(No Model.)

3 Sheets—Sheet 1.

J. H. L. TUCK.

SUBMARINE VESSEL.

No. 297,647. Patented Apr. 29, 1884.

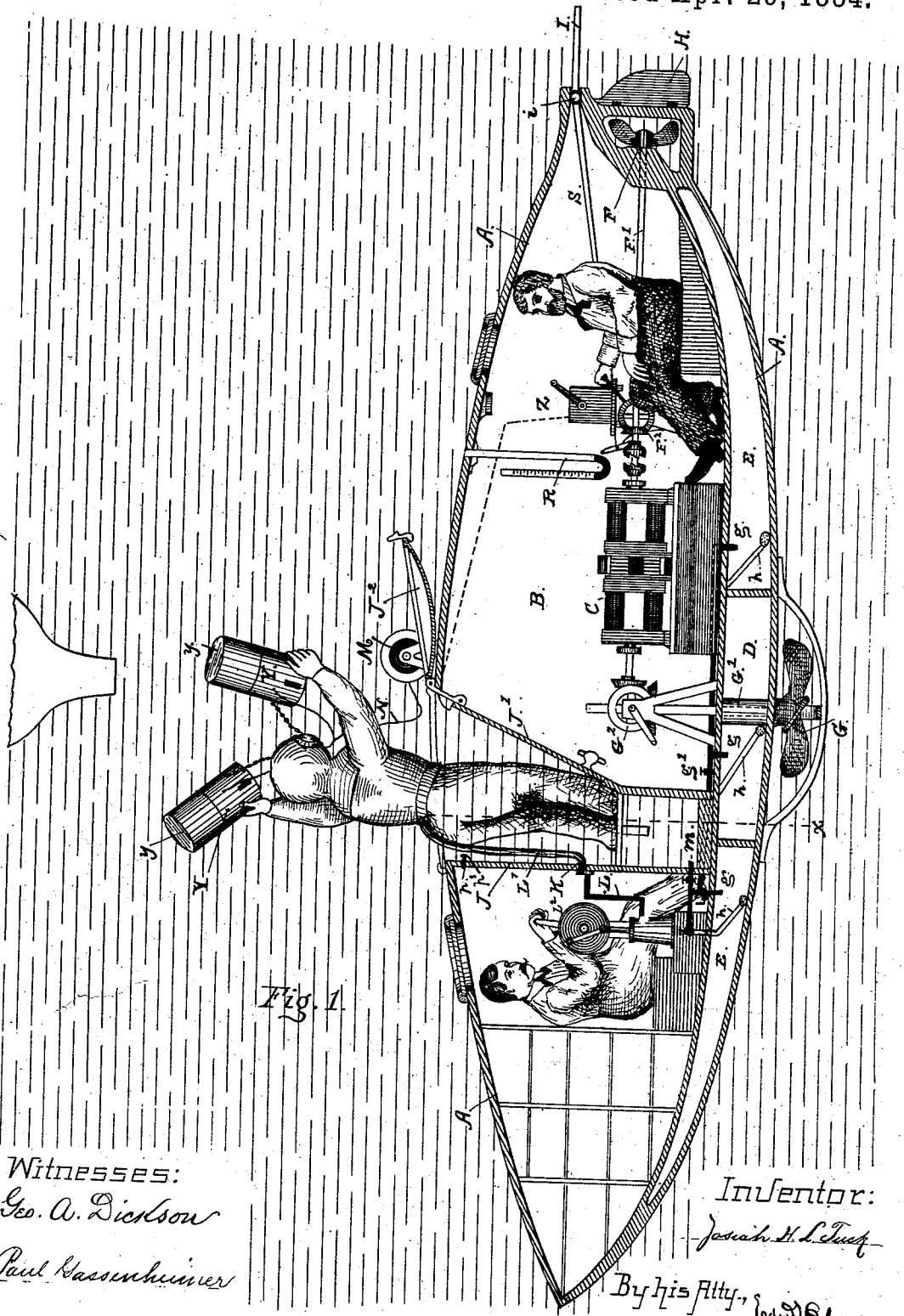

Fig. 1.

Witnesses:
Geo. A. Dickson
Paul Bassenheimer

Inventor:
Josiah H. L. Tuck
By his Atty., Edwd Shaw.

(No Model.) 3 Sheets—Sheet 2.

J. H. L. TUCK.

SUBMARINE VESSEL.

No. 297,647. Patented Apr. 29, 1884.

