

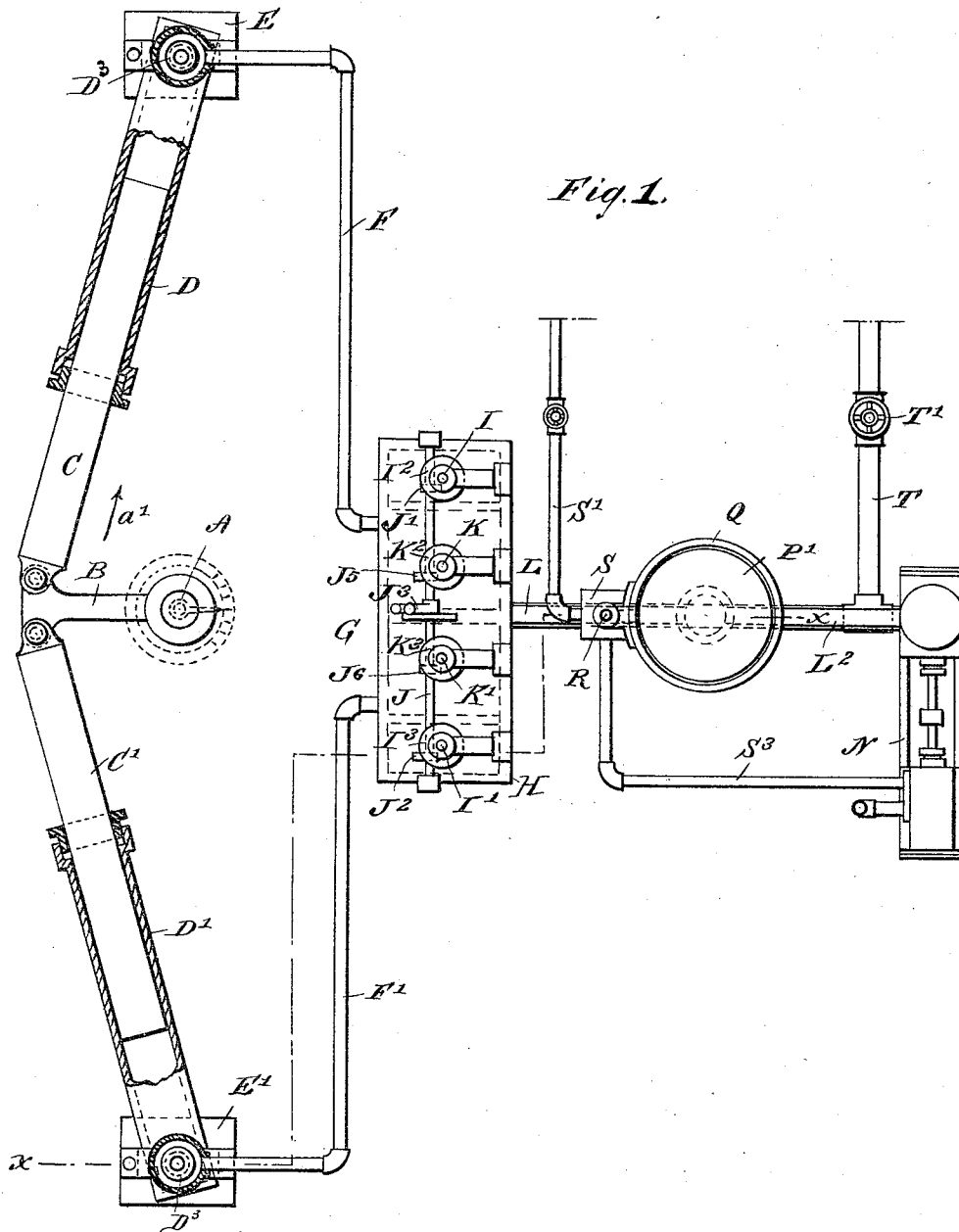
(No Model.)

2 Sheets—Sheet 1.

P. SMALL.
HYDRAULIC STEERING APPARATUS.

No. 437,523.

Patented Sept. 30, 1890.



WITNESSES:

Donn Twitchell
Co. Sedgwick

INVENTOR:

P. Small

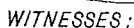
BY

Munn & Co.
ATTORNEYS

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

PERRY SMALL, OF BOSTON, MASSACHUSETTS.

HYDRAULIC STEERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 437,523, dated September 30, 1890.

Application filed June 12, 1890. Serial No. 355,196. (No model.)

To all whom it may concern:

Be it known that I, PERRY SMALL, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Hydraulic Steering Apparatus, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved hydraulic steering apparatus, which is simple and durable in construction, very effective in operation, and serves for conveniently, accurately, and surely manipulating the rudder on board of a ship.

