

No. 705,731.

Patented July 29, 1902.

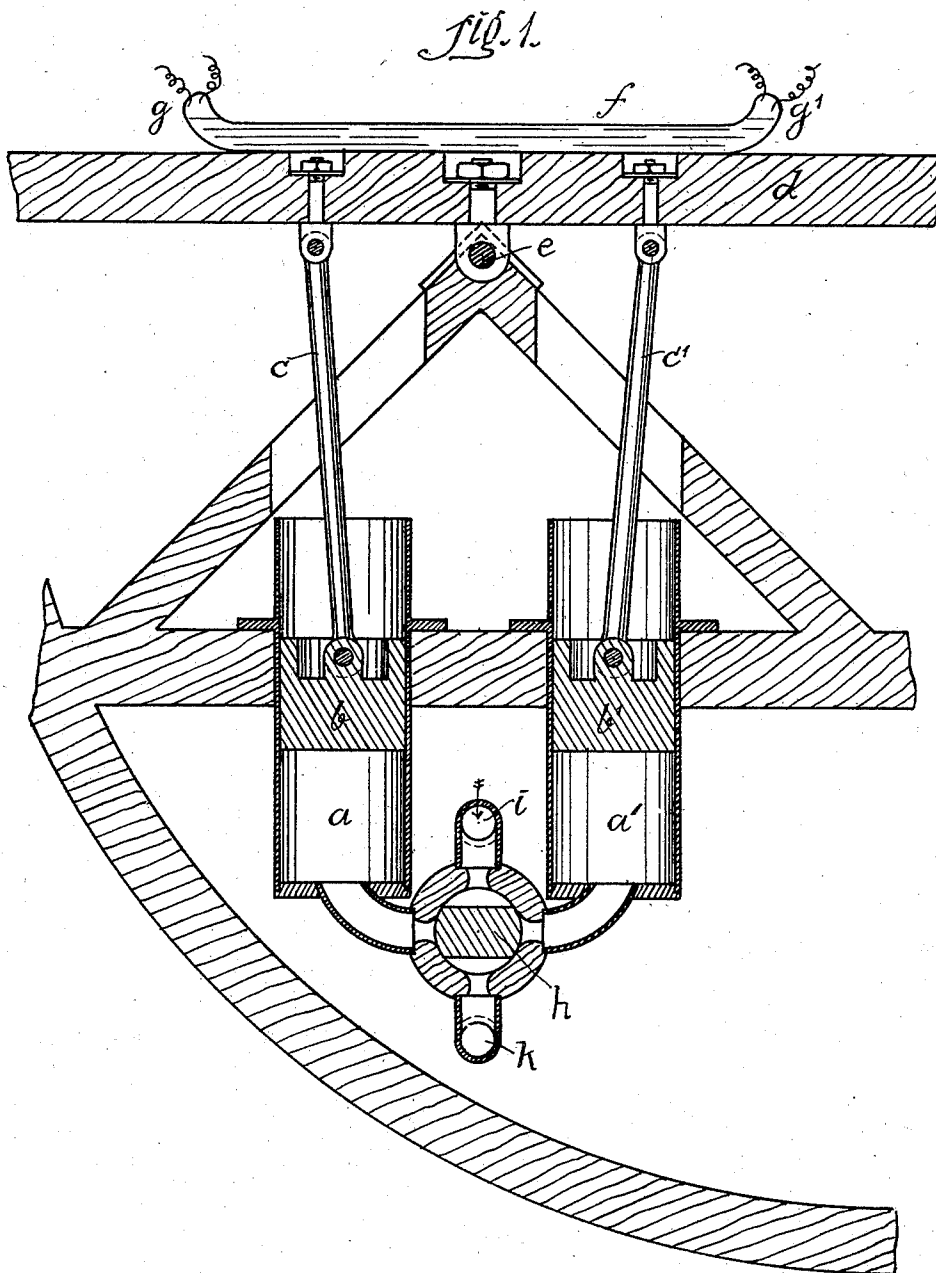
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MEANS FOR KEEPING MOVING OBJECTS IN HORIZONTAL POSITIONS.

(Application filed Feb. 18, 1902.)

(No Model.)

2 Sheets—Sheet 1



Witnesses
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2 Sheets—Sheet 2.

Fig. 2.