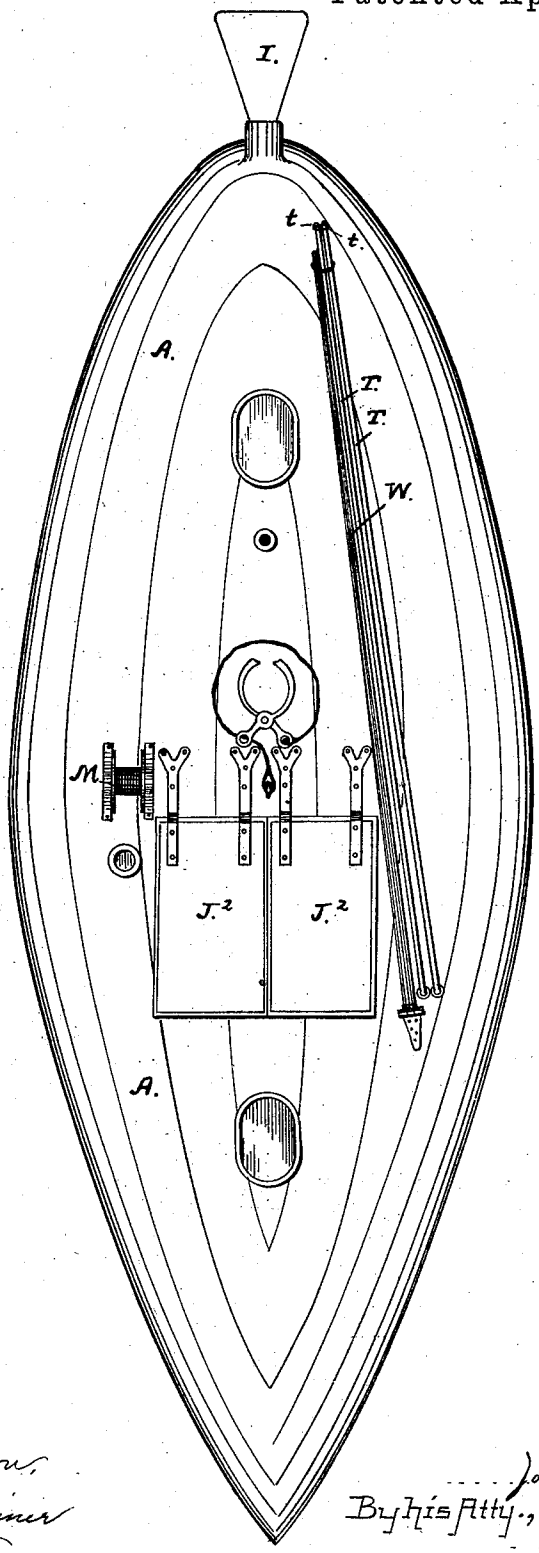

Fig. 2.

Witnesses:
Geo. A. Dickson,
Paul Gassenheimer

Inventor:
Josiah H. L. Tuck
By his Atty., Edwd L. Olson

(No Model.) 3 Sheets—Sheet 3.

J. H. L. TUCK.

SUBMARINE VESSEL.

No. 297,647. Patented Apr. 29, 1884.

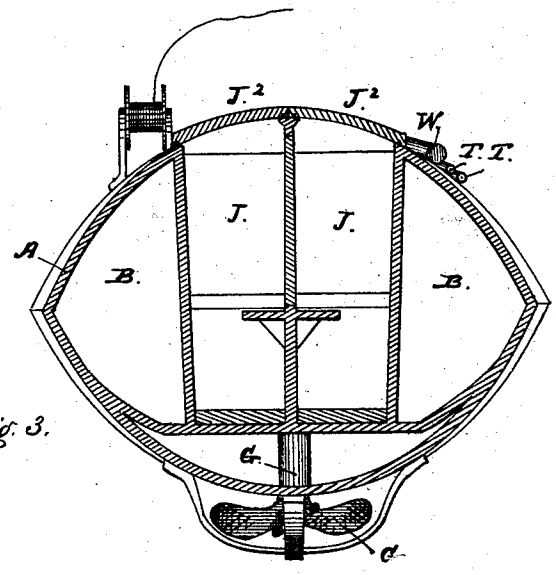

Fig. 3.

Witnesses:

Geo. A. Dickson

Paul Gassenheimer

Inventor:

Joseph H. L. Tuck

By his Atty., Edwd. Dodge

UNITED STATES PATENT OFFICE.

JOSIAH H. L. TUCK, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO THE SUBMARINE MONITOR COMPANY, OF NEW YORK, N. Y.

SUBMARINE VESSEL.

SPECIFICATION forming part of Letters Patent No. 297,647, dated April 29, 1884.

Application filed June 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH H. L. TUCK, a citizen of the United States, residing in the city and county of San Francisco, State of California, have made certain new and useful Improvements in Submarine Boats; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to submarine boats or vessels for use in harbor defenses and naval operations.

