Nov. 9, 1937. W. L. BAZÉ 2,098,531

STABILIZATION OF SHIPS

Filed May 21, 1934

Fig. 1.

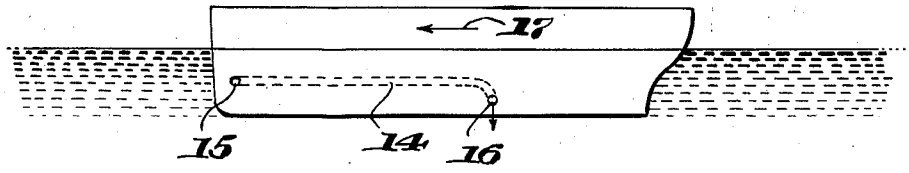


Fig. 2.

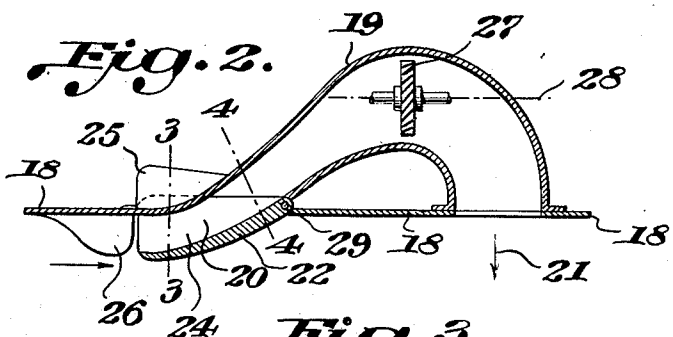


Fig. 3.

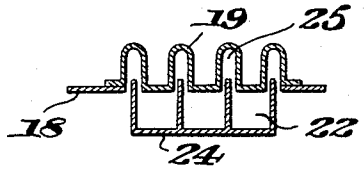


Fig. 4.

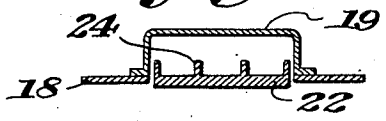
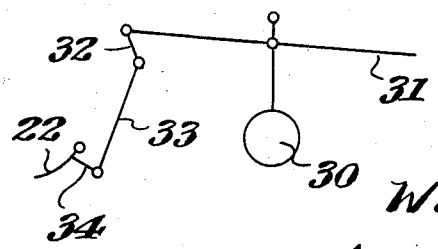


Fig. 5.



Inventor,
W. L. Baze

By: Glascock Downing & Seebold
attys.

Patented Nov. 9, 1937

2,098,531

UNITED STATES PATENT OFFICE

2,098,531

STABILIZATION OF SHIPS

William Lawrence Bazé, Paris, France

Application May 21, 1934, Serial No. 726,861
In France May 27, 1933

2 Claims. (Cl. 114—122)

The present invention pertains to a process for the stabilization of ships in which, in order to create the couples necessary for stabilizing the ship, the reaction produced by a current of water entering the ship is used, whereby this intake reaction can be used either alone or in combination with a delivery reaction, and the ship's own speed can also be used, if necessary.

When a current of water enters the inside of a ship with a certain speed, it causes an attraction in the direction contrary to that of its own motion, the force of the said attraction being equal to the quantity of movement of this current; the ship is thus attracted, instead of being repelled, as in the case with a delivery jet.

This attraction can be utilized for braking the rolling or the pitching of the ship, or for braking both these motions simultaneously.

The current of water must be suitably directed on entering the ship, so that it produces a couple opposing the swing of the ship in a certain direction; two different currents must naturally be used alternately, the righting couples produced by them being in opposite directions; when the direction of the swing changes, the action of the first current of water stops and is replaced by that of the second, which, in its turn, produces a righting couple in a direction opposite to that of the first. It will naturally be advantageous to arrange the current inlet orifices in such a way that the lever arm of the reactions, with respect to the ship's centre of gravity, is as long as possible.

In order to obtain rapid alternation of the delivery jets producing the righting couples in opposite directions, the quantity of water to be brought into action inside the ship will be reduced as far as possible; the current itself will also preferably be acted upon by means of a low-inertia sluice-valve of suitable type, rather than on the machines producing this current, so as to avoid having to overcome the inertia of these machines when they are started or stopped.

In order to avoid any harmful influence of the reaction of the current of water leaving the ship, the axis of this current, on leaving the ship, must be directed towards the ship's centre of gravity.

