No. 683,427. Patented Oct. 1, 1901.

L. BARGER.

FLUID PRESSURE STEERING GEAR.

(Application filed Sept. 15, 1900.)

(No Model.)

Fig. 1.

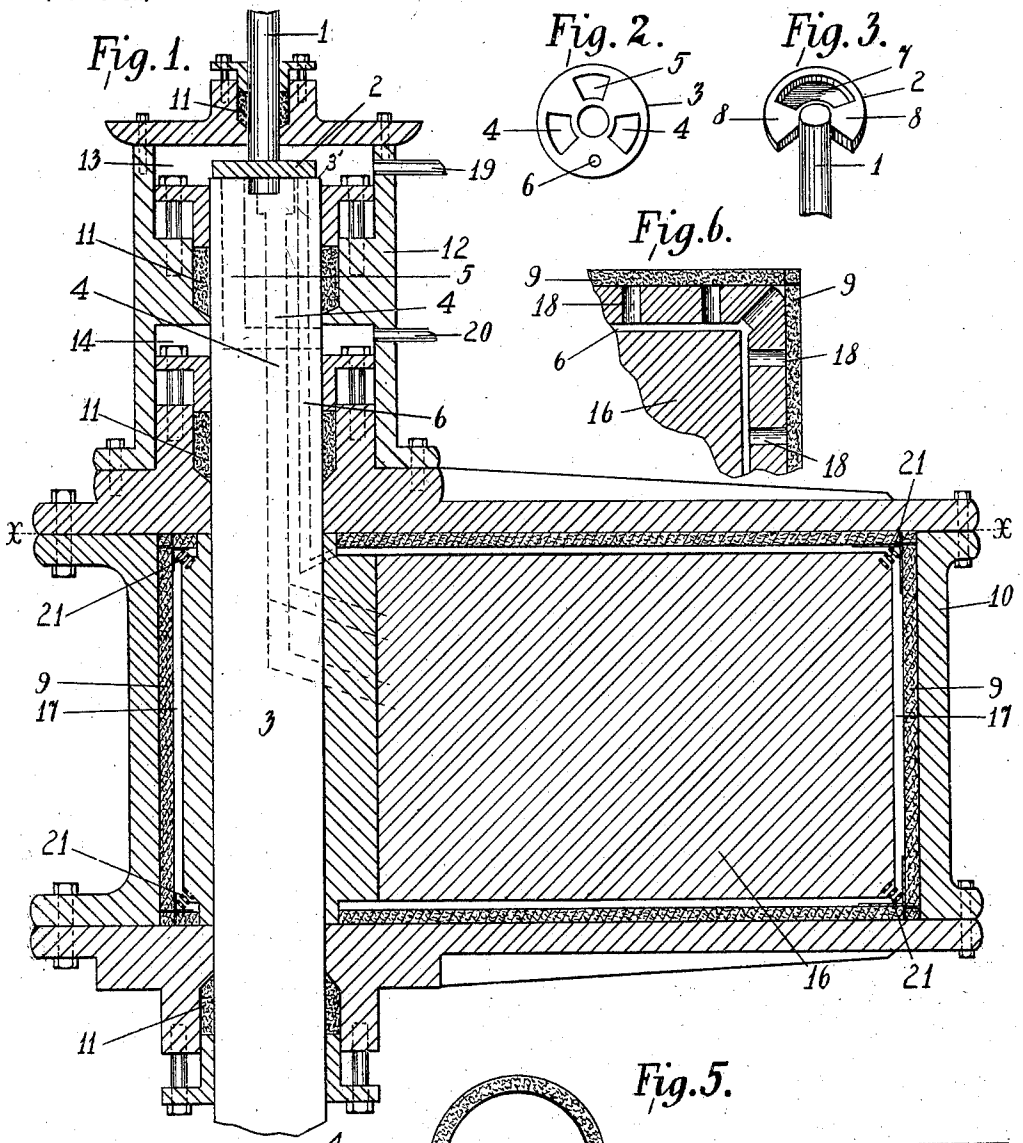


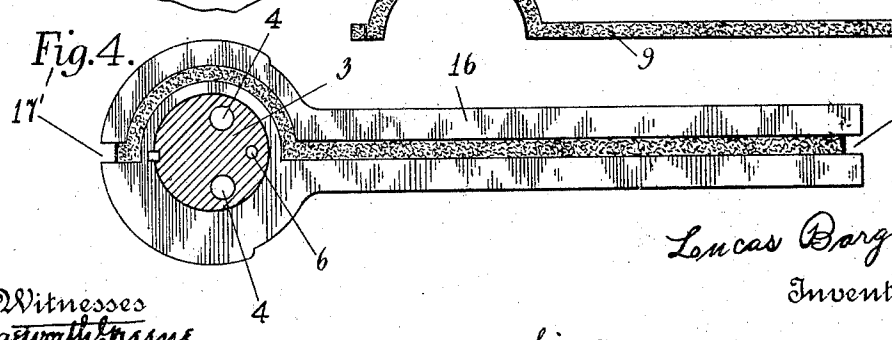
Fig. 2.

Fig. 3.

Fig. 6.

Fig. 5.

Fig. 4.



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FLUID-PRESSURE STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 683,427, dated October 1, 1901.

Application filed September 15, 1900. Serial No. 30,205. (No model.)

To all whom it may concern:

Be it known that I, LUCAS BARGER, a citizen of the United States, residing in the borough of Manhattan, city of New York, and State of New York, have invented a new and useful Steering-Engine Operated by Fluid-Pressure, of which the following is a specification.

My invention relates to mechanism for utilizing and controlling fluid-pressure to operate a steering-engine, designed to facilitate the movement of the rudders of vessels and give to the pilot a rapid and convenient control with the exercise of the least effort and attention on his part.

The object of my invention is to supply a simple and efficient operating-valve controlling the admission of the pressure to one side of the piston and the exit of a necessary amount of the exhaust from the other side of the piston connected to the operating-shaft, causing the force exerted on the pressure side of the piston to be equivalent to the force exerted on the exhaust side of the piston plus the force exerted by the resistance of the water against the rudder, and, further, to avoid the use of the complicated valves or the use of a number of cable-pulleys now in operation in connection with fluid-pressure steering-engines. The pressure and exhaust ports are closed without effort or thought on the part of the operator. He turns the primary-valve stem, opening one of the pressure-ports to the pressure and opening the other to the exhaust-chamber. The pressure turns the piston, which is keyed to the operating-shaft, which shaft forms the secondary valve, thereby automatically cutting off the pressure and coming to rest at a given position. The operator turns the primary-valve stem, to which an indicator is attached showing the position given to the rudder to produce the