No. 875,036. PATENTED DEC. 31, 1907.

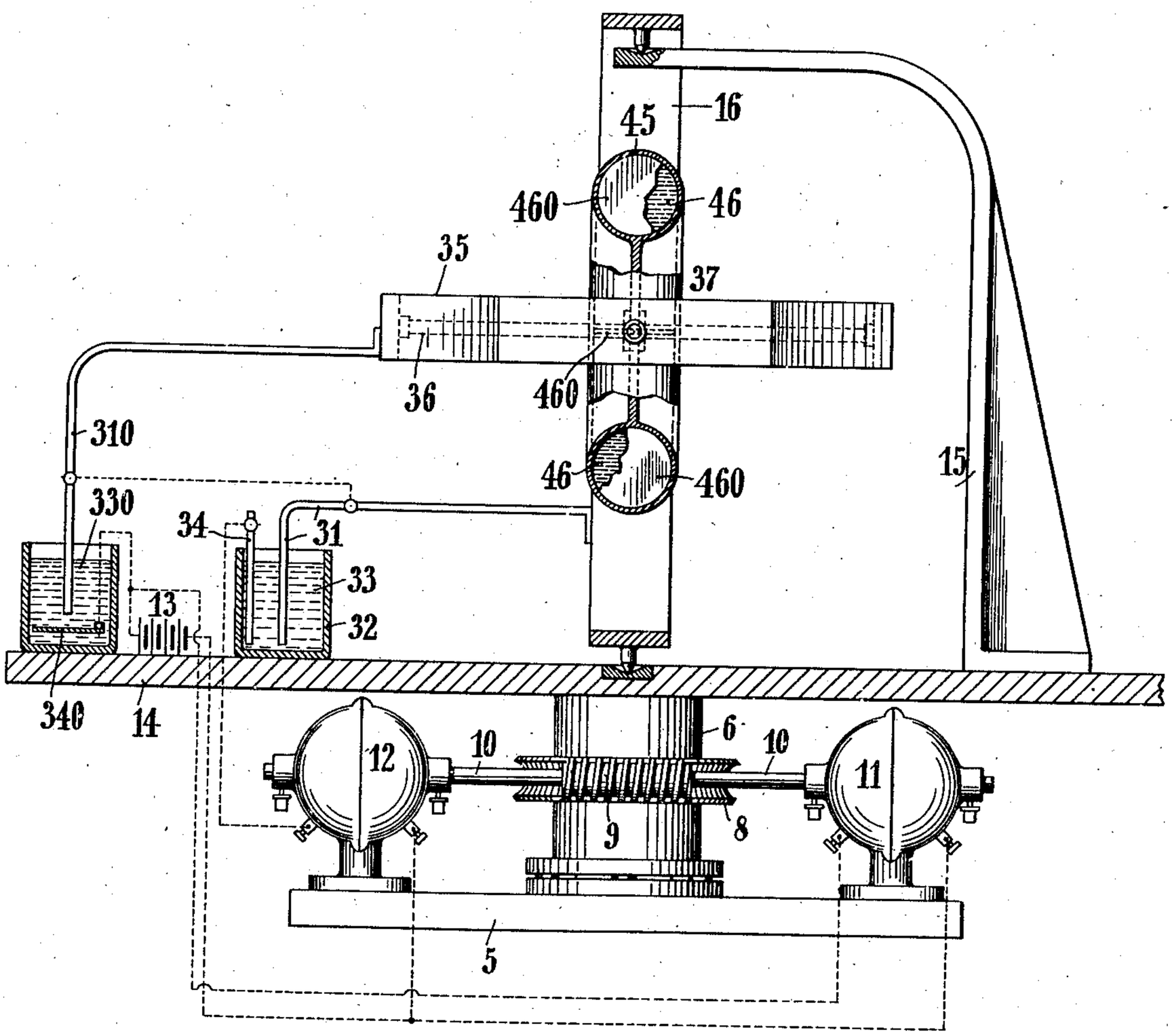
N. ACH.

GYROSCOPE.

APPLICATION FILED AUG. 30, 1906.

3 SHEETS—SHEET 3.

Fig. 5.



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3 SHEETS—SHEET 2.

Fig. 2.