The outlet current reaction can also be used concurrently with the reaction of the intake current; in this way, a particularly economical solution will be obtained since, with the same power, a much higher righting couple will be produced than with the use of the reaction of only one of these two delivery or intake currents.

The speeds of the two currents must be chosen as low as possible under the circumstances, so that the power consumption for stabilization purposes is reduced as far as possible; preferably, the same speed will be chosen for the intake and the delivery jets. A speed of five to ten yards per second may be taken in most cases.

All the above remarks apply both to the currents used against rolling and to those used against pitching.

The movement of the water through the ship will be obtained by suitable means or apparatus, viz. pumps of any kind, screws, etc.

The attached Figures 1, 2, 3, 4, and 5 show clearly the working of the devices covered by the present invention. These figures are given only as examples and are in no wise limitative; the invention applies to any device corresponding to the data given above.

Fig. 1 is a side elevation of a ship equipped with a form of stabilizing means.

Fig. 2 is a vertical longitudinal section of a stabilizing device somewhat similar to that shown in Fig. 1.

Figs. 3 and 4 are cross-sections through *aa* and *bb* Fig. 6 respectively.

Fig. 5 is a diagrammatic showing of means for operating the valves.

Fig. 1 shows the principle of the invention supposed to be applied to the lessening of rolling; a pipe **14** opens at **15** at the front of the ship, then runs aft horizontally along one of the sides of the ship and, finally, turns downwards in a vertical direction, near the main beam, and has a delivery orifice at **16** in the bottom of the ship, towards one side. A second pipe, which is symmetrical to the first with respect to the longitudinal plane of symmetry of the ship, completes the system.

If the ship moves in the direction of the arrow **17**, the water in each pipe will have a relative speed equal to that of the ship and will flow out vertically downwards with this same speed, if the pipe has a uniform cross-section. The quantity of movement of the jet produced in this way will give a reaction proportional to the section of the pipe and to the square of the speed of the ship. By fitting each pipe with a low-inertia sluice-valve driven by a pendulatory or gyroscopic automatic device, each of the pipes can be used alternately so as to produce a suitable righting couple corresponding to the direction of the ship's swing; this couple is constant during the whole period of the swing in the same direction.

It is evident that this device has the disad-

vantage of comprising the installation of two pipes taking up more or less room along each side of the ship, although they are placed inside the same.

Fig. 2 shows a particularly practical solution of the same process. On each side of the ship, in the neighbourhood of the main beam, two stabilizing devices are placed symmetrically with respect to the ship's longitudinal plane of symmetry. This figure shows a longitudinal section of the same stabilizing device, parallel to the fore and aft axis of the ship. **18** is the bottom plate of the ship's hull; **19** is a curved pipe which opens at **20** towards the ship's bow and which, after rising above the bottom of the ship becomes horizontal and then curves downwards and opens vertically at **21**. Along the different bends, the axis of the pipe can remain in a vertical plane or deviate more or less from such a plane.

At the front, the pipe has a rectangular cross-section, as shown in Figs. 3 and 4, which respectively represent cross-sections through **3—3** and **4—4** of Fig. 2; it is fitted with a spoon-vane **22**, shown in its lowered position, but which can be raised by slewing it round its axis **23**, in order to close the access to the pipe at the front. The said spoon-vane is fitted with ribs **24** which, when the vane is raised, fit into a cavity **25**. In front, and in the extension of each rib, the hull is fitted with protective plates **26** in order to avoid any damage to the vane, or obstruction of the same.

Towards the rear, the section of the pipe becomes oval and then circular. The section of the pipe preferably has the same area from one end to the other.

It will be seen that, by raising the port and starboard vanes alternately, only the suitable righting jet will be allowed to act. The raising of these vanes is effected preferably automatically by any suitable means. The vanes could also be opened more or less completely, so as to modify the action of the righting jet according to the state of the sea or the desired degree of stabilization. When the roll of the ship is low, the two vanes could be closed permanently.

In order to open and close the pipes more rapidly, low-inertia sluice-valves of a suitable type, placed at any point in the pipes, could be used, instead of raising or lowering the vanes for this purpose. A means for operating the valves is shown diagrammatically in Fig. 5. A pendulum **30** is swung from an upper part of the vessel. A transverse rod **31** connected with said pendulum is actuated thereby. A system of links and levers **32**, **33**, **34**, connect the rod to the valve **22**. Such an arrangement may evidently take any form desired.