desired change in the course of the vessel. When the rudder attains that given position, the operating-shaft automatically comes to rest and is so held regardless of any variation of pressure against the rudder. When the rudder is forced back, thereby turning the operating-shaft, the secondary valve being a portion of the shaft is opened to the pressure, which again forces the piston and rudder far enough around to again close the pressure-ports, and should the pressure against the rudder become less upon the slightest movement of the operating-shaft the opposite pressure-port would be instantly opened to the pressure and the other pressure-port would open correspondingly to the exhaust-chamber. Thus the rudder is held to the position given by the indicator in the pilot-house.

Another object of my invention is to utilize fluid-pressure. Either "elastic" or "non-elastic" fluids may be used, as shall be found best or most convenient under given circumstances. An advantage is derived from non-elastic, because that class of fluids are practically static, while in some cases the elastic fluid might be preferable when a cushion or elastic pressure is needed to avoid a heavy or rigid strain upon the rudder as it is being driven and operated by the actuating fluid-pressure against the opposite sides.

Further objects and advantages of this invention will appear in the following description. The novel and advantageous features and combinations will be pointed out in the annexed claims.

Similar figures refer to corresponding parts in all the drawings.

Figure 1 is a vertical section of the fluid-pressure steering-engine, showing a vertical section of the primary-valve stem, packing-boxes, primary and secondary valves, main shaft, and cylinder-casing. Fig. 2 shows the top of the operating-shaft, which is the secondary circular auxiliary cut-off valve, and the seat of the primary valve. Fig. 3 shows the bottom of the radial flat primary valve, showing the exhaust-channel and a portion of the valve shaft or stem. Fig. 4 shows a transverse horizontal section of the main shaft and the top of the operating-piston at the line $x\,x$ in Fig. 1. Fig. 5 shows the packing-strips, and Fig. 6 shows a modification of packing with pressure-ports in the piston.

