

(No Model.)

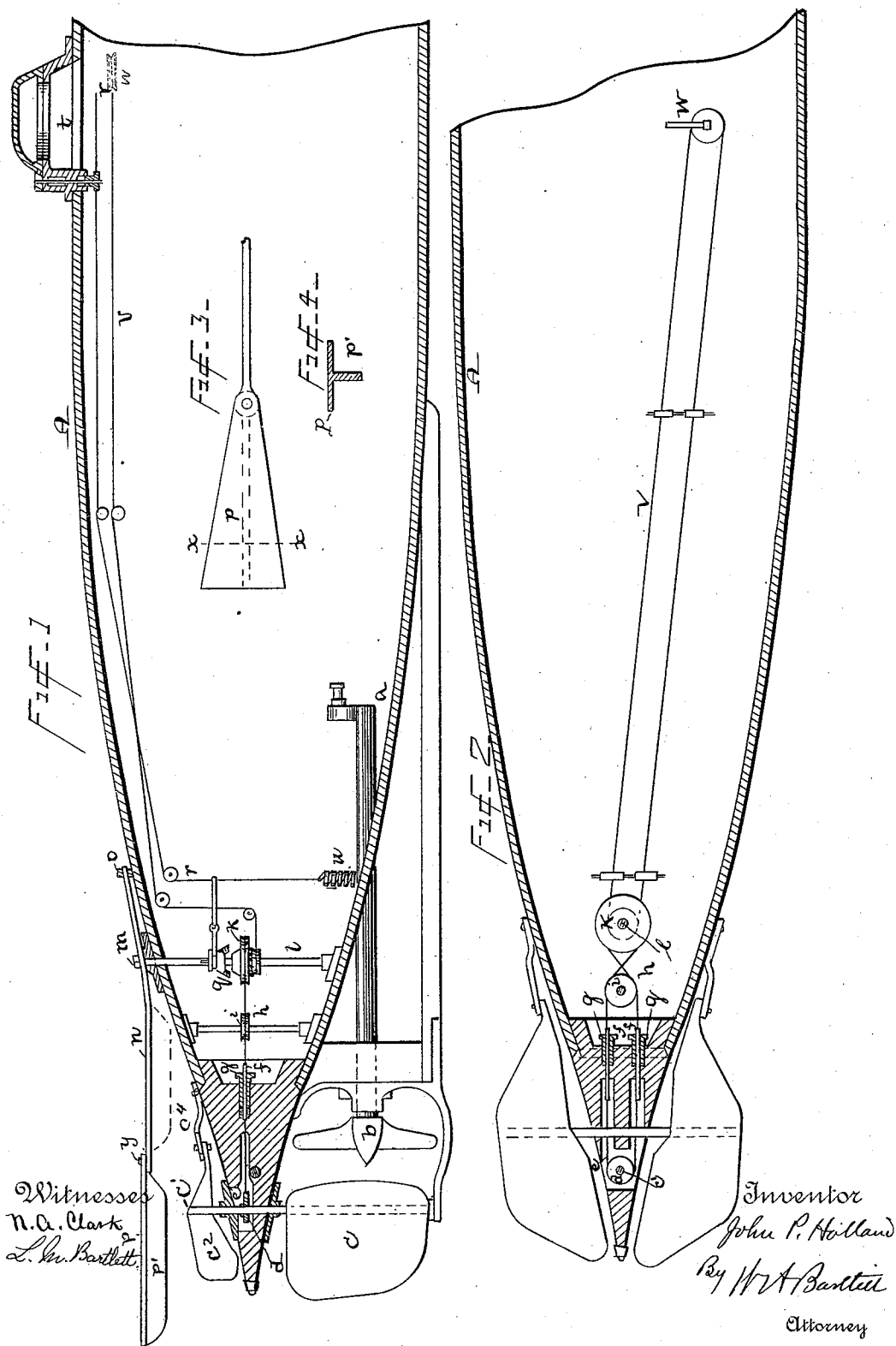
2 Sheets—Sheet 1.

J. P. HOLLAND.

# STEERING APPARATUS FOR SUBMARINE VESSELS.

No. 492,960.

Patented Mar. 7, 1893.



(No Model.)

