March 1, 1966 D. K. WINTER 3,237,585

VESSEL CONTROL MEANS

Filed June 1, 1965 4 Sheets-Sheet 1

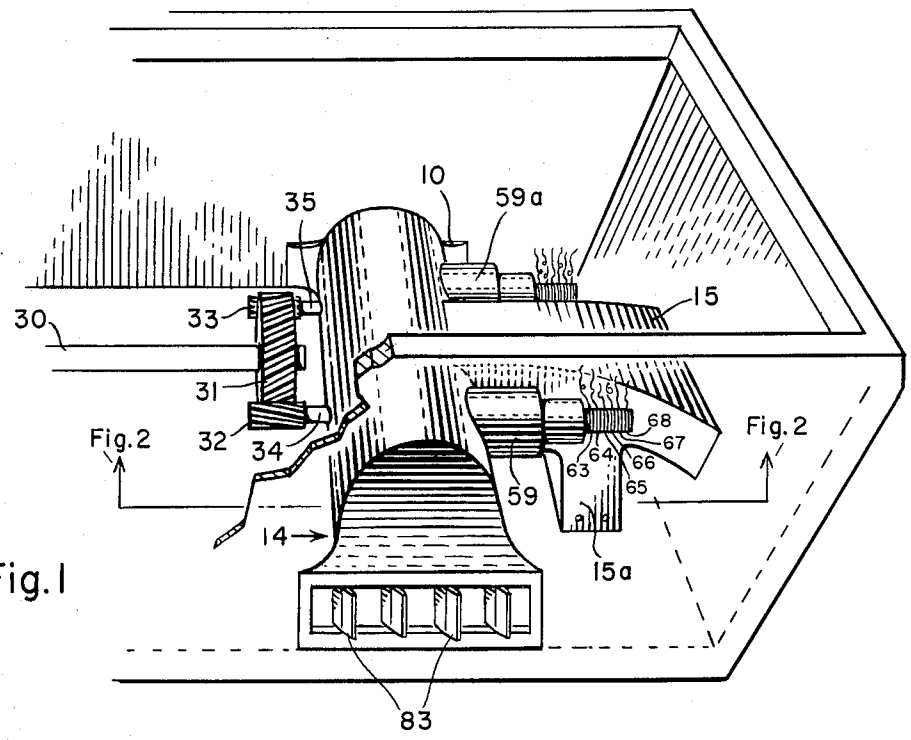


Fig. 1

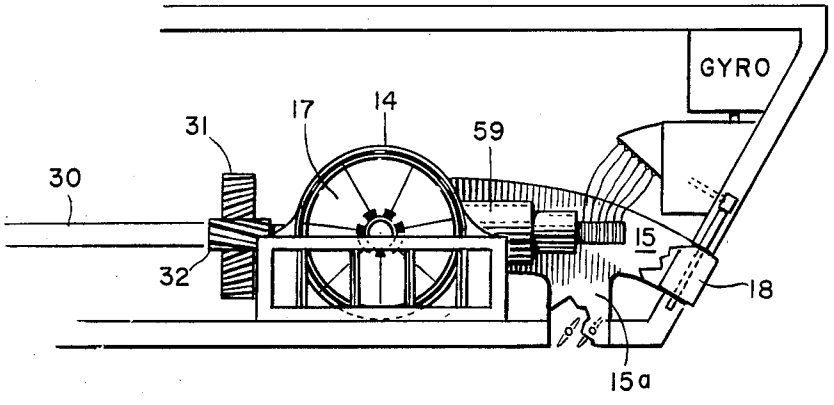


Fig. 2

INVENTOR

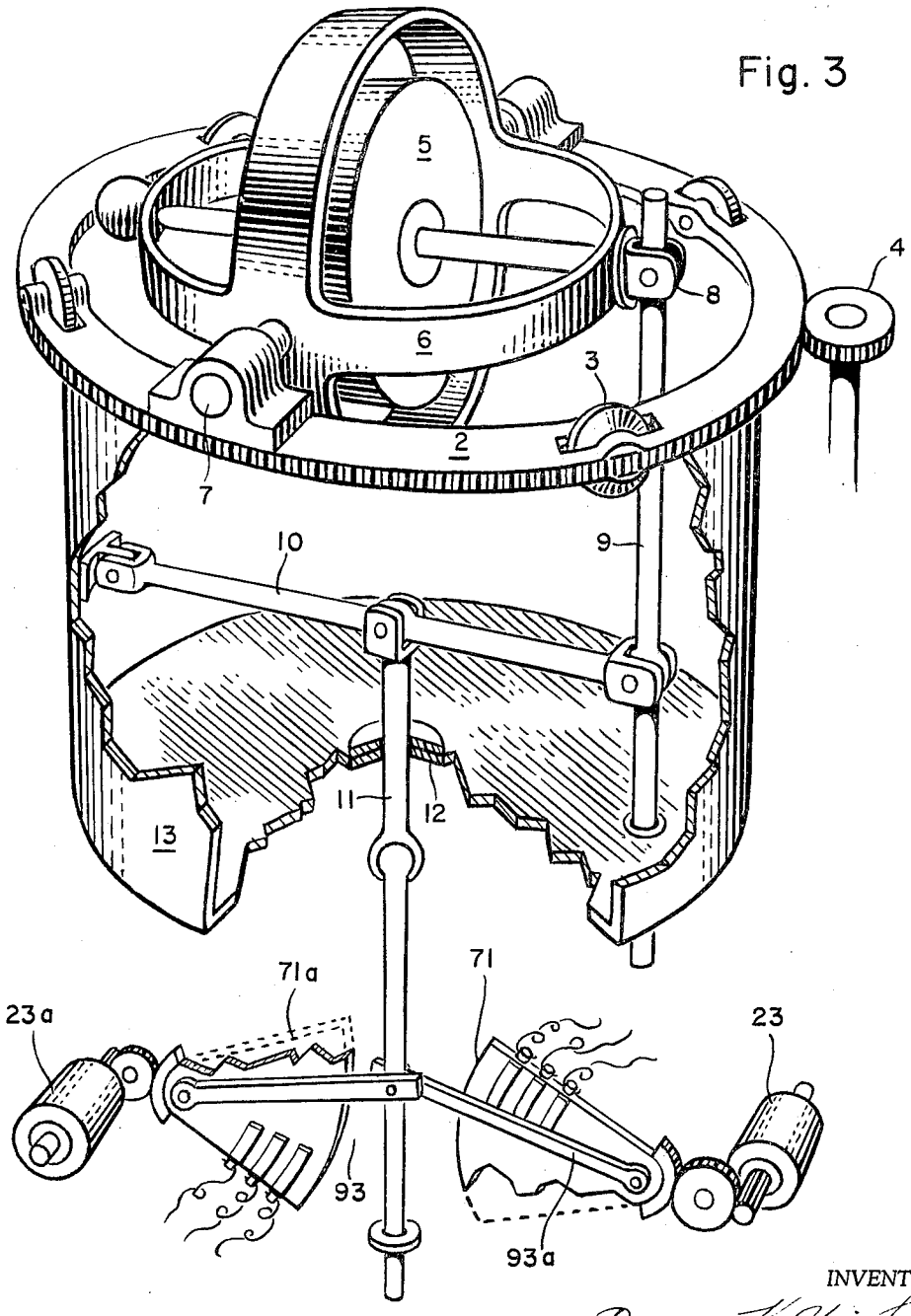
Duncan K. Winter

March 1, 1966 D. K. WINTER 3,237,585

VESSEL CONTROL MEANS

Filed June 1, 1965 4 Sheets-Sheet 2

Fig. 3



INVENTOR

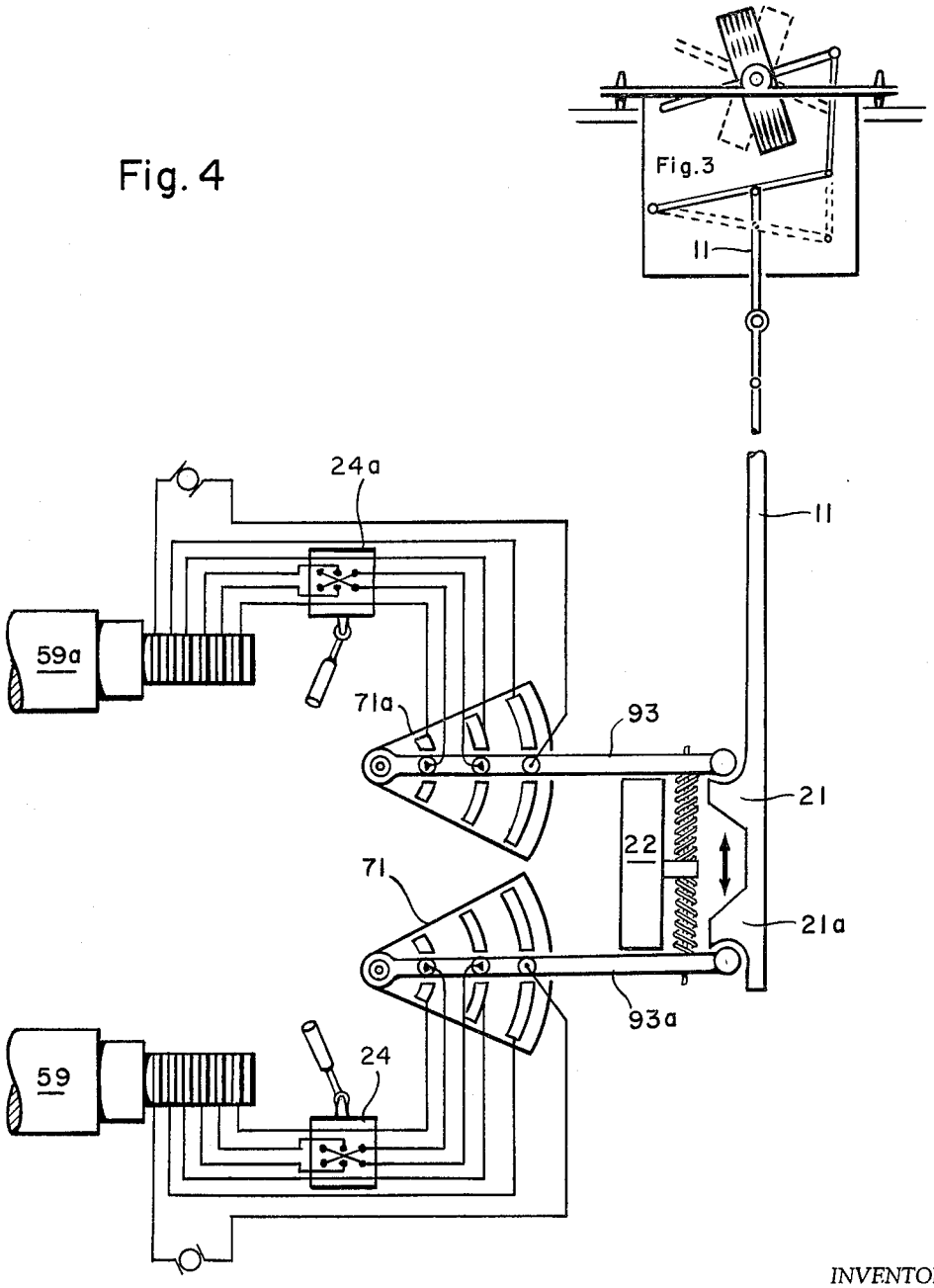
Duncan K. Winter

March 1, 1966 D. K. WINTER 3,237,585

VESSEL CONTROL MEANS

Filed June 1, 1965 4 Sheets-Sheet 3

Fig. 4



INVENTOR

Duncan K. Winter

March 1, 1966 D. K. WINTER 3,237,585

VESSEL CONTROL MEANS

Filed June 1, 1965 4 Sheets-Sheet 4

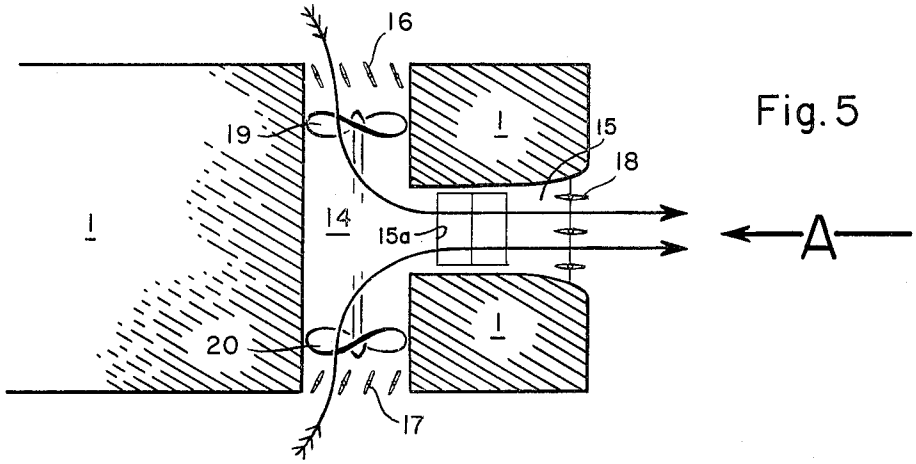


Fig. 5

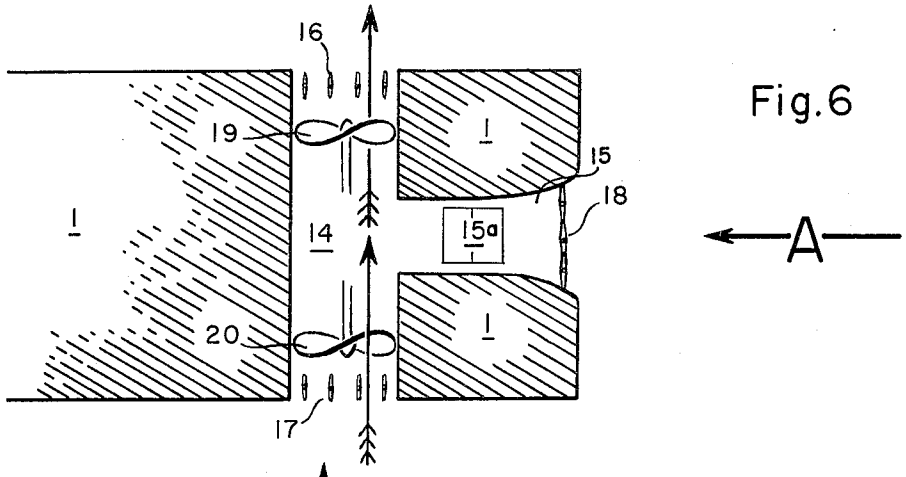


Fig. 6