The use of the motion of the ship for stabilization purposes makes the latter dependent on the speed of the ship. The righting force becomes smaller and smaller as the speed is reduced and becomes nil when the ship stops.

If stabilization is desired at low speed or while the ship is stationary, or even when the ship is moving astern, the circulation of the water in the pipes could be effected mechanically by any suitable means; for example, an axial pump or a screw **27**, driven by an electromotor fixed to its shaft **28**, could be placed in the horizontal part of the pipe.

In the case of a screw, for example, pivoting vanes could be used, which, when the screw is not used, would take up a position in the direction of the current.

At all events, in case of obstruction at the entry to the pipe, the direction of the current could be reversed mechanically in the pipe; the water sucked in vertically through the orifice **21** will produce the same reaction as when it is delivered through this orifice, but the direction of the reaction will be reversed, the ship being attracted downwards instead of being repelled upwards. The ship will therefore remain stabilized, provided that the automatic mechanism regulating the alternation of the action of the pipes is reversed.

It will be understood that the axis of the orifice **21**, although it remains in a plane parallel to that of the main beams, could advantageously be inclined in this plane, so as to increase its lever arm with respect to the ship's centre of gravity.

If the same stabilizing devices are to be used against pitching, one of the said devices will be placed forward and the other aft, the orifice with the cup-vane always being directed towards the front.

Naturally, instead of two stabilizing devices, acting alternately, a greater even number of stabilizing organs can be used, both against pitching and rolling, the apparatus working together preferably being placed in a row, one behind the other, for rolling, and side by side, in the case of pitching.

It is seen that, for a given ship, the efficiency of the system for damping the rolling and pitching will depend, at full speed, on the diameter of the stabilizing pipes, and, with the ship stationary, on the power used for bringing the water into action in these pipes. Needless to say, more particularly, the diameter of the pipes will be determined by the volume of water which is to flow through them; according to the value of the reactions to be produced, pipes could be used with a comparatively large diameter, through which a current of water passes at comparatively low speed, or, on the other hand, pipes of comparatively small diameter could be used, through which a current of water would flow at high speed.

The stabilizing device forming the object of the present invention—as well as all the devices using the reaction of a current of water entering or leaving a ship—could naturally be used to give the ship a certain list, the stabilizing devices on one side being made to act more energetically or even exclusively and permanently; in this way, the influence of a strong wind coming from the side could be corrected, or, if necessary, an artificial roll could be produced.

In the device shown in Fig. 2, the current of water, on entering the ship, produces no transverse reaction, since the axis of the entry of the cup-vane **24** is horizontal. If this cup-vane is done away with, the water can no longer enter the ship; but if a suction action is effected through the orifice without the cup-vane, by placing a centrifugal pump in the pipe, for example, the water will rise, as a result of this suction, and its speed, with respect to the ship, will be the resultant of the intake speed and the ship's own speed; this resultant should preferably be inclined, like the axis of the pipe itself, on entering the ship. It is this resultant which will act on the delivery.

Thanks to the power supplied to the pump, the effect of the ship's own speed will have been increased, on the one hand by the creation of an intake reaction and, on the other hand, by the increase in the delivery reaction. This is there-

fore a particularly supple and advantageous solution.

It is to be understood that the forms of the device above described are not limited but illustrative in their nature and the same results may be obtained by other mechanical means not specifically described in the specification.

What I claim is:

1. A device for counterbalancing the rolling of a ship comprising two stabilizers symmetrically placed on the sides of the ship, each stabilizer consisting of a tube opening under the water at the bow of the ship in a direction parallel to the direction in which the ship is sailing and ending in an outlet the axis of which is located on the widest part of the ship in a plane substantially perpendicular to the direction in which the ship is sailing, this axis being furthermore inclined downwardly below the horizontal and passing close to the hull as far as possible from the axis of oscillation of the boat and each stabilizer being provided with a suitable valve, means for alternately actuating said valves so that one of the tubes is open while the other is closed, this alternation following the motion of the ship in order to give the proper direction to the stabilizing couple created.

2. A device as claimed in claim 1 including a pump in each tube and automatic means for starting and stopping said pumps, said means being actuated by the rolling of the ship.

WILLIAM LAWRENCE BAZÉ.