

(No Model.)

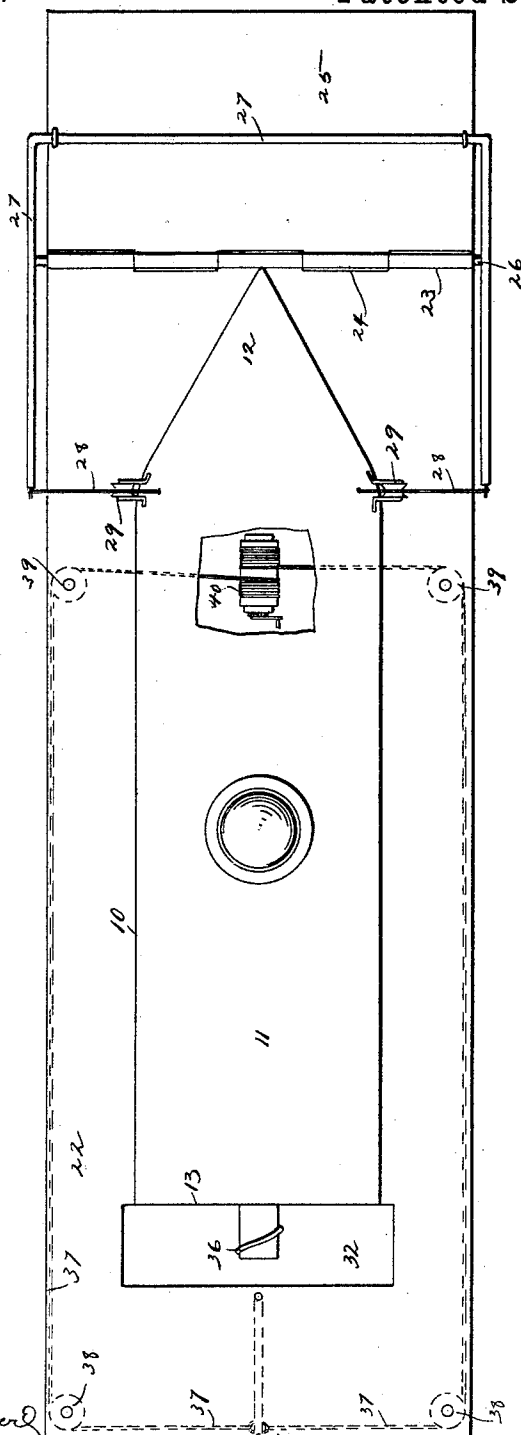
4 Sheets—Sheet 1.

F. W. POOL.  
SUBMARINE VESSEL.

No. 435,857.

Patented Sept. 2, 1890.

*Fig. 1.*



WITNESSES:

*John H. Deemer*  
*E. M. Clark*

INVENTOR:

*F. W. Pool*  
*Munn & Co.*

ATTORNEYS.

(No Model.)

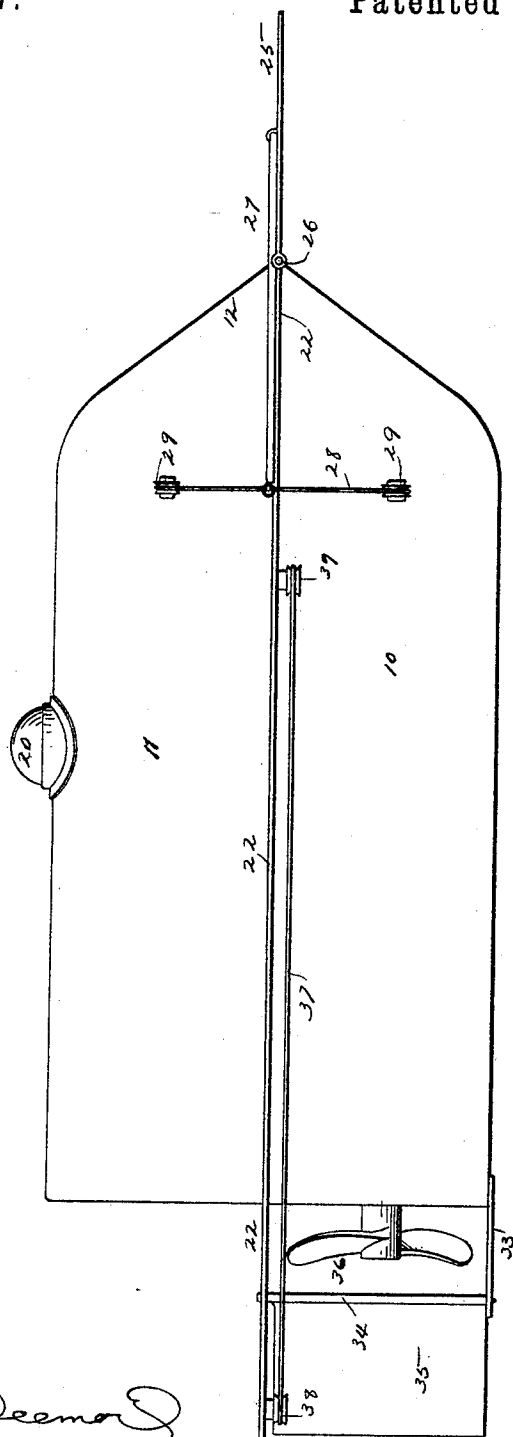
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F. W. POOL.  
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Fig. 2.