The invention consists of certain parts and details and combinations of the same, as will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the improvement with parts in section. Fig. 2 is an enlarged sectional side elevation of the same on the line xx of Fig. 1, and Fig. 3 is an enlarged transverse section of the valve-gear for controlling the plungers.

On the rudder-post A is secured an arm B, pivotally connected at its free end with the plungers C and C', arranged opposite each other and fitted to slide in cylinders D and D', respectively, each provided near its outer end with vertical trunnions D² and D³, (see Fig. 2,) mounted to turn in suitable bearings in supports E and E', respectively. The trunnions D² of the cylinders D and D' are solid, while the trunnions D³ are hollow and open into the interior of the cylinders D and D', respectively. The hollow trunnions D³ also open into compartments E², formed on the supports E and E', and the said compartments are connected by pipes F and F', respectively, with the valve-gear G. The latter is provided with a casing H, in which are formed the compartments H¹ and H², connected with the pipes F and F', respectively, and also connected by ports H³ and H⁴ with a compartment H⁵, and by ports H⁶ and H⁷ with the compartment H⁸.

The ports H³ and H⁴ are alternately opened and closed by valves I and I', fitted to slide vertically in the casing H, and carrying near the outer ends of their valve-stems the disks

I² and I³, respectively, engaged by the cams J' and J², respectively, secured on a transversely-extending shaft J, mounted to turn in suitable bearings on top of the casing H. The shaft J carries a hand-lever J³, for conveniently manipulating the said shaft, so as to change the position of the cams J' and J², in order to alternately open and close the ports H³ and H⁴ by the valves I and I'.

The ports H⁶ and H⁷, previously mentioned, are adapted to be opened and closed alternately by valves K and K', mounted to slide in suitable bearings in the casing H, and carrying near the outer ends of their valve-stems disks K² and K³, adapted to be operated by cams J⁵ and J⁶, also secured on the shaft J, similar to the cams J' and J².

As shown in Fig. 3, the ports H⁷ and H⁸ are open, while the ports H⁶ and H⁴ are closed. When the operator moves the lever J³ to the right, the position of the valves I I' and K K' is reversed, so that the ports H⁴ and H⁶ are opened and the ports H³ and H⁷ are closed. The several valves I I' K K' are pressed to their seats by springs J⁴, suitably arranged on the valve-stems.

From the compartment H⁵ leads a pipe L to a steam-pump N of any approved construction, and into the compartment H⁸ opens a pipe L', connected with a cylinder O, into which opens a pipe L², leading from the discharge-compartment of the said steam-pump N.

In the cylinder O is fitted to slide the vertically-arranged plunger P, moved outward when the pump N forces the liquid through the pipe L² in the cylinder O.

On the upper end of the plunger P is secured a weight P', fitted to slide in a cylinder Q, open at the top and provided in its bottom with a rubber ring Q', on which the weight P' is seated when in its lowermost position.

From one side of the weight P' extends an arm P², through which passes loosely a rod R, provided with two collars R' and R², adapted to be alternately engaged by the said arm P², as hereinafter more fully described.

On the lower end of the rod R is secured a valve R³, fitted to slide in a steam-chest S, connected by a pipe S' with a suitable source

of steam-supply. The steam-chest S is connected by a port α with a compartment S², from which leads a pipe S³ to the steam-pump N, to supply the latter with motive power for operating the same.

The pipe L², previously mentioned, is connected with a supply-pipe T for charging the apparatus with liquid, the said pipe being provided with a valve T', as is plainly shown in Fig. 1.

The operation is as follows: When the plunger P is in its lowermost position and the weight P' rests on the ring Q', then the arm P² has acted on the collar R' so as to press the valve-stem R downward to open the valve R³ on the port α . Live steam from the boiler can now pass through the pipe S', through the steam-chest S, and the port α into the compartment S², from which the steam can pass through the pipe S³ to the steam-pump N, to actuate the latter in the usual manner. The pump N forces the liquid through the pipe L² into the cylinder O, so that the plunger P is forced upward, thereby raising the weight P'. When the arm P² in its uppermost movement strikes the collar R², the valve R³ closes the port α and the motion of the pump N ceases as live steam is shut off from the pump.