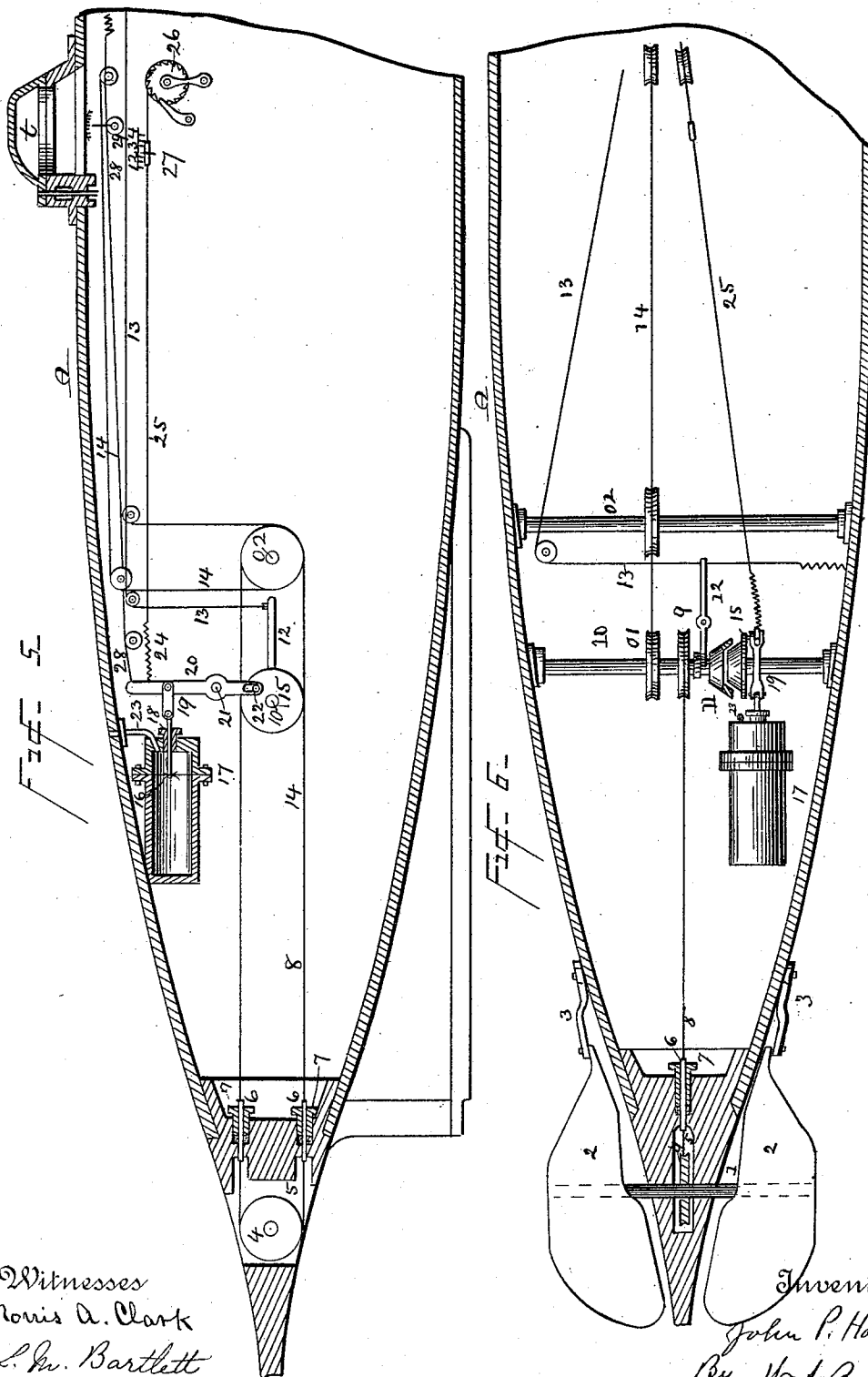
2 Sheets—Sheet 2.

J. P. HOLLAND.

# STEERING APPARATUS FOR SUBMARINE VESSELS.

No. 492,960.

Patented Mar. 7, 1893.



Witnesses  
Norris A. Clark  
L. M. Bartlett

Inventor  
John P. Holland  
By Wm Bantist  
Attorney

# UNITED STATES PATENT OFFICE.

JOHN P. HOLLAND, OF NEWARK, NEW JERSEY.