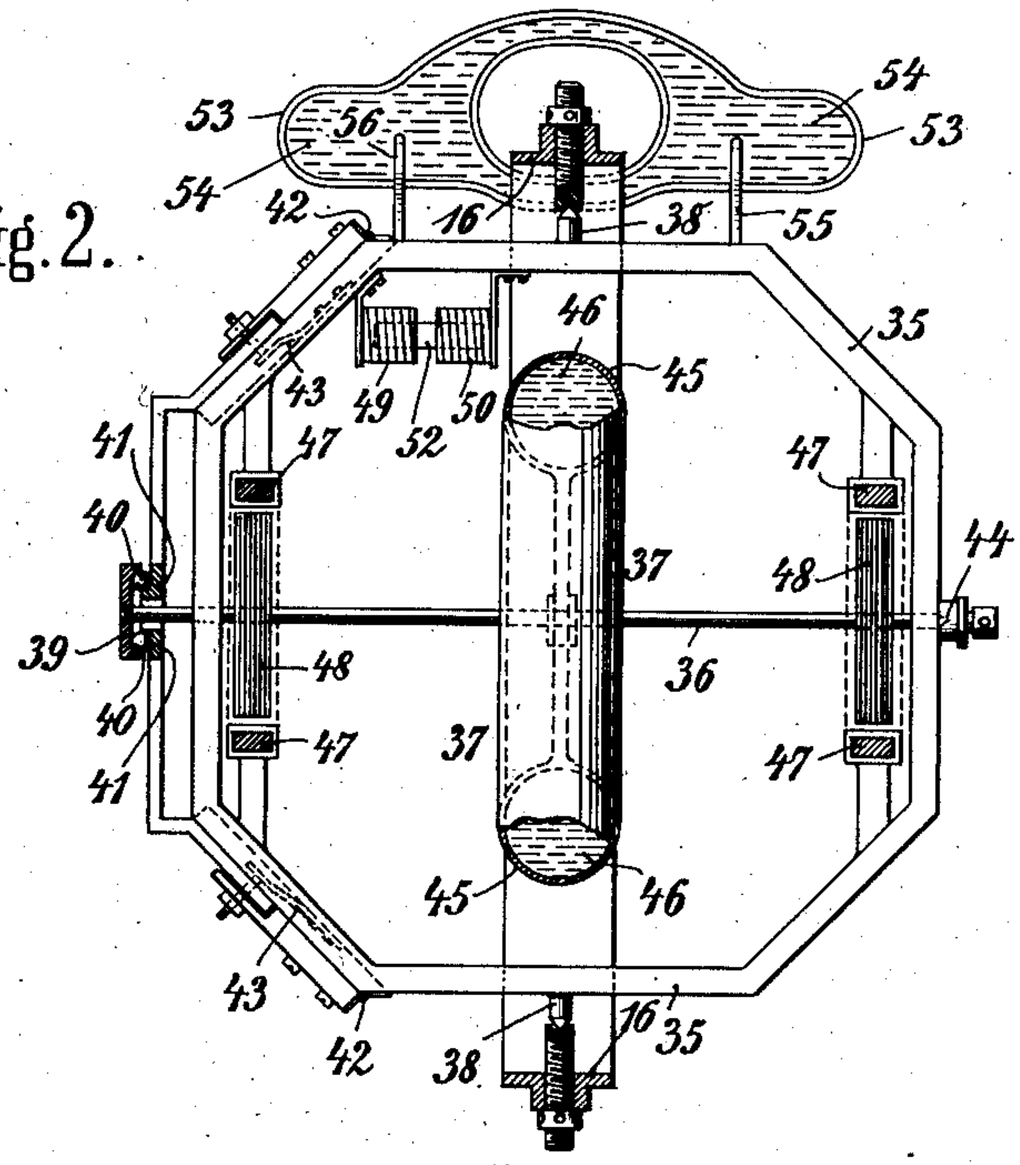


Fig. 3.