The following description fully explains the nature of my said improvement, and the manner in which I proceed to construct, apply, use, and operate the same, the accompanying drawings being referred to by figures and letters of reference—that is to say:

Figure 1 is a vertical longitudinal section through my submarine boat, and it represents the general arrangement of machinery for propelling, steering, and handling the boat, and apparatus for supplying and maintaining within the boat a suitable atmosphere for the occupants. Fig. 2 is a top view or plan; and Fig. 3 a cross-section at the line *x*, Fig. 1.

A represents a cigar-shape hull or body, constructed, preferably, of metal to give requisite strength and lightness.

B is a principal compartment, to contain a motor and other necessary apparatus, and affording also room for a sufficient number of persons to control and manage the boat and perform the required operations.

C is an electric motor.

D E E are independent water-ballast compartments, formed under and along the bottom of the boat, and having connection with the outside water through inlet and outlet pipes and with a pumping-engine, so that the ballast can be increased and diminished as required, to regulate the depth of submersion.

F is a screw-propeller for giving horizontal movement, and G is a similar propeller by which vertical motion is effected.

H is the principal rudder, and I is an auxiliary tail-rudder for changing the course in a vertical direction.

J J are water-lock compartments, having communication both with the interior and with the outside of the boat, through manholes or openings controlled by doors, covers, or hatches operated alternately. They are connected with one or more of the ballast-compartments by means of small outlet-pipes, whereby the body of water taken into the lock through the outer opening is drawn off, and the compartment emptied before the lower opening is uncovered. By this means exit and entrance into the boat are effected during submersion.

K is a coupling for making connection of the air-tubes of a submarine armor with a fixed air-tube, L, within the boat, and L^2 is a pumping-engine for supplying air to the occupant of the water-lock compartment.

R is a pressure-gage, by which the depth of water above the boat during submersion is indicated at all times.

W is a hinged mast for raising and lowering an air-supply tube or system of tubes to hold their inlet-openings above the surface while the boat remains submerged out of sight.

The hull or body is built up after the manner of constructing metal hulls of vessels. It is pointed at both ends, and is otherwise shaped according to the principles now used in constructing submarine vessels. Along the bottom are formed separate compartments, D E, and connection with the outside water is had through a system of pipes *g g*, controlled by stop-cocks *g'*, by which each compartment is filled with water independently of the others, or all may be filled simultaneously. From each compartment is a suction-pipe, *h*, leading to a pumping-engine for reducing or removing the body of water in any one or in all of the compartments and discharging it through the side of the vessel. This arrangement and the connection of the inlet and suction pipes is seen in Fig. 1 of the drawings. These compartments are employed to regulate the general distance of the boat beneath the surface during submersion. By changing the amount

of water-ballast the boat is caused to rise to the surface or sink to a greater depth.

Connection of the propeller-shaft F' is made by a clutch, F^2, and a hand-power engine, F^3, is combined with it in such manner that it can be thrown into action to work the propeller when the motor is inoperative or is not required. A propeller, G, on a vertical shaft, G', is mounted in the center of the body and beneath the bottom, and a like connection of this propeller-shaft with the motor, and with an auxiliary hand-power, G^2, is employed, so that the propeller can be operated by one or the other at such time as it is required to work it. The connection of these shafts with the motive power is made by clutches or couplings of any suitable character. The propeller G is employed to effect vertical motion of the boat directly up or down.

In the center of the hull are formed two independent water-locks or water-tight compartments, J J, accessible from the inside of the boat through openings sealed by doors or covers $J' J^2$, and affording exit from the vessel through hatchways or openings covered by hinged hatches. Each compartment is sufficiently large to permit entrance and exit of a person in submarine armor, and they are independent of each other as respects the taking in and letting out of water, so that one or both may be used, as the occasion requires. An outlet-pipe, *m*, from the bottom of each discharges into the water-ballast compartment below through the pump. A single compartment can also be used with good effect; but in the general construction throughout the boat I have provided a double set or system of parts and apparatus to insure against accidents and to place the entire vessel under control in all emergencies; and for such purpose I provide a separate egress and return for a second operator, who is able to assist or to operate jointly with another operator.

Into each water-lock compartment from the interior of the vessel is led an air-supply pipe, L, having connection with an air-pump. The end of this pipe is carried through the side or wall and terminates in the middle of the water-lock in a coupling, K, to which the end of the flexible air-tubes L' of a diver's costume or armor can be connected. With the exception of this one attachment, however, the occupant of the water-lock while in position for operation is independent of the vessel, and, having the full use of his limbs, he is free to manage and arrange explosives and other destructive appliances, to operate the mast and tubes for taking in air, and to assist in guiding and handling the vessel by a system of signals to the engineers and steersman.

Each compartment has a small vent-pipe, *p*, with a stop-cock, *p'*, to admit air necessary for discharging the water at the time when the hatches have been closed and it is required to draw off the water taken into the compartment and before the inner opening is uncovered.