WITNESSES:  
*John H. Deemer*  
*E. M. Clark*

BY

INVENTOR:  
*F. W. Pool*  
*Munn & Co.*

ATTORNEYS.

(No Model.)

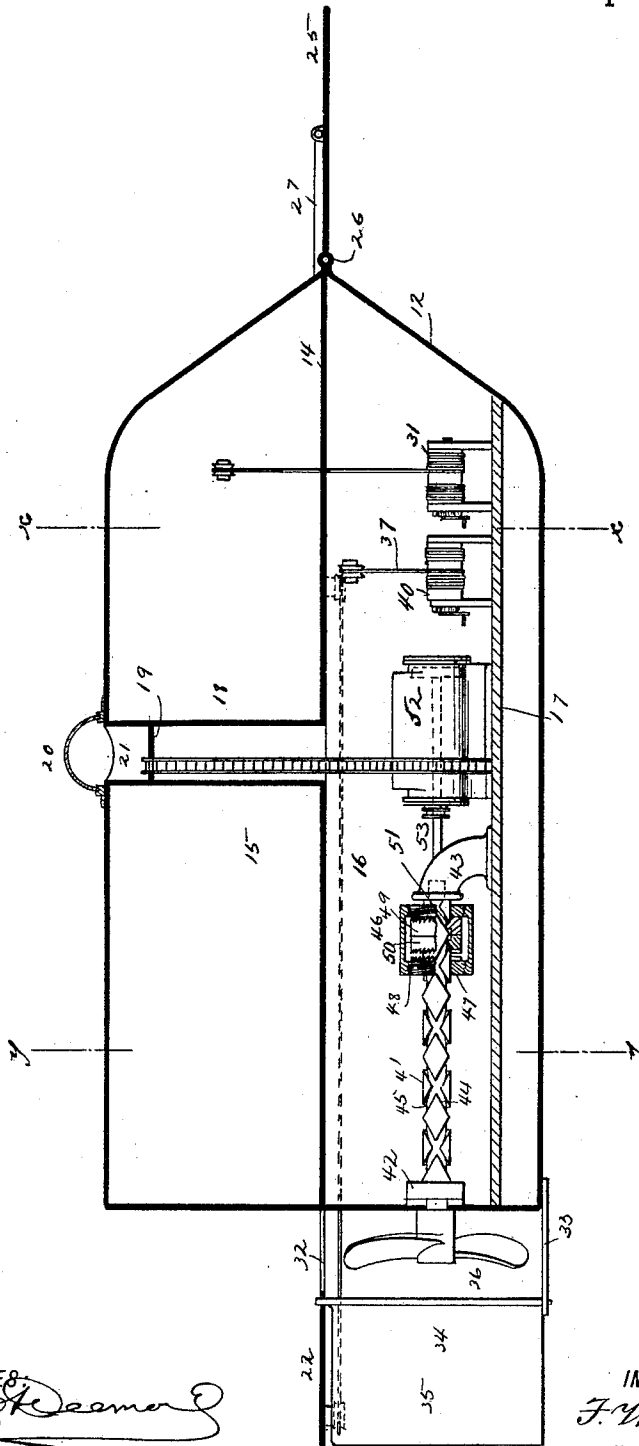
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Fig. 3.