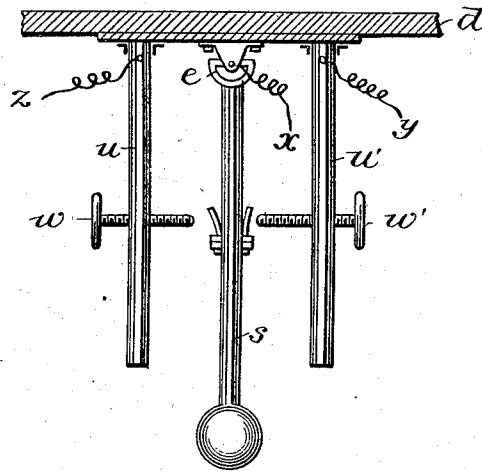
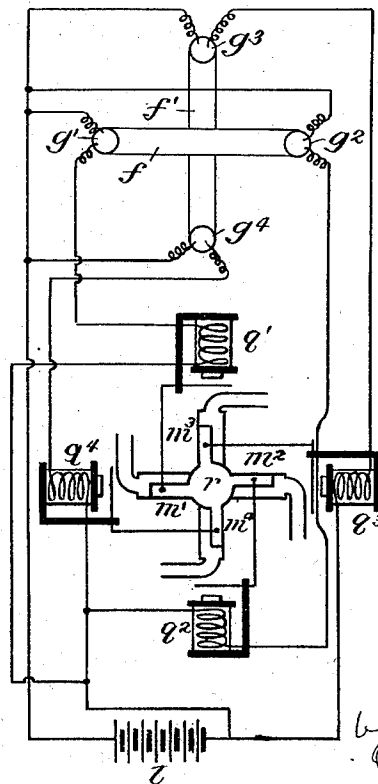


Fig. 3.



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NARZISS ACH, OF GÖTTINGEN, GERMANY.

MEANS FOR KEEPING MOVING OBJECTS IN HORIZONTAL POSITIONS.

SPECIFICATION forming part of Letters Patent No. 705,731, dated July 29, 1902.

Application filed February 18, 1902. Serial No. 94,701. (No model.)

To all whom it may concern:

Be it known that I, NARZISS ACH, a subject of the German Emperor, and a resident of Göttingen, Germany, (whose postal address is 7 Friedlaender Weg, Göttingen, Germany,) have invented certain new and useful Improvements in Means for Keeping Moving Objects in a Horizontal Position, of which the following is a specification.

10 This invention relates to means for keeping moving objects in a horizontal position; and the purpose is to obviate those rotary movements of objects which take place, as in ship motion, in planes perpendicular to the horizontal—that is to say, the purpose is to
15 keep the said objects in a horizontal position. To this end the gravitation of weights has hitherto been used in such a manner that the weights directly produced the horizontal position by their gravity. In the present invention the maintenance of the horizontal position is effected with the use of a power-machine or of accumulated or stored energy which acts on the bodies or objects in question.
20 The said machine is supplied with power—for instance, pneumatic or hydraulic energy—from any suitable source. The control of the machine or the stored energy when the object is inclined is effected by movable
25 bodies—for instance, pendular—connected with the object to be held horizontal. In the position corresponding to the horizontal position of the said object no change takes place in the system. When, however, the
30 said object becomes in any way inclined, the power-machine is regulated by the suitable arrangement of the controlling devices in such a manner that the inclined object is replaced in its horizontal position by the action
35 of the power thereon. This arrangement is used for two planes which are perpendicular to each other and to the horizontal plane corresponding, for instance, to the planes laid through a ship in the fore-and-aft and
40 thwartship directions; but the object can obviously also be held horizontal in one direction only.

The invention is more particularly adapted to be used with ships, but can also be used
45 in other connections for maintaining horizontal positions.

In the accompanying drawings, Figure 1 is

a vertical section of the improved device. Fig. 2 shows a modification of the contacts. Fig. 3 is a diagram of the electric controlling-
55 circuits.

