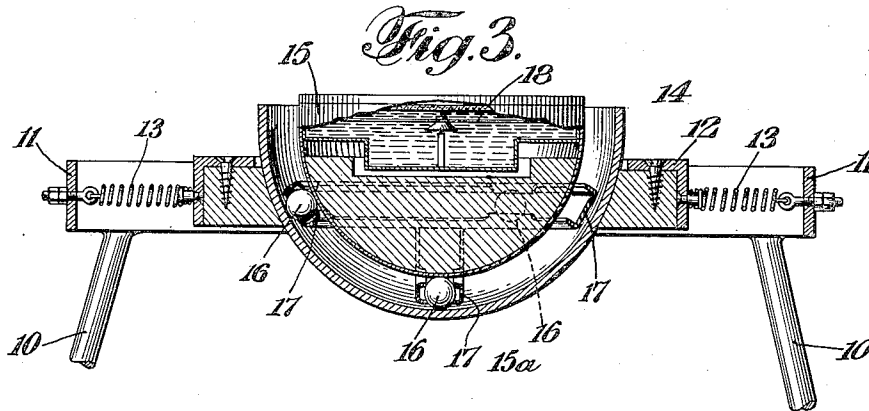
W. LILLY

1,915,466

SELF RIGHTING SUPPORT

Filed June 27, 1930

2 Sheets-Sheet 2



INVENTOR
William Lilly
BY *Kenyon Kenyon*
ATTORNEY

UNITED STATES PATENT OFFICE

WILLIAM LILLY, OF CHICAGO, ILLINOIS

SELF-RIGHTING SUPPORT

Application filed June 27, 1930. Serial No. 464,133.

This invention relates to self-righting supports and has for an object a device of this character more especially for use on water and air-craft to maintain nautical instruments and other devices level, despite the pitch and roll of the craft.

According to this invention, a weighted member having a spherical surface is supported by means of anti-friction balls interposed between said surface and a concentric spherical surface formed in a support carried by the water or other craft, the balls being mounted in a freely movable cage. A compass or other device is carried by the weighted member. When the craft rolls or pitches or both pitches and rolls, the weighted member remains level although it moves relative to the support. When the device is used as a compass mount, the design is such that the point of support of the compass needle is concentric with the spherical surfaces.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a perspective view of one embodiment of the invention.

Fig. 2 is a plan view thereof.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a plan view of the ball cage.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a plan view partially broken away of a modified form of the invention, and

Fig. 7 is a section on the line 7—7 of Fig. 6.

Referring now more especially to Figs. 1 to 5 inclusive, 10 is a standard provided at its upper end with a ring 11. An annulus 12 is resiliently supported from the ring 11 by means of springs 13. A cup 14 is carried by the annulus 12 and is provided with an inner surface of spherical contour. Within the cup 14 there is provided a member 15 having a spherical surface concentric with the inner surface of the cup 14. This member is supported by means of anti-friction balls 16 preferably four in number interposed between the inner surface of the cup and the outer surface of said member, the diameter of these balls preferably being equal to the difference between the radii of the outer sur-

face of the member 15 and the inner surface of the cup 14. These balls are mounted in a cage 17 comprising an annular section and a bridge section. When the parts are in the position shown in Fig. 3, one ball 16 is retained by the bridge section of the cage directly below the center of the two spherical surfaces and the other three balls are retained by the annular section with their centers lying in a horizontal plane and uniformly spaced.

The member 15 is weighted with lead as indicated at 15a so that its center of gravity lies below the geometrical center of its spherical surface. The member 15 will therefore tend to remain in level position even though the standard 10 may be moved into different angular positions and to return the member 14 to level position should it be displaced from such position. A standard compass 18 is mounted in the member 15 and the point of support of the compass needle is preferably made concentric with the spherical surfaces of the member 15 and the cup 14.