WITNESSES:  
*John M. Deemer*  
*E. M. Clark*

INVENTOR:  
*F. W. Pool*  
BY *Munn & Co.*  
ATTORNEYS.

(No Model.)

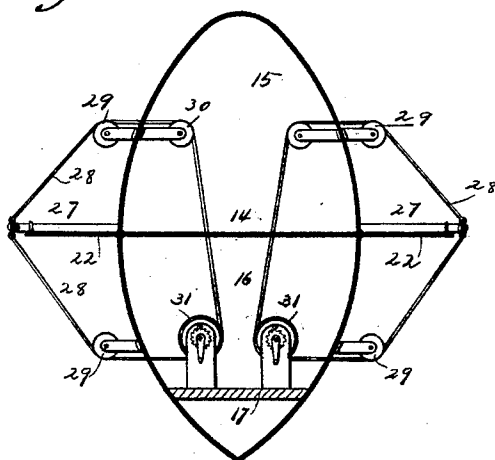
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F. W. POOL.  
SUBMARINE VESSEL.

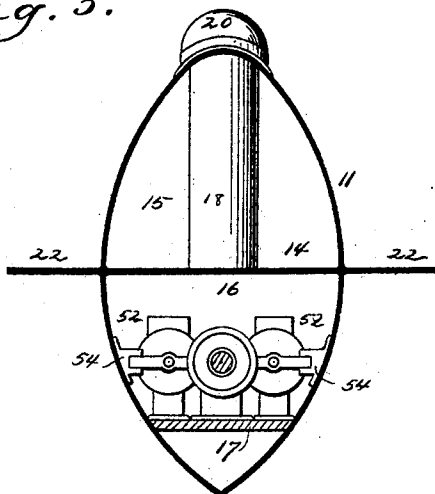
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*Fig. 4.*



*Fig. 5.*



WITNESSES:  
*John B. Deemer*  
*E. M. Clark*

INVENTOR:  
*F. W. Pool*  
BY *Munn & Co*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

FRANCIS WRIGHT POOL, OF NORWICH, CONNECTICUT.

## SUBMARINE VESSEL.

SPECIFICATION forming part of Letters Patent No. 435,857, dated September 2, 1890.

Application filed July 23, 1888. Serial No. 280,727. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS WRIGHT POOL, of Norwich, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Submarine Vessels, of which the following is a full, clear, and exact description.

My invention relates to an improvement in submarine vessels, and has for its object to construct the same in a simple, economical, and durable manner, and provide a means whereby the ship or vessel may be steered vertically as well as horizontally, and the further object of the invention is to provide a means whereby the propeller utilized in the propelling of the ship or vessel may be rapidly revolved with a minimum degree of friction upon the shaft and through the medium of light and simple machinery.

The invention consists in the construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

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

Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is a central vertical and longitudinal section. Fig. 4 is a transverse section on the line  $x x$  of Fig. 3, and Fig. 5 is a similar section on line  $y y$  of Fig. 3.

In carrying out the invention the vessel 10 is constructed of iron or other suitable material and provided with an elliptical body 11, having a conical bow 12 and straight stern 13. The vessel is centrally and longitudinally divided by a horizontal partition 14, extending from stem to stern, whereby two compartments 15 and 16 are obtained.

The compartment 15 represents the gas or air chamber, whereby it is purposed to establish an equipoise between the vessel and the element intended to be navigated—for instance, the water. The said chamber 15 constitutes about one-half the body of the vessel, and is provided with suitable egress and ingress apertures for the purpose of replenishing or emptying the chamber of its buoyant contents.

The lower chamber 16 is purposed to be

allotted to passengers and machinery, and is preferably provided with a suitable floor 17.

At or about the center of the buoyant chamber 15 a casing 18, preferably cylindrical in contour, is projected downward from the upper face of the vessel through the partition 14 into the lower chamber 16. The upper and lower ends of the casing 18 are open, and at or near the top a horizontal floor 19 is constructed provided with an aperture or opening adapted to receive one end of a ladder or equivalent device, the other end whereof rests upon the floor of the lower chamber 16. The upper open end of the casing 18 is closed through the medium of a preferably cylindrical glass or other transparent cover 20, which cover is secured to the outer side of the vessel in any approved manner. By reason of the cover 20 and the floor 19 a chamber 21 is obtained adapted for the use of the pilot, and the cover 20 is of sufficient size to admit of the pilot's head and shoulders, for instance, extending above the plane of the vessel at the top, whereby the said pilot may conveniently and effectively take observations upon all sides, and thereby properly steer the vessel or give orders for so doing.