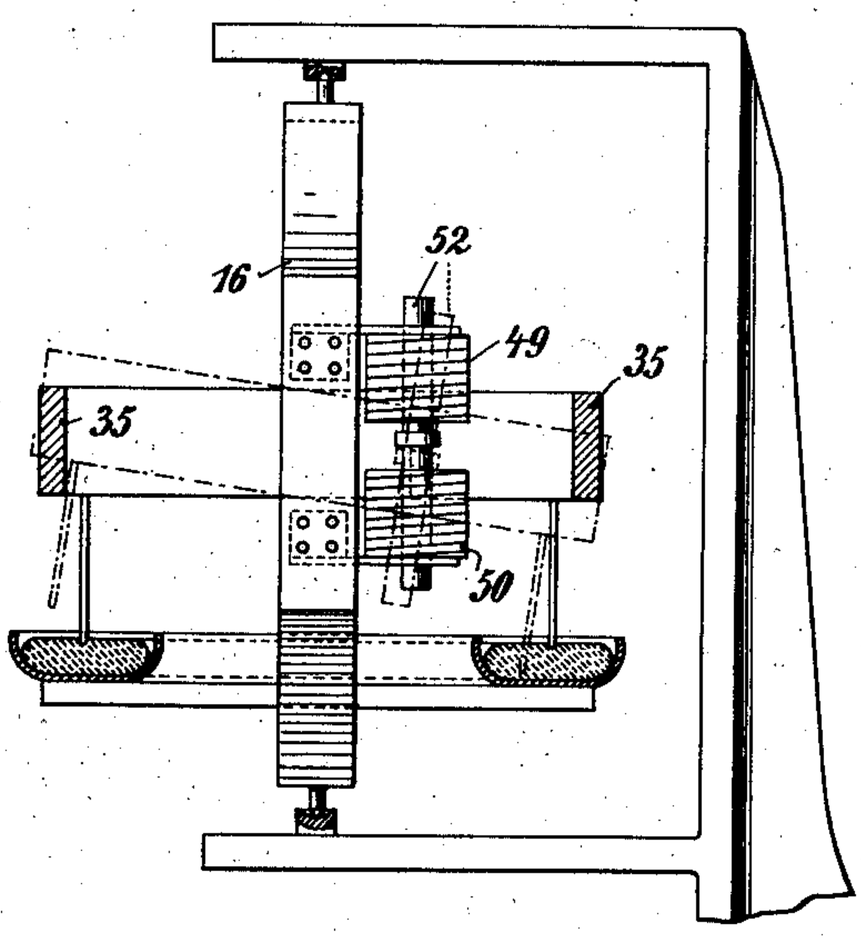
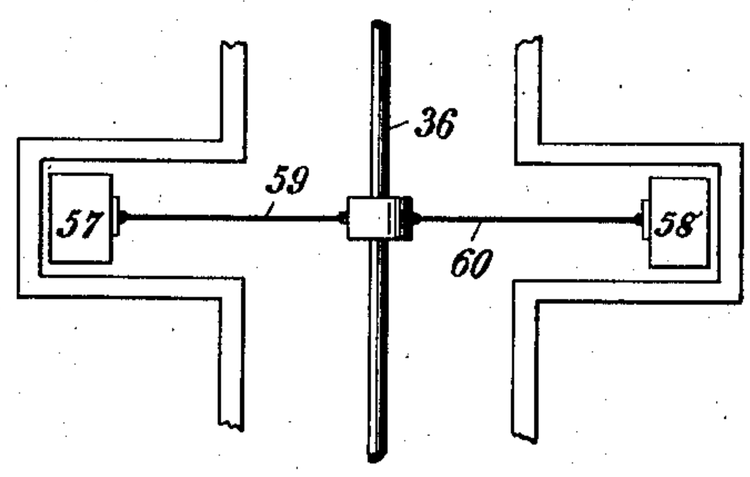


Fig. 4.



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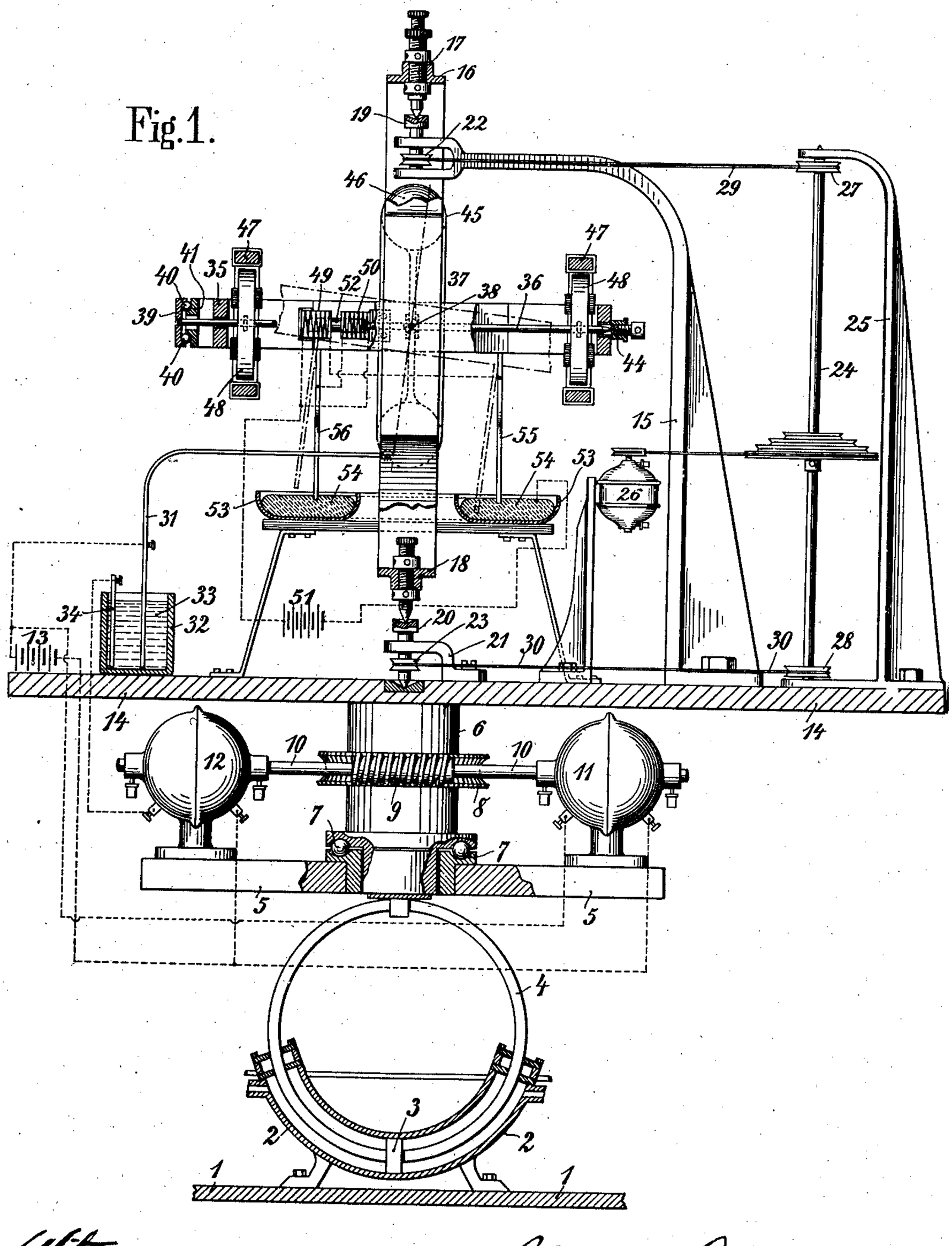
3 SHEETS—SHEET 1.