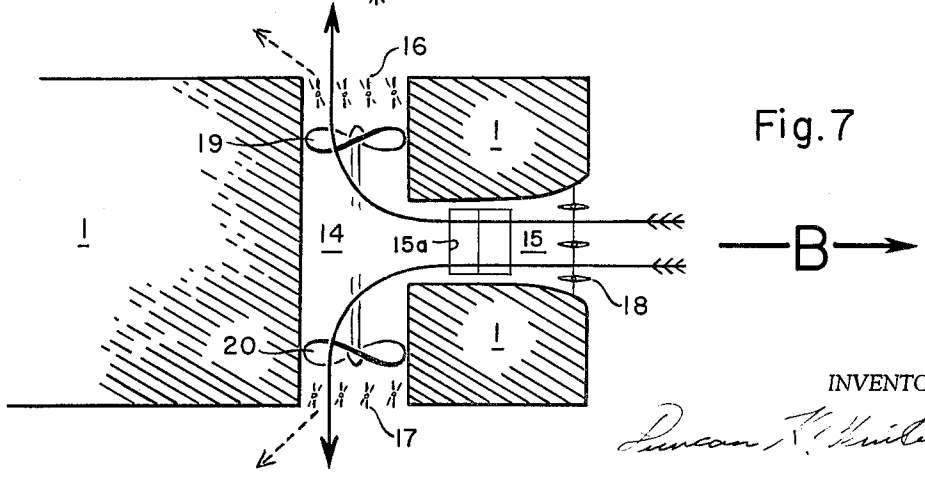


Fig. 7

INVENTOR

Duncan K. Winter

United States Patent Office 3,237,585 Patented Mar. 1, 1966

3,237,585

VESSEL CONTROL MEANS

Duncan K. Winter, 4614 Maple Ave., Bethesda, Md. 20014

Filed June 1, 1965, Ser. No. 460,339
5 Claims. (Cl. 114—151)

This invention relates to a means and a system for controlling and maneuvering a barge or other vessel, and is a continuation in part of application Serial No. 358,235, filed April 8, 1964, now Patent No. 3,198,158.

Barges and other vessels that are not normally self propelled are difficult to control and to maneuver. There are, generally, two means of moving barges; one by towing using a hawser leading from the barge to a tow boat; and the other, as in the rivers of the midwest, by pushing