The body of the vessel is surrounded by a rectangular flange 22, which flange is rigidly secured to the outer side of the said body at or about the center in such manner as to project outward at right angles to the body, as best illustrated in Fig. 1. The forward end of the flange 22, which extends across the bow of the body, is provided with a series of spaced knuckles 23, adapted to engage with a series of similar knuckles 24, formed integral with the horizontal rudder 25, which rudder is of like width as the flange 22 at the bow and stern. The hinged connection of the horizontal rudder with the flange 22 is effected by the passage of a stout bar 26 through the abutting knuckles 23 and 24, as best shown in Fig. 1. The ends of the bar 26, forming the pintle of the hinge, project beyond the outer end of the flange 22, and upon said extremity of the hinge-pintle 26 an essentially U-shaped lever 27 is fulcrumed. The body of the U-shaped lever 27, which consists of a bar of metal bent to U shape, is rigidly attached longitudinally to the hori-

zontal rudder 25, preferably upon the outer surface at or near the center, and the members of said lever extend in direction of the stern a distance from the outer sides of the flange 22 parallel therewith.

The horizontal rudder 25 may be manipulated in various ways, and although I have illustrated one means of manipulating the said rudder, I do not confine myself thereto.

The means whereby the rudder 25 is raised and lowered, as illustrated in the drawings, consists of ropes or chains 28, attached to the rear ends of the lever 27, which ropes or chains extend respectively upward and downward over pulleys 29, attached to the side of the body above and below the center, the upper rope passing over a similar pulley 30, secured horizontally to the inner wall of the air-chamber and passing through the partition 14 to a connection with a drum 31, located in the lower chamber 16. The lower rope is passed from the outer pulley 29 in through the wall of the vessel directly into the chamber 16, and is also attached to the afore-said drum 31. Two sets of rope are thus employed for each member of the U-shaped lever 27, and two drums 31 are provided, one drum for the ropes entering at each side of the vessel, as best illustrated in Fig. 4.

In the rear portion of the flange 22, which is rectangular, a transverse slot or opening 32 is produced, extending across and parallel with the stern of the vessel, and to the bottom of the vessel at the center a horizontal brace-bar 33 is secured, in the outer end of which brace-bar and in the flange 22 at a point immediately above the said brace-bar the rudder-post 34 of a vertical rudder 35 is journaled, as best illustrated in Fig. 2, the space between the rudder-post and stern of the vessel being adapted for the reception of a suitable propeller 36.

The vertical rudder 35 is manipulated through the medium of a rope or chain 37, attached at the top near the outer edge, one rope or chain upon each side, the said rope or chain extending parallel with the under surface of the flange and over grooved pulleys 38, journaled to the rear of the flange, and similar pulleys 39, located near the bow portion of the flange, from which pulleys the several ropes or chains 37 are projected through the side of the vessel into the lower chamber 16 to an engagement with a drum 40, as best illustrated in Figs. 1 and 3.

The propeller 36 is attached to one end of a horizontal shaft 41, which shaft is provided with a collar 42, located adjacent to the stern, whereby the thrust of the shaft in that direction is limited, and the forward end of the said shaft 41 is journaled in a standard 43, secured to the floor of the chamber 16, in which chamber the shaft is adapted to revolve. The standard 43 is preferably curved in direction of the stern, in order that greater

strength may be obtained and a better support effected for the inner end of the shaft.

The shaft 41 is provided with a series of spirally-arranged grooves 44 and 45, which grooves extend from end to end of the shaft in opposite directions, crossing each other, as best shown in Fig. 3. Upon the shaft 41 a sleeve 46 is adapted to reciprocate, in the ends of which sleeve heads 47 are screwed or otherwise secured, provided with a series of teeth 48 upon their inner or contiguous faces. Between the toothed heads 47 two rings 49 and 50 are loosely held, the approaching faces of which rings are smooth and the outer edges contiguous to the heads 47 are toothed, the teeth of the rings being adapted to mesh with the teeth of the heads and form a clutch. Each ring 49 and 50 is provided with an interior spiral lug or rib 51, the lug or rib of one ring being purposed to enter and travel in the shaft-groove 44 and the lug or rib of the other ring in the shaft-groove 45. The sleeve 46 is reciprocated from, preferably, two cylinders 52, located at each side of the shaft, the pistons 53 of which cylinders are connected to opposite sides of the sleeve, as best shown in Fig. 5, and the said pistons are guided in their movements by channels or ways 54, formed upon the inner side of the vessel within the chamber 16. It will be observed that as the sleeve 46 is carried in direction of the stern the rib of the ring 49, which engages with the groove 45, will mesh with the forward head of the sleeve and the shaft be turned in one direction. Upon the back-stroke of the cylinder the opposite ring will engage with the opposite head, causing the rib of the ring 50 to engage with the groove 44, whereby the said shaft will continue to revolve in the same direction.