The radial flat primary valve 2 rests upon the secondary valve and is held in position by the extension below its surface of a portion of the valve-stem 1, acting as a pivot sunk centrally into its seat in the secondary valve. In the bottom of the primary valve is an exhaust-channel 7. A portion of the bottom face of the primary valve 2 in Fig. 3 forms

covers 8 8 of the pressure-ports 4 4, Figs. 1 and 2, of the secondary valve, leaving a chamber through said primary valve, which is always open to the pressure. The exhaust-channel 7 is of such shape and size as continually to cover the exhaust-port 5 and of sufficient radial length to establish communication between the exhaust-port 5, leading to the exhaust-chamber 14, and either one of the two pressure-ports 4 4 in the secondary valve 3, Figs. 1 and 2. The bottom portion of the face 8 8 of the primary valve 2, Fig. 3, is of such size as to cover both pressure-ports 4 4 while the secondary valve 3 is at rest, and upon a radial motion in either direction imparted to the valve-stem 1 by the operator turning the primary valve 2 radially about its pivot upon the secondary valve 3 simultaneously one pressure-port 4 is uncovered to the pressure in the pressure-chamber 13, Fig. 1, and the other pressure-port 4 is put in communication with the exhaust-chamber 14 and the exhaust-port 5, Fig. 1, through the exhaust-channel 7, Fig. 3. The primary-valve stem 1, Figs. 1 and 3, is controlled by the operator by any convenient device capable of imparting thereto a radial motion, such as a wheel or lever connected directly onto the valve-stem 1. In such case a knuckle or slip joint should be used in the stem 1, or a connection may be maintained between the stem and the operating wheel or lever by means of any convenient device found suitable. The valve-stem 1 is furnished with a friction-box, or, if more desirable, the gear may have a clutch or spring-catch at the operating-point to hold the stem 1 and the primary valve 2 in position given it by the operator, and thus prevent the primary valve 2 from being turned by the friction upon the secondary valve 3 while the secondary valve is being automatically turned by the operating-piston, which comes to rest when the rudder assumes the desired position, and both pressure-ports 4 4 are closed by the faces 8 8 of the primary valve 2, Fig. 3, all of which is contained within a valve-casing 12, provided with a pressure-chamber 13 and an exhaust-chamber 14, Fig. 1.

The secondary circular auxiliary cut-off valve 3′, Figs. 1 and 2, is formed on the end of the main operating-shaft, which forms a seat for the primary valve 2. The cut-off valve 3 contains the three ports 4 4 5, Figs. 1 and 2, leading down the main shaft 3. The two pressure-ports 4 4 establish communication between the pressure-chamber 13 and the exhaust-channel 7 and the cylinder-chambers on either side of the operating-piston 16, Fig. 1, the exhaust-port 5 communicating between the exhaust-channel 7 in the bottom of the primary valve, Fig. 3, and the exhaust-chamber 14, Fig. 1. The pressure-ports 4 4 also form the exhaust-ports from the exhaust side of the operating-piston 16 to the exhaust-channel 7, Fig. 3. While one acts as the pressure-port the other is acting as the exhaust-port from the piston-chamber to the exhaust-channel 7 in the primary valve. The top surface or the face of the secondary valve, Fig. 2, is so situated with reference to the exhaust-channel 7 and the port-covers 8 8 in Fig. 3 of the primary valve that upon a radial motion imparted to the primary valve 2 one pressure-port is uncovered to the pressure and the other pressure-port is thrown in communication with the exhaust-channel 7. The ports 4 4 and 5, Fig. 3, are so situated with reference to the exhaust-channel 7 and the covers 8 8, Fig. 3, of the primary valve upon the face of the other that one pressure-port 4 or 5, Fig. 2, is uncovered by the covers 8 8, Fig. 3, to the pressure, and simultaneously the other pressure-port is thrown in communication with the exhaust-channel 7 of the primary valve, Fig. 3, all of which is located within a valve-casing 12, provided with pressure and exhaust chambers. The stuffing-boxes 11 in Fig. 1 pack the cylinder, and the pressure and exhaust chambers about the main shaft 3 and the valve-casing 12 about the primary-valve stem 1.