The indicator is a U-shaped tube, R, like a barometer-gage, with its open end fixed in an aperture in the top of the vessel to communicate with the outside water, and its sealed end situated in a convenient place inside the engine room or compartment and provided with a scale to indicate the pressure of the column of water supported by the mercury in the bend of the gage.

The rudder I, for changing the vertical course of the vessel, consists of a flat horizontally-placed blade having a center of motion or pivot, *i*, at the point of connection with the hull, and capable of swinging up and down upon this pivot to take any angle above and below the horizontal within certain limits. The pivot works in a water-tight box, and a lever, S, connected with it, projects into the engine-room in position to be under control of a steersman. The movements of this blade effect the front end or bow of the boat and produce elevation and depression to a greater or less degree.

Air for respiration is supplied to the vessel and the atmosphere is renewed as often as desired without coming to the surface by means of the tubes T T, and a device for raising and holding their ends above water during the operation while the vessel remains below out of sight. The tubes lead through openings in the top of the vessel, and their upper ends are attached to a mast or boom, W, hinged or otherwise attached to the vessel, so as to be readily raised and lowered. One of these tubes leads off the warm vitiated air from the interior, and the other tube conducts the cooler air from above downward to replace that flowing out, the upward current through one tube thus inducing a downward flow in the other, the effect of which is to renew the atmosphere. Valves *t t* are fixed to the ends of the tubes T to exclude the water. When the ends of the tubes are raised above water, these valves are held open to permit passage of the air. For this purpose they are connected with valve-cords leading from inside the tubes into the boat, so that they can be operated by those within.

In going out of the boat, the operator, inclosed in his armor, removes the lower door or hatch and steps into the water-lock. This opening is then closed again by those in the compartment B and secured against leakage. The upper hatch is then opened, and the operator is at liberty to manage the apparatus on the outside of the box. In returning, the opeator firsts shuts himself in the lock by closing the hatch, and then the water is drawn off into one of the compartments below by admitting air through the vent and starting the pumps, and, this being accomplished, the operator is released by opening the lower door. I employ a torpedo or explosive of such character that when released from the boat it will

gradually rise to the surface, and when loosened by the operator beneath a vessel it will be held by its own buoyancy in place, and in the case of an iron-bottom vessel it will attach itself to the structure. It is constructed of a cylindrical case, Y, containing a sufficient quantity of explosive compound, and sealed up to render it impervious to water. Upon the top of the case is then fixed a float, *y*—such as a cylinder of cork or a case containing a body of air. This is sufficiently buoyant to float the case. In the top of this float I may fix a magnet of sufficient power to hold the case against an iron vessel.

I hereby reserve the right to make separate application for patent for the torpedo or explosive herein described.

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

1. In a submarine vessel, a water-lock having openings to the interior and exterior of the vessel, and means for closing the same, in combination with a water-ballast compartment and connections thereto, whereby the lock may be emptied of water after being used, as set forth.

2. In a submarine vessel or boat, a water-lock, J, located in the upper part of the vessel, and having hatches or coverings opening out upon the top thereof, whereby a person in the lock, when it is open, can stand upright above the top of the vessel.

3. In a submarine vessel or boat, a double water-lock the compartments of which are separate from each other, and which can be used separately or together, substantially as set forth.

4. In a submarine vessel, a water-lock located at or near its upper surface, and provided with hatches opening upon said upper surface, but which are air and water-tight when closed, the said lock having an air-vent connected with the air-chamber of the vessel, and means for controlling the same, and a water-passage leading to the water-ballast chamber or compartment underneath the vessel, substantially as set forth.

5. In a submarine vessel, the combination, with the water-lock located at or near its upper surface, and means for entering, opening, closing, and emptying the same, of an air-supply pipe, as L′, connected to the interior of the vessel at one end and to the armor of the operator at the other, as set forth.

6. In a submarine boat or vessel, a water-lock compartment, J, located in the upper portion of the vessel's body, having openings upward upon the top of the vessel controlled by removable covers, doors, or hatches J′ J², a water-discharge pipe, *m*, connecting it with a water-receiving compartment in the vessel, an air-vent, *p*, and a coupling, K, for connecting an air-tube within the compartment with an air-supply apparatus in the vessel, as set forth.

7. The combination, with the body or vessel A, of the air-conducting tubes T T, capable of being raised and lowered, having their open ends controlled by valves to keep out water and admit air, and the hinged mast W, to which the tubes are attached, and with which they are raised and lowered, substantially as described.

8. The herein-described submarine vessel, consisting of the hull A, having water-lock compartments J, water-ballast compartments D E E, inlet and discharge tubes *g g h*, propelling-engine C, propellers F G, and suitable motors for driving them, the indicator R, the air-conducting tubes T T on the outside, and means for raising and holding their ends above the water, and an air-pump, substantially as described.

JOSIAH H. L. TUCK. [L. S.]

Witnesses;
EDWARD E. OSBORN,
E. PATTEN.