Fig. 1.



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UNITED STATES PATENT OFFICE.

NARCISS ACH, OF MARBURG, GERMANY.

GYROSCOPE.

No. 875,036. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed August 30, 1906. Serial No. 332,723.

To all whom it may concern:

Be it known that I, NARCISS ACH, a citizen of the German Empire, and resident of 36 Deutschhausstrasse, Marburg, Germany, have invented certain new and useful Improvements in and Relating to Gyroscopes, of which the following is a specification.

My invention relates to gyroscopes and has for its object to provide such improvements in gyroscopes which secure the invariability of the axis of rotation of the gyroscope in spite of arbitrary movements of the carrier of the gyroscope.

Therefore my invention comprises means to do away with the influence of gravity acting on the spinning body and causing friction between the axle and its bearing which undergoes changes on variation of the inclination of the axis of rotation towards the horizontal plane.

My invention furthermore comprises means for securing an invariable position of the axis of rotation of the spinning body and of the rotatable frames forming support for same with relation to their carrier in spite of any rotations of the support of such gyroscope carrier.

Other objects of my invention will become clear from the following specification and the annexed drawings forming part of same.

In the drawings Figure 1 is a vertical sectional view of an embodiment of my invention. Fig. 2 is a side elevation of the rotatable frame carrying the axle of the spinning body of the gyroscope. Fig. 3 is a detail view showing a modified device for securing an invariable inclination of the revoluble axle of the spinning body. Fig. 4 is a detail view of a modified form of connection between the spinning body and its carrying shaft. Fig. 5 shows diagrammatically part of a modification, in which each of the two rotatable frames of the gyroscope is controlling an actuating device for the platform carrying the gyroscope. This figure at the same time illustrates a spinning body consisting of a hollow ring divided into cavities by partitions.

In the drawings 1 designates the platform of a ship or some other object on which it is intended to use the gyroscope.

2 is a double-acting pump forming a curved tube and containing a piston 3 carrying a ring-shaped rod 4 firmly connected to a plate 5.

6 is a pillar mounted on the plate 5 by a ball-bearing 7 and carrying a worm wheel 8. 9 is a worm meshing with said worm wheel and mounted on an axle 10 which forms the common axle of two electromotors 11, 12.

13 is a source of electric power. The electromotors 11, 12 are included in the current circuit of such electric source in such a manner that the two motors tend to rotate the axle 10 in opposite directions.

On the pillar 6 is mounted a platform 14 carrying a column 15.

16 is a rotatable frame mounted by pins 17, 18 on bearings 19, 20. The bearing 19 is revolubly mounted in the column 15 and the bearing 20 is revolubly mounted in a bracket 21. The bearings 19, 20 are provided with pulleys 22, 23 respectively.

24 is an axle mounted in a bracket 25 of the platform 14 and driven by a motor 26 which is likewise mounted on the platform 14. Mounted on the axle 24 are pulleys 27, 28 which are connected with pulleys 22, 23 by cords 29, 30 respectively, said cords communicating rotation in opposite directions to said pulleys 22, 23 and bearings 19, 20.

31 is a pole piece rigidly connected with the frame 16 and immersed into a receptacle 32 containing a fluid 33 forming a resistance included in the electric current circuit containing the electromotor 12. 34 is a second pole piece also immersed into fluid-resistance 33 opposite the pole piece 31 and rigidly mounted whereas the pole piece 31 is adapted to follow the movements of frame 16. The current conductors including the said electromotors 11, 12 and the fluid-resistance 33 are clearly indicated on the drawing.