a "tow" made up of many barges lashed together. The problems of these two types of "tows" are, in great measure, solved by the present device.

When a barge, or several barges in a row, are being towed by a hawser, the barge may yaw or veer from its course due to wind, waves, or currents. Such yawing or veering of a heavy laden barge can, on occasion, take steerage way off of the tow-boat so it is not maneuverable to pull the barge back to its proper course until the hawser has been slackened and the tow-boat gained steerage way again.

A river tow, say five hundred or more feet long pushed by a "tow-boat" at the stern requires both skill, and perhaps some luck, to maneuver, especially when the river is in flood and the current swift. The use of a barge at the head of such a tow that incorporates the present invention helps keep the tow from being swung about by cross currents in the river, and helps swing the front of the tow in the desired direction when a turn is desired.

As a further use for the present device it may be used to assist in the propulsion of a hawser-towed barge and, in some instances, may be used to propel the barge independently of a tow-boat.

It is an object of the present invention to provide a means for, and a method of controlling a "tow," to prevent the tow from being deflected from its desired course.

It is a further object of the present invention to make it possible to maneuver a tow from a tow boat.

It is a yet further object of the present invention to provide automatic control means on a towed vessel to hold it on a predetermined course, and to provide for altering the course to a different selected course.

Other and further objects and advantages will appear from the following specification taken with the attached drawing in which like reference characters refer to similar elements in the several views and in which:

FIGURE 1 is a perspective view partly broken away of one end of a barge.

FIGURE 2 is a section taken at **2**—**2** of FIGURE 1.

FIGURE 3 is a perspective view partly broken away of a gyroscope used to control the device, and showing the electrical switches by which the device is controlled.

FIGURE 4 is a diagram of the circuitry for the device.

FIGURES 5, 6, and 7 illustrate diagrammatically, in plan, the use of the device under different circumstances.