In the device above described, the compass is retained in horizontal position through relative rotation of the member 15 and cup 14. This relative rotation is made possible by the anti-friction balls 16 which roll on the spherical surfaces of both the member 15 and the cup 14. Free rolling of the balls is permitted due to the fact that the cage 17 is freely movable.

The device above described may be embodied in a mounting in which the cup is replaced with a complete sphere thereby allowing complete inversion of the standard such as would occur while flying air-craft upside down or in making loops.

Referring now to Figs. 6 and 7, 20 is a standard terminating in a circular table 21 having a flange 22. The table is provided with a central aperture, and an annular bearing member 23 is arranged in a recess surrounding said aperture. A second bearing member 24 is supported from the first bearing member by means of anti-friction balls 25 contained in an annular cage 26. The bearing member 24 is provided with a flanged member 27 from which project radial studs

28. Corresponding studs 29 project inwardly from the flange 22 and springs 30 are interposed between the two flanges, the ends of each spring fitting over opposed studs 28 and 29.

A cup 31 is supported by the bearing member 24 and is provided with an inner spherical surface; there being an aperture in the bottom of the cup. A spherical member 32 is supported from the cup by means of anti-friction balls 33 mounted in a freely movable cage 34. The inner surface of the cup and the outer surface of the sphere are concentric and the diameter of the balls is equal to the difference between the radii of the two surfaces. A pendulum 35 is fastened at one end to the sphere 32 and carries at its other end an adjustable weight 36. A support 37 is mounted on the sphere by means of a stud 38 diametrically opposite the pendulum 35.

In this modification the center of gravity of the pendulum 35 and ball 32 lies below the geometrical center of the ball 32 and the plate 37 is maintained in substantially horizontal position at all times. The pendulum tends to remain vertical despite the roll or pitch of the ship and friction is reduced to a minimum by use of the balls 33, which roll both on the surfaces of the sphere 32 and the inner surfaces of the cup 31. Any lateral movement of the standard 20 is cushioned through the springs 30 which permit relative movement of the cup 31 and the standard 20.

It is apparent that the device above described may be utilized in a great many ways, for example, it may be utilized as a support for a telescope, a bed, a chair, a camera, an operating table or platform, an observation platform for taking observations with a sextant and artificial horizon or as a support for machines and other types of guns mounted on ships, motor trucks or railway carriages. In fact, it may be made use of wherever it is desirable to maintain an instrument device or apparatus in a predetermined position regardless of the motion of the structure upon which it is mounted.

It is of course understood that various structural modifications may be made without in any way departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In a device of the character described,

a supporting and a supported member having concentric concave and convex surfaces, anti-friction balls interposed between said surfaces, said supported member having its center of gravity below the geometric center of its surface, and a freely movable cage in which said balls are mounted, said cage comprising an annular section and an arched bridge section, one of said balls being mounted in said bridge section and the remaining being mounted in said annular section.

2. In a device of the character described, a table, a carrier, resilient means extending between said table and carrier tending to oppose movement of the carrier relative to the table, a supporting and a supported member having concentric concave and convex surfaces, said supporting member being mounted on said carrier, anti-friction balls interposed between said convex and concave surfaces, a freely movable cage in which said balls are mounted, said supported member having its center of gravity below the geometric center of its spherical surface.

3. In a device of the character described, a table, a carrier, anti-friction balls interposed between said table and carrier, resilient means tending to oppose lateral movement of said carrier, a supporting and a supported member having concentric spherical concave and convex surfaces, said supporting member being mounted on said carrier, anti-friction balls interposed between said convex and concave surfaces, a freely movable cage in which said balls are mounted, and a pendulum depending from said supported member.

4. In a device of the character described, a support having a continuous concave spherical surface, a member having a continuous convex spherical surface concentric with said concave surface, anti-friction balls interposed between said surfaces, said member having its center of gravity below the geometric center of its spherical surfaces, and a freely movable cage in which said balls are mounted, said cage comprising an annular section and an arched bridge section, one of said balls being mounted in said bridge section and the remainder being mounted in said annular section.

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

WILLIAM LILLY.