35 is a frame rotatably mounted in the frame 16 and carrying the axle 36 of the spinning body 37. The axis of rotation of frame 35 in frame 16 is indicated by the numeral 38.

The axle 36 of the spinning body 37 is provided at one end with a disk 39 having a ball-bearing 40.

41 are supporting pieces for the balls 40 which are connected by links 42 with the frame 35.

43 are springs mounted on the frame 35 and having a tendency to raise the supporting pieces 41 which are made of flexible metal, which permits the springs 43 to relieve the pressure on the pointed end of the axle 36 when the frame 35 is inclined so that the bearing 44 is downward, the tendency of the springs 43 being to push the supporting

pieces 41 upward when in an inclined position.

The axle 36 of the spinning body terminates at the end opposite the plate 39 in a point, said point running in a bearing 44 carried by the frame 35 and adjustable in axial direction.

The spinning body 37 is provided with a heavy rim 45 forming a hollow ring Figs. 1 and 2 or a ring provided with a number of cavities symmetrically arranged all around said ring. The cavity or the several cavities of the ring 45 which are separated from each other by partitions 460, Fig. 5 are filled with a heavy material of fluid, granular or pulverulent condition, for instance mercury or metal filings. The filling material of the cavities of ring 45 is indicated on the drawing with the numeral 46.

Firmly connected with frame 35 are current-inducing bodies 47 of two electromotors for currents with more than one phase. The numerals 48 designate the induced bodies of the said electromotors, such induced bodies being mounted on the axle 36 of the spinning body 37. The inducing bodies 47 encircling the induced bodies 48, as is clearly shown on the drawing. 49 and 50 are two coils carried by frame 35 and included in the circuit of a source of electric power 51. The connection between said two coils 49, 50 and the poles of the source of electric power 51 are clearly shown on the drawing.

52 is an iron core shiftably mounted within the coils 49 and 50 and adapted to be moved towards one side or the other depending from the kind of energizing the coils 49 and 50.

53 is a ring-shaped vessel mounted on plate 14 and filled with mercury 54.

55 and 56 are metallic rods connected to frame 35 and forming part of the current-circuits which include coils 49 and 50.

The one pole of the source of electric power 51 is connected to the mercury filling 54 of the ring-shaped vessel 53 so that energizing of coils 49 and 50 only takes place when the corresponding circuits are closed by immersing of rods 55 or 56 into the mercury filling 54. The circuit connections are arranged in such a manner that the current flows through coils 49 and 50 in opposite directions.

In Fig. 3 I have shown a modification of the last named device in which the coils 49 and 50 are not fixed to frame 35 but to frame 16 whereas the iron core 52 is fixed to frame 35 in substantially vertical position. The current connections may be identical with those illustrated in Fig. 1 and are therefore not shown in Fig. 3.

In the modification of the connection of the spinning body with the carrying axle shown in Fig. 4 heavy bodies 57, 58 are connected to the revoluble axle which in this case is again designated with the numeral 36, as in the other figures, by wires 59 and 60. The wires 59 and 60 prevent the flying away of the heavy bodies 57, 58 on rotation of the axle 36.

Referring now to the embodiment of the invention shown in Figs. 1 and 2 the operation of the device described is as follows: Assuming that the platform 1 is the platform of a ship and the ship is moving on the sea, then the waves of the sea will cause the platform of the ship to continuously change its inclination towards the horizontal plane. If now the device is placed on the platform of the ship in such a manner that the cylinder of the double-acting pump 2 is in vertical direction to the longitudinal axis of the ship then the ring 4 of the pump will be moved by known means, which are not represented on the drawing and which do not form the object of this invention, in such a manner that the rolling movement of the ship is compensated so that the plate 5 in a direction parallel to ring 4 remains always horizontal. In the embodiment shown on the drawing only means are provided for compensating the variable inclinations of the platform of the ship towards the horizontal plane in one single direction, say in the direction perpendicular to the longitudinal axis of the ship. Of course it would be possible to provide also means for taking up the variable inclinations of the platform of the ship with relation to the horizontal plane in every other direction.

The effect of a device like the double-acting pump 2 is this that the plate 5 is rigidly held in horizontal position, although the platform 1 is rolling and that the horizontal position is not altered even if a pressure asymmetrical to the point in which the plate is supported by ring 4 is exerted on the surface of the plate, for instance at the point of the electric source 13. This is an essential difference between the kind of supporting of the gyroscope used in connection with my invention and the supporting of the gyroscope by means of a system suspended after the manner of Cardan.