In FIGURE 1 will be seen an installation in a barge of substantially the same device as shown in applicant's application Serial No. 358,235, FIGURE 3. An athwart ship passage **14** is provided, on each side of the centerline of the barge, with an adjustable pitch propeller the pitch of which is adjusted by an electric motor **59** or **59***a*. The propellers are driven, without regard to the pitch to which they are adjusted, by shafts **34** and **35** which are driven by bull gear **31** through spur gears **32** and **33** respectively.

A prime mover (not shown) is operatively connected by a shaft **30** to the bull gear **31**.

The prime mover may be, for instance a diesel engine, or may be an electric motor. It will be noted that if it is an electric motor, power may be supplied to it by cable from the tow boat, and if the power plant is a diesel engine, the barge may be, upon occasion, and to a limited extent, self-propelled.

The control of the pitch of each propeller is by activation of motor **59** or **59***a* as the case may be. This activation is accomplished through sliprings **63**, **64**, **65**, **66**, **67** and **68** for motor **59** and by corresponding sliprings on motor **59***a*. A circuitry for these motors is shown in FIGURE 4. Switches **71** and **71***a* may be the switches seen in application Serial No. 358,235 or may be other switches that perform in like manner.

Referring now to FIGURE 5, 6, 7 we see, in diagrammatic plan a barge **1**, having an athwart ship passage **14** and an axial passage **15**, that is open through the "transom" or end of the barge. The outboard ends of the passage **14** are provided with deflectors or louvres **16** and **17**, and the passage **15** is provided at the transome with louvres or deflectors **18**, constituting valve means to close passage **15** when in the position shown in FIGURE 6.

A bottom opening may be provided as disclosed in the earlier application for purposes discussed therein and the drawing shows the auxiliary or bottom opening at **15***a*, FIGURES 1 and 2. Bottom opening **15***a* may be used to take in or to expel water in lieu of opening **15**.

An adjustable pitch propeller **19** is provided adjacent louvres **16**, and an adjustable pitch propeller **20** is provided adjacent louvres **17**. An appropriate structure for such propellers is disclosed in the earlier application referenced above, but any other type of reversible adjustable pitch propeller may be used. Propellers **19** and **20** are shown only diagrammatically.

Assuming that barge **1** is being towed by a hawser in the direction A in FIGURE 5. Propellers **19** and **20** may be set so that they each draw water into passage **14** through louvres **16** and **17** which will be expelled through passage **15** thus aiding in the propulsion of the barge. This constant use of the prime mover under load is especially desirable if the prime mover on the barge is a diesel engine, since a "no load" operation of a diesel engine is very destructive of the engine.

Now asume that, in this example, the stern of the barge swings to starboard (upwardly in FIGURE 5), propeller **19** will be reversed by the automatic control to be discussed below so that water will be ejected through louvres **16** to push the stern of the barge to port, (downwardly in FIGURES 5 and 6) to correct the course of the barge. When the barge is again on course, the adjustment of propeller **19** will be automatically reversed to the FIGURE 5 condition, by the control means.

Where an electric prime mover is used in the barge, it may be desired to have both propellers **19** and **20** set to neutral, in which condition the propellers do not impell water in either direction. Then, when an athwartship thrust is called for both propellers adjust in unison so both propellers impel water in the same direction to provide the required side thrust, by the means disclosed below.

It will be noted here that since both propellers adjust in the same direction and in unison that the barge will act just as though there were only one propeller in the athwart ship passage. A simplified installation using but one adjustable reversible propeller in a single athwart ship passage is also contemplated by the present disclosure.

In FIGURE 7 it is assumed that the barge **1** is the leading barge on a large tow on the Mississippi River, so

the barge is moving in the direction shown by arrow B in FIGURE 7.

Propellers **19** and **20**, in FIGURE 7 may be set at neutral to be adjusted in unison without normally contributing to the propulsion of the tow, or, as shown, the two propellers **19** and **20** may be adjusted to normally draw water in through passage **15** or passage **15***a* at the end, in this case the bow, and expel it through deflectors **16** and **17** to help propel the tow. If the bow of the tow needs to be pushed to starboard (downwardly in FIGURE 6) propeller **20** will be reversed, and if it needs to be thrust to port (upwardly in FIGURE 6) propeller **19** will be reversed. When the tow is again on course, the propeller would be again returned to its "normal" condition.