## STEERING APPARATUS FOR SUBMARINE VESSELS.

SPECIFICATION forming part of Letters Patent No. 492,960, dated March 7, 1893.

Application filed May 23, 1892. Serial No. 433,969. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN P. HOLLAND, residing at 185 Court street, Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Steering Submarine Boats, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to the steering mechanism of submarine torpedo boats and similar craft.

The object of the invention is to place the steering and dividing rudders under control of the steersman, but to cause the steering to be continued automatically for some distance after the vessel is put on her course. Also to improve the vertical and horizontal steering mechanism of submarine boats.

20 Figure 1 is a diagrammatic representation of a longitudinal vertical section of the rear end of a submarine boat, illustrating the principles of my invention relating to vertical rudders. Fig. 2 is a diagrammatic plan of the working parts of the same steering gear, the shell of the boat being shown as a horizontal longitudinal section. Fig. 3 is a plan of the automatic steering drag, and Fig. 4 is a cross-section of same on the line  $x-x$ . Fig. 5 is a diagram showing the main features of a vertical longitudinal section of stern portion of the boat illustrating the controlling mechanism of the diving rudders. Fig. 6 is a plan of same, the boat being in section.

35 The reference letter A indicates the shell of the boat.

$b$  denotes the propeller, which is driven in any suitable manner.

40  $c$  is the vertical rudder, which gives the vessel her course, as usual with steering-rudders. The rudder in the illustration is hung to a shaft  $c'$ , which extends through the "dead wood" at the cigar-shaped end of the boat. A small auxiliary rudder  $c^2$  is borne on the upper end of rudder shaft  $c'$ . The rudders preferably extend forward as well as astern of the rudder shaft. A loosely connected pivoted link  $c^4$  serves to prevent too great movement of the rudders.

50 A pulley,  $d$ , is fixed to the rudder shaft within the dead-wood, as a driving chain  $e$  passes

round this pulley, interlocking in usual manner so there shall be no slip.

Chain  $e$  has its ends attached to rods  $f f$ , which enter the boat through stuffing boxes  $g g$ , making water-tight sliding connection from the interior of the boat to the rudder. The rods  $f f$  are connected to the wire rope or chain  $h$ , which rope or chain crosses round an idler,  $i$ , and closely wraps driving pulley  $k$  which turns loosely on shaft  $l$ . By this connection, the rudder shaft will be rocked whenever pulley  $k$  is turned. The shaft  $l$  extends up through the deck of the boat, passing through a water-tight bushing. At the upper end  $m$  of shaft  $l$ , a lever,  $n$ , is attached, extending forward of said shaft, the front end being movable under a bracket,  $o$ , which extends athwart the boat. A drag,  $p$ , preferably triangular in shape and with a downwardly projecting rib,  $p'$ , (Figs. 3 and 4) is pivoted at  $y$  to the rear end of lever  $n$  (or lever  $n$  may serve as a drag—(see dotted lines in Fig. 1). As shaft  $l$  must partake of the movement of lever  $n$ , and this movement is controlled by the drag, it follows that if shaft  $l$  be coupled to pulley  $k$  the drag  $p$  will control the rudder. This coupling may be effected by means of friction coupling  $q$ , splined to shaft  $l$ , and in position to be thrown into close engagement with pulley  $k$  by a pull on cord  $r$ , the spring  $u$  serving to hold the coupling normally out of engagement. Cord  $r$  extends to the vicinity of the steersman in turret  $t$ . The steering chain  $v$  passing round a pulley attached to pulley  $k$ , extends to wheel  $w$ , near the hand of the steersman, suitable guiding pulleys being supplied. The clutch  $q k$  being normally uncoupled, the rudder is under control of the steersman, as usual. The vessel having been put on her course, drag  $p$  will partake of the movement, and assume a direction parallel to the axial line of the boat, by reason of the rush of water against said drag, and especially against the rib thereon. As soon as the boat is well on her selected course the steersman may drop the handle of wheel  $w$ , and couple the wheels  $q, k$ . The steering gear will then be under control of the drag, and any departure from a straight line will immediately cause a swinging movement of the lever  $n$ , the tendency of the drag being always

straight forward. The swing of lever *n* will throw the rudder in reverse direction, thus righting the ship. As the boat only occasionally rises to the surface to get direction, this automatic steering, after the course is laid, becomes very important.