If now the ship runs continuously in one definite direction, the parts of the gyroscope system will remain in their position with relation to the plate 5. However if the ship alters the direction of its course this would produce a tendency to deviate the axis of rotation of the spinning body by means of the several members connecting the platform 1 of the ship with the said axis of rotation of the spinning body. The spinning body which all this time is rotating with high velocity has a tendency to retain its original direction of axis of rotation. Now the tendency of the members connecting the platform 1 of the ship with the axis of rotation of the spinning body to deviate said axis is overcome by the electrical means for adjusting the position of plate 14 with relation to plate 5. Namely these adjusting means op-

erate in such a manner that on turning of plate 14 with relation to the plane of frame 16 which is substantially kept invariable by the rotating spinning body the fluid resistance included in the current of motor 12 is altered. The alteration of the resistance in the current of motor 12 influences the power of said motor in such a manner that the axle 10 of the two motors 11, 12 is rotated till the resistance in said current of the motor 12 has attained again the value of the original position of the parts. The rotation of the axle 10 produces a rotation of the pillar 6 with plate 14. This rotation of the plate 14 now produces on frame 16 substantially the same rotating tendency as the tendency of the displacement of parts produced by the alteration of the direction of the course of the ship. In this way the effect of the alteration of the course of the ship on the direction of the axle of rotation of the spinning body is substantially excluded.

For further correcting the influence of the varying direction of the course of the ship adjusting means similar to those described and controlled by frame 35 could be used. The effect would also be essentially the same if instead of frame 16 frame 35 would be used for controlling the adjusting means because the displacement of plate 14 with relation to frame 16 causes a variation of the inclination of the revoluble axle 36 of the spinning body towards the horizontal plane 14.

Fig. 5 shows a modification where correcting means are provided controlled as well by frame 35 as by frame 16. The operation of such controlling means is substantially the same as that described with reference to Fig. 1, where only frame 16 controls the operation of the actuating means for platform 14. The pole piece connected to frame 35 is designated 310, the opposite pole piece 340, and the fluid resistance 330.

Besides the alteration of the direction of the course of the ship the invariability of the direction of the axis of rotation of the spinning body is disturbed by the friction of said axis in its bearings and by the friction of the rotatable frames 16 and 35 in their bearings. As a means for overcoming this friction I have shown rotatable bearings 19 and 20 for the pins 17 and 18 carrying frame 16. It is known that the influence of the friction is much more considerable if an object is put into movement from the situation of rest. Therefore the influence of friction is diminished if the bearings of a rotatable body are permanently rotated so that there exists no friction resulting from the starting of the rotatable object. The friction diminishing effect is the completest possible if cooperating bearings, that is to say bearings belonging to one single axle, are rotated in opposite directions, or if same are only oscillated so that the influence of friction exerted by the oscillation in one direction is compensated by the influence exerted by the oscillation in the opposite direction. The influence of friction must be considered also in so far as it is caused by the weight of the rotating body resting in its bearings.

It is known to those skilled in the art that the spinning body is practically a body of considerable weight. Now it is an essential point in a gyroscope that the rotating masses are arranged symmetrically to the axes of rotation. However the influence of gravity cannot be excluded by merely distributing the mass of the rotating elements symmetrically to the axes of rotation if the axes of rotation do not remain in invariable position. Assuming that the mass connected to the axle 36 of the spinning body is arranged symmetrically to such axes and to the axis 38 of frame 35 so that the bearings of the axle 36 are free from tension in axial direction as long as the axle 36 remains in horizontal position, then pressure will be exerted on the bearings of said axle 36 if frame 35 is rotated about the axis 38. The bearing of the axle 36 in that part of the frame 35 which is inclined toward plate 14 must sustain tension in the direction of the axle 36 resulting from the influence of gravity. In order to secure equal pressure on both bearings of the revoluble axle of the spinning body the upper bearing is formed by the spring actuated parts 41 connected to frame 35. The springs 43 take up one part of the weight of the spinning body and of its axle in a position inclined towards the horizontal plane. In this way the disturbing influence of the inclination of the revoluble axle of the spinning body towards the horizontal plane is diminished or entirely eliminated. The springs 43 are so regulated that the weight of the spinning body is uniformly distributed on the bearings on both sides of the spinning body so that an actual movement of axle 36 in an axial direction does not take place even if the frame 35 assumes a considerable inclination toward the horizontal plane.

The springs 43 are intended to be operated only in the case where the revoluble axle of the spinning body is not kept horizontal. This is the case under preferred conditions where the said axle is adjusted so as to be parallel to the axis of the earth. When this is done the variation of the inclination of the rotatable axis is kept within certain limits provided that the ship or other carrier of the gyroscope permanently remains either on the northern or on the southern hemisphere of the earth. For this reason the conical step bearing on the right and the ball bearing on the left in the embodiment shown in Figs. 1 and 2 of the drawings are made to be adapted to resist displacement of the axle

in one direction only, namely, to right hand displacement, whereas no means are provided to resist left hand displacement.