What the device is to do, is then apparent. To understand the means by which the results are accomplished, we refer to FIGURES 3 and 4.

A rotatable ring **2** is supported by rollers **3** in a horizontal position in the vessel. The edge of ring **2** is provided with gear teeth to mesh with gear teeth on a pinion **4** which is driven by a reversible electric motor that may be operated in either direction from a remote position in a conventional manner. When the barge is placed on a desired course, ring **2** is stationary in the barge. A gyroscope **5** is mounted in a cage **6** on trunnions **7** supported by ring **2**.

It is well known that a gyroscope supported as shown in FIGURE 3 will remain with its axis horizontal unless the axis is subjected to a turning force or couple to turn the axis of rotation of the gyroscope through an angle to itself.

When such a turning force is applied to the gyroscope a moment results that will tend to turn the gyroscope about an axis at right angles to the turning force applied Since, in this case, the cage **6** holding the gyro **5** is free to rotate about the horizontal axis of trunnions **7**, rotation of the ring **2** about its vertical axis will cause the gyro to rotate about the axis of trunninns **7**. When the barge is on a selected course, and ring **2** held by pinion **4** from rotating with respect to the barge, the only way that a turning force can be applied to ring **2** is by the barge turning from its selected course. Movement of a gyroscope, keeping the axis of rotation parallel to itself, the gyroscope remains inactive.

When the barge does turn from its selected course the end of cage **6** will move up or down dependent on the direction of rotation of the gyroscope **5** and the direction of rotation of the ring **2**.

End **8** is connected by a link **9** and a lever **10** to center link **11** which is coaxial with the axis of rotation of ring **2** and is held in this vertical position by guide **12** in the "bucket" in which the gyro and so forth are mounted.

Below the bucket **13** are two switches **71** and **71***a*. Switch **71** controlling propeller **20** by operating control motor **59**, and **71***a* controlling propeller **19** by controlling motor **59***a*.

It will be noted that the switches **71**, **71***a* are here shown as the same switches shown in the earlier application, except that they are not secured together for simultaneous movement. On an extension of center link **11** are two lugs **21** and **21***a*, FIG. 4. Lug **21** can pull lever **93** of switch **71***a* upwardly, but cannot push it downwardly. Lug **21***a* can push lever **93***a* of switch **71** down but cannot pull it up. Each lever **93** and **93***a* is returned to its normal position by a spring and is prevented from further movement by a stop **22** as seen in FIGURE 4.

If the stop **22**, lugs **21** and **21***a* and the springs biasing the switch levers to their normal position are removed, the propellers may be adjusted and controlled manually as they are in the earlier application referred to above. Each switch **71** and **71***a* have motor means **23**, **23***a* (see FIGURE 3) respectively so the switch will follow the switch lever **93** or **93***a* as the case may be.

Where the propellers are used only to provide athwart ship thrusts by normally running idle or at no pitch, the switch levers **93** and **93***a* will be operated in both directions both up and down from their normal position, in which case they are each pivotally connected to the extension of center link **11** and the springs and stops are omitted. This arrangement can readily be used in the vessels shown and claimed in the earlier application referred to above.

In the uses illustrated in FIGURES 5, and 6, however, where the barge is being towed by hawser; the two propellers are first adjusted by manual operation of levers **93** and **93***a* and of reversing switches **24**, **24***a*, so that when the levers **93** and **93***a* are in "normal" position connected to center link **11** by lugs **21**, **21***a* the propellers are delivering maximum flow inwardly through the louvres **16** and **17** and outwardly through passage **15** and louvres **18**. As the barge is moved to its selected course, the pinion **4** is used to rotate ring **2** with respect to the barge so that the end **8** of the gyroscope cage will move neither up or down. Once the barge is on its selected course pinion **4** does not rotate so the ring **2** is fixed against rotation with respect to the barge. If then the barge veers or yaws the ring is rotated with the barge so the end of the gyroscope cage either rises or falls and so a switch **71** or **71***a* is adjusted to change the direction of pitch of one of the propellers as explained above with respect to FIGURES 4 and 5.