In connection with the operation of my invention I employ an old-form cylinder, being a main radial or segmentary-shaped cylinder, about that of a quadrant 10, (shown in Fig. 1,) containing the operating-piston 16, moving with a radial sweep and keyed to the main shaft 3. The main shaft may be the rudder-shaft or connected to the rudder-shaft by a gear if it should be desired to extend the rudder-shaft beyond the position of the steering-engine or should it be advantageous to place the steering-engine in another position in the vessel. The pilot is furnished with a lever, wheel, or convenient device which is connected to a dial indicating to him the position the rudder will take upon his turning the lever or wheel, thereby opening the primary valve, admitting the pressure to one or the other side of the operating-piston. The operative power may be any fluid desired. The pressure-chamber contains the primary and secondary valves. The pressure is admitted to either one of the pressure-ports by turning the primary valve one way or the other, as may be desired. The secondary valve is the main shaft (and may be or may not be the rudder-shaft) and being keyed to the operative piston its movement is coincident with the secondary valve, which automatically follows the primary valve, cutting off the pressure and exhaust ports and coming to rest. The primary and secondary valves always assume the same relative position when at rest and always tend to assume the position of rest the instant either valve is displaced. The ports lead down the secondary valve (which is also the main shaft and may be the rudder-post) and communicate the one with one side and the other with the other side of the operating-piston through apertures leading from each side of the piston through the hub into the main shaft connecting with the two ports

leading down the shaft, as shown in Fig. 1. A longitudinal section of the main shaft would not show the ports, as in Fig. 2. Dotted lines are therefore used to indicate their position down the operating-shaft. The exhaust-port also leads down the main shaft, as shown in Figs. 1 and 2. The primary valve has a depression or exhaust-channel 7, Fig. 3, of such shape and size as to continually cover the exhaust-port communicating with the exhaust-chamber. The said exhaust-port communicates with either one of the pressure-ports through the said depression or exhaust-channel the instant the other pressure-port is opened to the pressure (see Fig. 3) and rests upon Fig. 2 as its seat. While one pressure-port is acting as the exhaust-port and in communication with the exhaust-channel 7, the other pressure-port conducts the pressure to the piston 16. The pressure fluid is admitted to one port simultaneously as the exhaust is admitted to the other, 4, thence through the exhaust-channel 7 and the exhaust-port 5 to the exhaust-chamber 14. The pressure fluid passes from the pressure-chamber 13 through the open chamber, through said primary valve between 8 8, Fig. 3, of the primary valve, down the shaft through the port 4 into the piston-chamber, and forces the operating-piston around, carrying with it the main shaft—*i. e.*, the secondary valve—to which it is keyed, until its movement closes the ports and comes to rest, in which position the piston is held regardless of varying pressure against the rudder until the primary valve is given another position by the pilot, when the same operation is repeated upon every movement of the primary valve by the pilot. In the cylinder, which is the ordinary quadrant-shaped cylinder, Fig. 1, may be packed in the usual way. Fig. 4 shows the top surface of the piston, with the groove in which the packing-strip is placed, and may be held by springs or packed by expansive metal run in the groove 17, or water packing may be used. The packing extends around the entire piston and around the shaft, fitting work-tight at the corners.

Various changes in the form, proportion, and minor details of the construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

What I claim, and desire to secure by Letters Patent, is—

1. A steering-engine, the combination of a cylinder with a piston attached to the main shaft, on the end of which is formed a valve, and a primary valve seated on the said shaft for controlling the movement of the piston, substantially as specified.

2. The combination of a main shaft provided with ports; and a primary valve provided with an operating-stem, with an exhaust-channel and with an open chamber through said primary valve; which primary valve is seated upon the end of the said shaft to control the motor fluid to and from the cylinder, substantially as specified.

3. The combination with a main shaft adapted to be attached to a rudder-shaft; a piston attached to the main shaft of an operating-valve; means controlled by the operating-valve for applying fluid-pressure to the opposite sides of said piston, said operating-valve consisting of a main primary valve and an auxiliary secondary valve adapted, when in their normal relative position, to close the valve-ports; the auxiliary valve keyed to the operating-piston to secure automatic, coextensive movement thereof; means for manually operating the primary valve, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

LUCAS BARGER. [L. S.]

Witnesses:

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DANIEL J. AUGUSTINE.