When the operator now desires to turn the rudder-post A so as to shift the rudder, which has been standing in its normal position—that is, in line with the axis of the vessel—he manipulates the lever J³ so that either of the sets of valves K and I' or I and K' are opened or closed. When the lever J³ has been moved to the position shown in the drawings, the fluid from the cylinder O is forced by the plunger P and its weight P' through the pipe L' into the compartment H⁸, from which the fluid passes through the port H⁷ into the compartment H², and through the pipe F', the compartment H², and the hollow trunnion D³ into the cylinder D', so that the plunger C' is forced outward and the arm B is swung to the right in the direction of the arrow α' , so that the rudder is moved in a similar direction and the vessel is steered to the left. The other plunger C, during the outward movement of the plunger C', moves inward in its cylinder D, so that the fluid contained in the latter is forced out of the cylinder through the pipe F into the compartment H', and from the latter through the open port H⁵ into the compartment H⁵, from which it can pass through the pipe L to the pump N, to be returned at the next operation of the pump to the cylinder O.

As the cylinders D and D' are mounted to swing they readily accommodate themselves with their plungers to the swinging movement of the arm B, so that no undue friction is caused. A suitable pointer is arranged in connection with the rudder-post to indicate at all times the position of the rudder.

When the operator desires to swing the rudder in an opposite direction, he changes the position of the lever J³, so that the valves I

and K' are closed and the valves K and I' are opened. The fluid, under pressure from the cylinder O, then passes through the pipe L' into the compartment H⁸ and from the latter through the port H⁶ into the compartment H', and from the latter through the pipe F into the cylinder D, so that the plunger C therein is moved outward and the arm D is caused to swing in the reverse direction of the arrow α' . The other plunger C' then slides inward in its cylinder D' and the fluid contained therein is forced through the pipe F' into the compartment H², and from the latter through the port H⁴ into the compartment H⁵, from which the said fluid can pass through the pipe L back to the pump N to be returned to the cylinder O, as previously described.

Thus it will be seen that the operator, by simply turning the lever J³, can very readily change the position of the rudder as is required. It will further be seen that the cylinder O is always charged with a liquid under pressure, as the plunger P, when in its lowermost position, starts the pump N automatically to refill the cylinder O in the manner previously described. Then the operator does not need to give any attention to the motive power after operating the plungers C and C' controlling the movement of the rudder.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In a hydraulic steering apparatus, the combination, with an arm secured on the rudder-post, of two plungers pivotally connected with the free end of the said arm and extending in opposite directions, pivoted cylinders, in which are fitted to slide the said plungers, and means, substantially as described, for alternately filling the said cylinders with the liquid under pressure, substantially as shown and described.

2. In a hydraulic steering apparatus, the combination, with an arm secured on the rudder-post, of two plungers pivotally connected with the free end of the said arm, and extending in opposite directions, pivoted cylinders, in which are fitted to slide the said plungers, pipes opening into the pivoted ends of the said cylinders, and a valve mechanism, substantially as described, under the control of the operator and adapted to alternately connect with the said pipes, substantially as shown and described.

3. In a hydraulic steering apparatus, the combination, with a weighted plunger and a cylinder containing a liquid, and in which is held to slide the said plunger to exert a pressure on the said liquid, of a casing provided with inlet and outlet compartments of which the inlet-compartment is connected to the said cylinder and the several compartments are connected with each other by ports, pipes leading from the said casing, pivoted cylinders into which discharge the said pipes, and plungers fitted to slide in the said cylinders

and pivotally connected with an arm held on the rudder-post, substantially as shown and described.

4. In a hydraulic steering apparatus, the combination, with a weighted plunger and a cylinder containing a liquid, and in which is held to slide the said plunger to exert a pressure on the said liquid, of a casing provided with inlet and outlet compartments of which the inlet-compartment is connected with the said cylinder and the several compartments are connected with each other by ports, pipes leading from the said casing, pivoted cylinders into which discharge the said pipes, plungers fitted to slide in the said cylinders and pivotally connected with an arm held on the rudder-post, and valves controlling the ports in the said casing, substantially as shown and described.

5. In a hydraulic steering apparatus, the combination, with a weighted plunger and a cylinder containing a liquid, and in which is held to slide the said plunger to exert a pressure on the said liquid, of a casing provided with inlet and outlet compartments of which the inlet-compartment is connected with the

said cylinder and the several compartments are connected with each other by ports, pipes leading from the said casing, pivoted cylinders into which discharge the said pipes, plungers fitted to slide in the said cylinders and pivotally connected with an arm held on the rudder-post, valves controlling the ports in the said casing, and means, substantially as described, for changing the position of the said valves, as set forth.

6. In a hydraulic steering apparatus, the combination, with the rudder-post arm, the hydraulic plungers connected therewith, and valve-pipe connections between the said cylinder and plungers, and a steam-pump, of a cylinder adapted to be charged from the said steam-pump, a weighted plunger held to slide in the said cylinder, and a valve controlled from the said plunger and adapted to open and close the steam-supply for the said pump, substantially as shown and described.

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Witnesses:

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