Referring to Fig. 1, in the vertical cylinders *a* and *a'* the pistons *b* and *b'* move, the latter being connected by the movable piston-rods *c* and *c'* with the platform or other object *d*
60 to be kept horizontal. The said platform is supported by the shaft *e*, which is rigidly connected with the ship's frame by a triangular bracket, as shown. On the platform *d* a mercury contact device *f* is provided. When
65 by the motion of the ship in one direction the contact-conductor *g* in the communicating pipe *f* is closed by the mercury, the action of suitable electromagnets causes the corresponding movement of the valve *h* to take
70 place, so that the piston *b* is moved upward and the piston *b'* downward. The power for working the pistons is water, air, or steam, which enters at *i* and passes out at *k*, according to the action of the valve *h*. The control
75 of the pistons is obvious from the drawings, but can be effected by any other suitable known means. As stated above, the controlling-gear is operated by electromagnets or solenoids in an otherwise-known manner.
80

Instead of closing the circuit on one or the other side by means of mercury this can be effected by means of a pendulum—as, for instance, shown in Fig. 2. The metal pendulum *s* is suspended on the shaft *e* of Fig. 1.
85 The pendulum and the metal supports *u u'* are insulated from the platform *d* by the ebonite plate *v*. On movement of the platform the circuit is closed in the desired manner by the pendulum *s* and the contact-screw *w* or *w'*.
90 With rotation in one plane, therefore, the operation is such that the surface *d* first rocks. When the movement has reached a certain degree, the circuit is closed by the mercury or the pendulum. The electric current then excites the device (electromagnet-solenoid) which operates the valve in the desired sense, whereupon the action of the machine places the platform horizontal
95 again. This operation is repeated continuously. Since, however, the phases follow each other in very rapid succession, only very slight deflections from the horizontal occur even with a powerful rolling motion.
100

As already stated, the form illustrated applies only to one motion of the vessels—for instance, the rolling motion. If the pitching motion is to be neutralized also, the same arrangement is made for the direction of the latter, a pillar being used for the center of the platform instead of the shaft *e* and the triangular frame. The said pillar is rigidly connected with the ship and is connected to the plate *d* by means of a universal joint.

In Fig. 3 I have illustrated one system of electrical circuits by means of which valves may be controlled to maintain the platform in a horizontal position when the vessel either rolls or pitches, in which it will be seen that the mercury-tube *f* is placed in the transverse direction of the vessel and the mercury-tube *f'* in the fore-and-aft direction. When the contact *g'* or *g''* is closed by the rolling of the vessel, the action of the electromagnet *q'* or *q''* opens the respective valve *m'* or *m''*, so that the platform is rendered horizontal by the outflowing compressed air or the like. When the horizontal position is to be restored in the longitudinal sense—that is to say, when the vessel pitches—the contacts *g''* *g'''*, the electromagnets *q''* and *q'''*, and the valves *m''* and *m'''* come into operation, so that the platform is also placed in the horizontal position in this direction. In this arrangement *r* represents a reservoir for compressed air, steam, or the like fluid, from which four pipes run in different directions and may lead to four cylinders similar to *a* and *a'* in Fig. 1, and each pipe is provided with a controlling-valve, as *m'*, *m''*, *m'''*, and *m''''*, such valves being constructed to control both the admission of fluid to and exhaust from the cylinders. The source of current used may be the lighting installation of the vessel. In order to prevent fusing of the mercury con-

tacts *g'*, *g''*, *g'''*, and *g''''*, relays are inserted into the separate circuits. Since the closing of the contacts is simultaneously effected by the mercury, the movement of which takes place on the principle of the communicating pipes, and the pipes may be of any length; very slight deviations from the horizontal position will take place.

What I claim is—

1. In an apparatus for maintaining movable objects in a horizontal plane, the combination with such object, of a support to which the object is pivotally connected, cylinders rigidly connected to said support, pistons in said cylinders connected to said object on opposite sides of its pivot, valves for controlling admission of fluid-pressure to the cylinders, and means actuated by the movement of said object for controlling the said valves, substantially as set forth.

2. In an apparatus for maintaining movable objects in a horizontal plane, the combination with such object, of a support to which the object is pivotally connected, cylinders rigidly connected to said support, pistons in said cylinders connected to said object on opposite sides of its pivot, valves for controlling the admission of fluid-pressure to said cylinders, devices adapted to be electrically controlled for actuating the valves, and circuit-closing devices operated by the movement of said object for controlling the currents of electricity for said actuating devices, substantially as set forth.

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

NARZISS ACH.

Witnesses:

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