A cross current will, of course, have some effect on the steering drag, but by actual trial in submarine boats this method of automatic steering has been found very effective, and the variation from true course is surprisingly slight when the vessel dives under water.

The diving rudders 2, 2, which guide the vessel under water, are hung to a transverse shaft *l*, and the front ends of said rudders are loosely pivoted to slotted links 3, 3, which are pivoted to the side of the boat, so as to prevent an excessive movement of the rudders and to prevent catching on drift or obstructions. A wheel 4 on shaft *l* is keyed to said shaft, and may be turned by chain 5, which passes round the wheel and connects with rods 6, 6, which pass through stuffing boxes 7 7, and in turn connect with chain 8, which passes round pulley 9 fixed on shaft 10. A cord or chain 14 from pulley O' on shaft 10 passes round countershaft O<sup>2</sup>, and so over guiding pulleys to the vicinity of the steersman in turret *t*. The diving rudders are controlled in usual manner of steering through this chain connection. Shaft 10 bears a clutch section 11 splined thereto, which clutch is normally out of engagement with clutch section 15, but may be coupled by a pull on line 13, extending to the turret. The clutch section 15 is loose on shaft 10, but held from sliding longitudinally thereof.

A cylinder 17, in the boat, has an air and water tight diaphragm 16 stretched across it. This diaphragm is connected to a piston rod, 18, which passes through a gland in the cylinder head, and connects with link 19 pivoted to lever 20. Lever 20 is conveniently pivoted at 21, and has a slotted engagement with a pin or clutch piece 15. A pipe or passage 23 permits water from outside the boat to enter one end of cylinder 17. This cylinder is air tight, so that a difference of air pressure in the boat has no effect on the diaphragm, but the water pressure from outside the boat controls the diaphragm, and through the connections described may move the clutch section. When the clutch is thrown into engagement by a pull on cord or chain 13, the diving rudders are placed under control of the water pressure in the diaphragm, and will be changed to submerge the boat more or less as the pressure increases or diminishes. A spring 24, connected to lever 20, may be placed under more or less tension by drawing on wire 25, passing to winch 26. An indicator 27 on the wire shows the tension of the spring. A draw rod 28 may be used to hold the lever 20 against the action of the diaphragm.

It will be understood that changes may be

made in the mechanical construction without departing from the spirit of the invention.

The diving rudder combination places the control of the diving rudders in the hands of the steersman, but when he drops it the automatic mechanism controls, and the pressure required to operate this mechanism may be predetermined or at any time changed by means of the winch.

I claim—

1. In combination with the rudder of a submarine boat, a floating drag connected with the rudder controlling wheel, substantially as described.

2. In combination with the rudder controlling wheel shaft of a submarine boat, a lever outside the boat attached to said shaft, and a floating drag on said lever, as described.

3. The rudder, steering wheel, and connections as described, the lever outside the boat connected to the shaft of said wheel, and the automatic floating drag pivoted to said lever, as set forth.

4. In combination with the rudder controlling wheel and its shaft, an automatic floating drag connected to said shaft, and a clutch on the shaft whereby the drag may be thrown into or out of gear with the rudder.

5. The combination with an automatic steering gear controlled by a drag outside the vessel and connected to the rudder of a submarine boat, of a hand-steering apparatus, also connected to said rudder, substantially as described.

6. In combination with a hand controlled apparatus connected to the diving rudder of a submarine boat, of an automatic apparatus operated by the pressure of the water connected to the same rudder, substantially as described.

7. In combination with the inclosing casing, the diaphragm, the rod connected thereto, and its counterpoise spring, of the automatic mechanism described for controlling the diving rudders, and a tension regulator connected to said spring, as set forth.

8. In a submarine boat, the combination with an automatic device having an inclosed diaphragm substantially as described for controlling the diving rudders, of an indicator connected to the rudder controlling mechanism as described to indicate the oscillation of the rudder controlling diaphragm, as set forth.

9. In combination with the rudder of a submarine boat, a loosely pivoted link or guard attached to the end of said rudder and to the boat, whereby the rudder is permitted to oscillate but obstructions are prevented from catching on the rudder.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN P. HOLLAND.

Witnesses:

HENRY KROPF,  
ELIHU B. FROSK.