If an alteration of the inclination of the revoluble axle of the spinning body towards the horizontal plane takes place, the iron core 52 immediately readjusts the carrying frame 35 of said axle. Namely under normal conditions the metallic rods 55 and 56 connected to frame 35 are immersed at the same time into the mercury filling 54 of the receptacle 53. Therefore under normal conditions the current circuits of both the coils 49 and 50 are closed securing an invariable position of the iron core 52. If however by some external influence the frame 35 which carries the axle 36 of the spinning body alters its inclination towards the horizontal plane then the one rod, say 55, is immersed deeper into the mercury, the level of which always remains in a horizontal plane, whereas the second rod, say 56, is elevated above the level of the mercury 54 so that the current circuit through the one coil, say 49, remains closed, whereas the current circuit through the other coil, say 50, is interrupted. The consequence of such interrupting of the current circuit of the one coil is a shifting of the iron core 52 in such a direction that the weight of the frame 35 on that side of the axle 38 which had been elevated is increased. Thus producing a tendency to depress the elevated part of the frame 35 and to bring it back to its normal position in which the two rods 55 and 56 are immersed at the same time into the mercury 54. The same effect would be obtained if the coils were not fixed to frame 35 and the iron core shiftable within the cores but if instead the coils would be fixed to frame 16 and the core in substantially vertical position fixed to frame 35. In this instance the tendency of the coils to shift the iron core would result in a pull on frame 35.

The device above described for securing invariable inclination of the axle of the spinning body toward the horizontal plane is substantially intended to secure a position of the axle parallel to the horizon, the variation of the inclination in this case being very small. The yielding means comprising springs 43 are in this instance substantially inoperative so that the effectiveness of the apparatus is not interrupted by the fact that the conical step bearing 44 on the right and the ball bearing 40 on the left of the axles 36 only prevent displacement of said shaft and rotatable parts toward the right. If it is intended to keep the axle of the spinning body in a position different from that parallel to the horizon, for instance, in a position parallel to the axis of the earth, the mercury contained in the vessel 53 may be poured out or the rods 55 and 56 may be taken off.

The rotation of the spinning body which forms the essential condition for the practical use of a gyroscope is effected by two electromotors for currents with more than one phase comprising the inducing bodies 47 firmly mounted on the frame 35 and the induced bodies 48 mounted on the axle 36. It has been found that the use of current-induced bodies mounted on the axle 36 and being separated from the spinning body 37 is of high practical value if such induced bodies form part of an electromotor for currents with more than one phase, especially if the induced bodies 48 are encircled by the inducing bodies 47.

While I have described in the foregoing specification a gyroscope which is provided with a number of improvements adapted to diminish the disturbing influences of the movement of a ship or other carrier of the gyroscope it is to be understood that it is not necessary that all the said improvements are used in combination with each other and that at the same time without departing from the spirit and the scope of my invention numerous changes may be made with relation to the details of construction.

Having now particularly described and ascertained the nature of my invention, and in what manner the same is to be performed, I declare that what I claim is:

1. A gyroscope comprising an arbitrary number of spinning bodies, a rotatable frame, an axle supporting said spinning bodies and revolubly mounted in said rotatable frame, pivots for said frame, supporting means for said pivots and frame, means for rotating said axle with said spinning body, at least one part of the mass of the spinning body adapted to be displaced with relation to the carrying axle by centrifugal force.

2. A gyroscope comprising an arbitrary number of spinning bodies, an axle supporting same, a rotatable frame, said axle revolubly mounted in said rotatable frame, pivots for said frame, supporting means for said pivots and frame, means for rotating said axle with said spinning body, at least one part of the mass of the spinning body adapted to be displaced with relation to the carrying axle by centrifugal force, and means for securing permanent connection between the axle of rotation of the spinning body and the displaceable parts of its mass.

3. A gyroscope comprising at least one spinning body provided with at least one cavity, filling material in said cavity adapted to be displaced on rotation of the spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame and supporting means for said last named frame.

4. A gyroscope comprising at least one spinning body provided with at least one cavity forming a ring, filling material in said cavity adapted to be displaced on rotation

of the spiming body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame and supporting means for said last named frame.

5. A gyroscope comprising at least one spinning body provided with at least one cavity forming a ring filling material of liquid condition in said cavity, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame and supporting means for said last named frame.

6. A gyroscope comprising at least one spinning body provided with at least one cavity forming a ring, said cavity containing mercury, an axle supporting said spinning body or bodies, said axle revolubly mounted in a rotatable frame and supporting means for said last named frame.

7. A gyroscope comprising at least one spinning body provided with at least one cavity forming a ring, filling material in said cavity adapted to be displaced on rotation of the spinning body, an axle supporting said spinning body, said axle being arranged concentrically to said ring and substantially perpendicular to the plane of the ring and revolubly mounted in a rotatable frame and supporting means for said last named frame.