If desired, and to augment the side thrust on the barge when the direction of thrust of one propeller is changed, the louvres **18** at the stern of the barge may be closed by an electric motor activated by a switch also connected to rod **11**.

Where the barge is to be used as explained with respect to FIGURE 7, at the front of a river tow, the original manual setting is performed as above except that the propellers are set to maximum flow outward from passage **14** through louvres **16** and **17**. In this case the louvres **18** would not be closed when one of the propellers is reversed.

It will be seen, therefore, that a method has been devised, and a means has been provided by the present invention to automatically apply a correcting force on a barge, or on a ship, to return it to a selected course.

It will be noted, further, that adjustment of the louvres or deflection means **16** and **17** can be associated with the same or with a similar device for automatic adjustment if desired. In any case controls for the louvres would be provided, so that when desired the barge can be maneuvered independently of a tow boat as stated above.

Having thus disclosed my invention, I claim:

1. In a control device for a water borne vessel or the like having an athwartship submerged passage and a submerged water passage extending axially of said vessel connected to said athwartship water passage amidships between said two propellers and extending through the adjacent end of said vessel, two adjustable pitch propellers in said athwartship passage, means for adjusting the pitch of said propellers from a no pitch condition to a maximum pitch in either direction, a gyroscope mounted on horizontal gudgeons, actuating means operatively connected to said gyroscope at a point remote from said gudgeons and operatively connected to said adjusting means to selectively reverse the pitch of either of said propellers by movement of said actuative means under the influence of said gyroscope dependent on a change of course of said vessel to starboard or to port.

2. The device of claim **1** in which adjustable water deflecting louvres are provided at each of said athwartship passages.

3. In a control device for a water borne vessel or the like having an athwartship submerged passage and a submerged amidship water passage connected to said athwartship water passage between said two propellers, and means to close said submerged amidship water passage, two ad-

justable pitch propellers in said athwartship passage, means to rotate said adjustable pitch propellers, means for adjusting the pitch of said propellers from a no pitch condition to a maximum pitch in either direction, a gyroscope mounted on horizontal gudgeons, actuating means operatively connected to said gyroscope at a point remote from said gudgeons and operatively connected to said adjusting means to selectively reverse the pitch of either of said adjusting means under the influence of said gyroscope, depending on changes of course of said vessel to starboard or to port.

4. In a barge, a power plant, an athwartship water filled passage adjacent one end of said barge, a submerged valved connection joining said athwartship passage amidships, a pair of independently controllable reversible pitch propellers each positioned in said athwartship passage outboard of said valved connection, drive means operatively connecting each said reversible pitch propeller to said power plant, a single automatic control device coupled to said reversible pitch propellers to control both said propellers, the means coupling said single automatic control device to one of said reversible pitch propellers being

selectively reversible whereby said reversible pitch propellers will be simultaneously controlled for operation in the same direction or in opposition.

5. The barge of claim 4 in which said submerged valved opening is in the end of the barge adjacent said athwartship passage, and an auxiliary valved opening is provided in the bottom of the barge.

References Cited by the Examiner

UNITED STATES PATENTS

2,369,456	2/1945	Hammond	115—35
3,002,486	10/1961	Jardmo	115—16
3,182,623	5/1965	Lehmann	115—12

FOREIGN PATENTS

556,011	9/1943	Great Britain.
1,136,908	9/1962	Germany.

MILTON BUCHLER, *Primary Examiner.*

ANDREW H. FARRELL, *Examiner.*