It will be observed from the construction of the vessel that by reason of the horizontal rudder the course of the ship may be directed upward or downward, as desired, and that by reason of the vertical rudder it may be guided laterally, or in the usual manner. It will be further observed that the mechanism of the vessel and the machinery employed are both simple, durable, and economical.

I desire it to be distinctly understood that I do not confine myself to steam as a motive power to drive the sleeve 46 upon the shaft 41, as other motive power may be employed; and I further desire it to be understood that I do not limit myself to the means shown and described for manipulating the horizontal and vertical rudders, as other suitable and equivalent means may be employed, and the rope or chain by which the rudders are manipulated may be made to lead directly into the pilot room or chamber 21, if it be found desirable. The passenger-entrance will be through the top.

The special construction of the propeller-shaft is not claimed herein, but forms the

subject-matter of my application, Serial No. 332,096, allowed February 15, 1890.

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

1. In a submarine vessel, the combination, with an essentially elliptical hull centrally divided into two compartments, a passenger and an air or gas compartment, a vertical casing extending from the top of the hull through the upper compartment into the lower compartment, and a transparent cap covering the outer extremity of said casing, of a horizontal flange surrounding the hull, a vertical rudder pivoted in said flange at the rear, and a horizontal rudder hinged to the forward end of the flange, substantially as shown and described.

2. In a submarine vessel, the combination, with an essentially elliptical hull provided with a conical bow and straight stern, a partition centrally and longitudinally dividing the hull into two chambers, a vertical casing extending centrally through the upper chamber into the lower chamber, a horizontal apertured partition dividing the said casing, and a transparent cylindrical covering fitted to the outer end of the said casing, of a horizontal flange surrounding the hull at or near the center, a vertical rudder pivoted in said flange at the rear, a horizontal rudder hinged to the forward end of said flange, and means, substantially as shown and described, for manipulating the said rudders, as set forth.

3. In a submarine vessel, the combination, with an essentially elliptical hull having a conical bow and straight stern, a partition dividing the hull centrally and longitudinally into two compartments, a casing projected vertically downward from the top of the hull into the lower compartment, an apertured partition horizontally dividing the said casing, and a transparent circular covering surrounding the upper end of the casing, where-

by an outlook is provided, of a horizontal flange attached to and surrounding the hull at the center, a vertical rudder pivoted in the rear of the said flange, a horizontal rudder hinged to the forward end of the flange, a U-shaped lever secured to the said horizontal rudder, a rope or chain leading from said lever within the hull and from the vertical rudder also into the hull, and means, substantially as shown and described, for manipulating the said chain or rope, as and for the purpose specified.

4. In a submarine vessel, the combination, with a hull provided with a central partition dividing the same into an upper and lower compartment, a vertical cylinder extending from the top of the hull into the lower compartment, a circular transparent covering fitted to the upper end of the said cylinder, a horizontal flange surrounding the hull at or about the center, a vertical rudder pivoted to the rear of the said flange, a horizontal rudder hinged to the forward end of the flange, and means, substantially as shown and described, for manipulating said rudders, of a horizontal shaft located in the lower compartment of the hull, provided with spirally-arranged grooves extending from end to end in opposite directions, a propeller secured to the outer end of the said shaft, a sleeve mounted to slide upon the said shaft, having fixed heads and teeth upon the inner surface of said heads, two loose rings within the sleeves having teeth produced upon the surface contiguous to the heads, projections formed upon the inner surface of the rings, adapted to engage the grooves of the shaft, and means, substantially as shown and described, for reciprocating the said sleeve, as and for the purpose specified.

FRANCIS WRIGHT POOL.

Witnesses:

EDGAR T. KINGSLEY,  
GEORGE W. KIMBALL.