8. A gyroscope comprising an axle revolubly mounted in a rotatable frame, pivots for said frame and means for supporting said pivots, a heavy ring-shaped body encircling said axle and in connection with same the connecting member adapted to allow limited freedom of movement of said axle and ring with relation to each other by centrifugal force and power-actuated means for rotating said axle and heavy ring.

9. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, bearings for said axle in said rotatable frame and means on opposite sides of said spinning body adapted to relieve the pressure of the spinning body operative in axial direction.

10. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, bearings for said axle in said rotatable frame and spring actuated means on one side of said spinning body adapted to relieve the pressure of the spinning body operative in axial direction and means on the other side of the spinning body likewise adapted to relieve the pressure of the spinning body operative in axial direction.

11. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, bearings for said axle in said rotatable frame, spring actuated means co-acting with the axle of the spinning body on opposite sides of said spinning body adapted to relieve the pressure of the spinning body operative in axial direction.

12. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, bearings for said axle in said rotatable frame co-acting with said axle on opposite sides of the spinning body mounted on the axle, the bearing surfaces of said bearing beings turned towards the same side, so as to allow distribution of the axial pressure on bearings on opposite sides of the spinning body.

13. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, bearings for said axle in said rotatable frame on opposite sides of the spinning body, spring actuated means in operative connection with said bearings adapted to relieve the pressure of the spinning body in axial direction.

14. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, said axle revolubly mounted in a rotatable frame, supporting means for said last named frame, automatical adjusting means adapted to secure substantially invariable position of the axes of rotation, of said frame and spinning body with relation to the support of said frame and spinning body.

15. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a further support carrying said first named support, a rotatable connection between said two supports, and power actuated means for rotating said frame carrying support.

16. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a further support carrying said first named support, a rotatable connection between said two supports, power actuated means for rotating said frame carrying support and automatical adjusting means adapted to control said power actuated means, said automatical adjusting means operated by the frame which is directly carried by the frame carrying support.

17. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle

of the spinning body being revolubly mounted in one of said frames, a further support carrying said first named support, a rotatable connection between said two supports, power actuated means for rotating said frame carrying support and automatical adjusting means adapted to control said power actuated means, said automatical adjusting means operated by the frame which carries the spinning body and its revoluble axle, said adjusting means being operated by the spinning body carrying frame.

18. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a further support carrying said first named support, a rotatable connection between said two supports, power actuated means for rotating said frame carrying support and automatical adjusting means adapted to control, said power actuated means said automatical adjusting means operated by the frame which is directly carried by the frame carrying support and further adjusting means operated by the frame which carries the spinning body and its revoluble axle.

19. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, automatical adjusting means adapted to adjust said last named frame so as to secure an invariable inclination of the same.

20. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a horizontal platform, current controlling means forming a bridge between said frame and said platform, automatical adjusting means operated by such current and adapted to adjust said spinning body carrying frame so as to secure an invariable inclination of the same.

21. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a weight in adjustable connection with said axle carrying frame and automatical means for adjusting said weight so as to secure an invariable inclination of said carrying frame.

22. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a weight in adjustable connection with said axle carrying frame, a coil connected to said frame and adapted to be energized by electric current, said coil in operative connection with said weight, a horizontal platform, current controlling means forming a bridge between said frame and said platform.

23. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, a rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames upon rotatable oscillating bearings.

24. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, rotatable bearings carrying said rotatable frames and axle of the spinning body, said rotatable bearings being arranged in pairs in axial alinement, means adapted to rotate one bearing of each pair in one direction and the other in the opposite direction.

25. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, a carrier for said support, power actuated means in connection with said carrier adapted to rigidly hold the carrier in a predetermined position, parallel to the horizontal plane.

26. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frame connection between said support and said axle including a carrying frame in which the axle of the spinning body is revolubly mounted and a rotatable platform in which the said support for the rotatable frames of the gyroscope is mounted.

27. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of the spinning body being revolubly mounted in one of said frames, current actuated means for rotating said spinning body and its revoluble axle, said current actuated means forming an electromotor for currents with more than one phase and comprising current inducing bodies, mounted on the spinning body carrying frame and current induced bodies different from the spinning body and mounted on the axle of the spinning body.

28. A gyroscope comprising at least one spinning body, an axle supporting said spinning body, a support, rotatable frames between said support and said axle, the axle of

the spinning body being revolubly mounted in one of said frames, current actuated means for rotating said spinning body and its revoluble axle, said current actuated means forming an electromotor for currents with more than one phase and comprising current inducing bodies, mounted on the spinning body carrying frame and current induced bodies mounted on the axle of the spinning body and encircled by said current inducing means.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

NARCISS ACH.

Witnesses:
JEAN GRUND,
CARL GRUND.