

(No Model.)

2 Sheets—Sheet 1.

J. F. AUER.
SUBMARINE BOAT.

No. 470,535.

Patented Mar. 8, 1892.

Fig. 1.

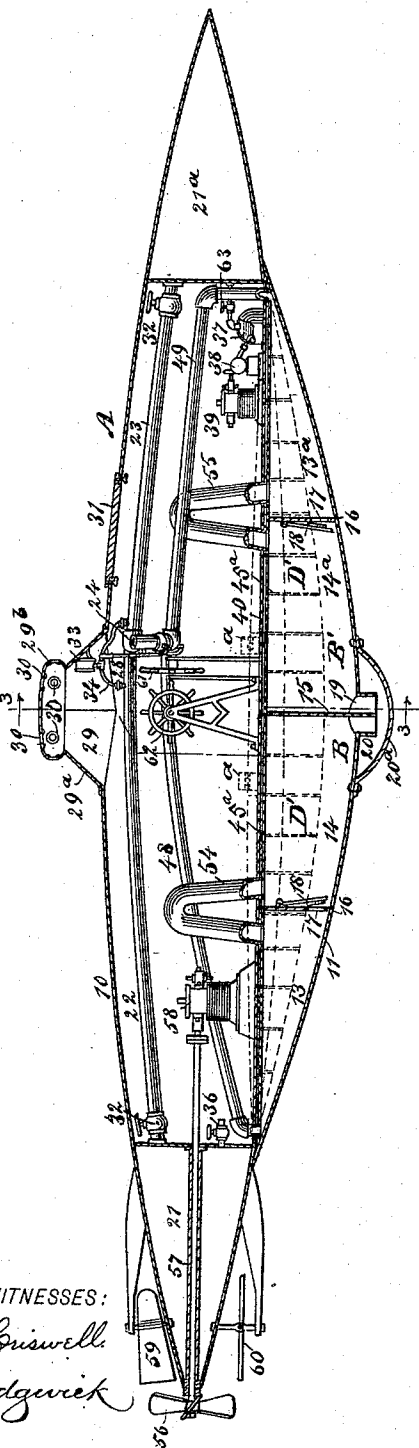
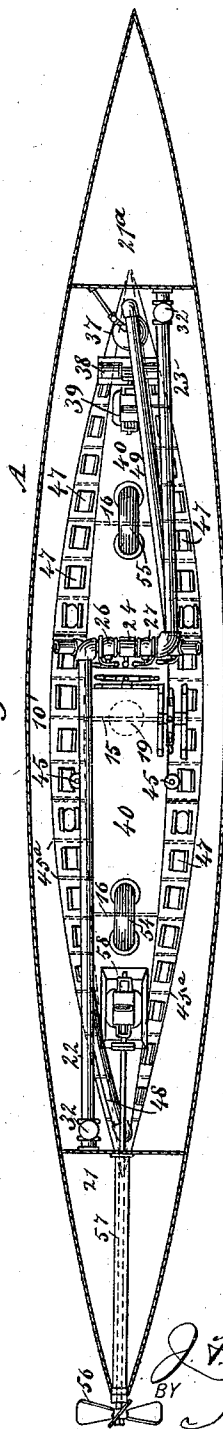


Fig. 2.



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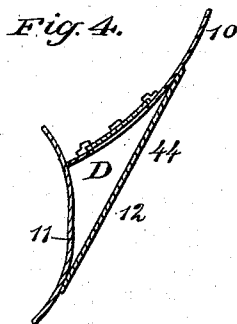
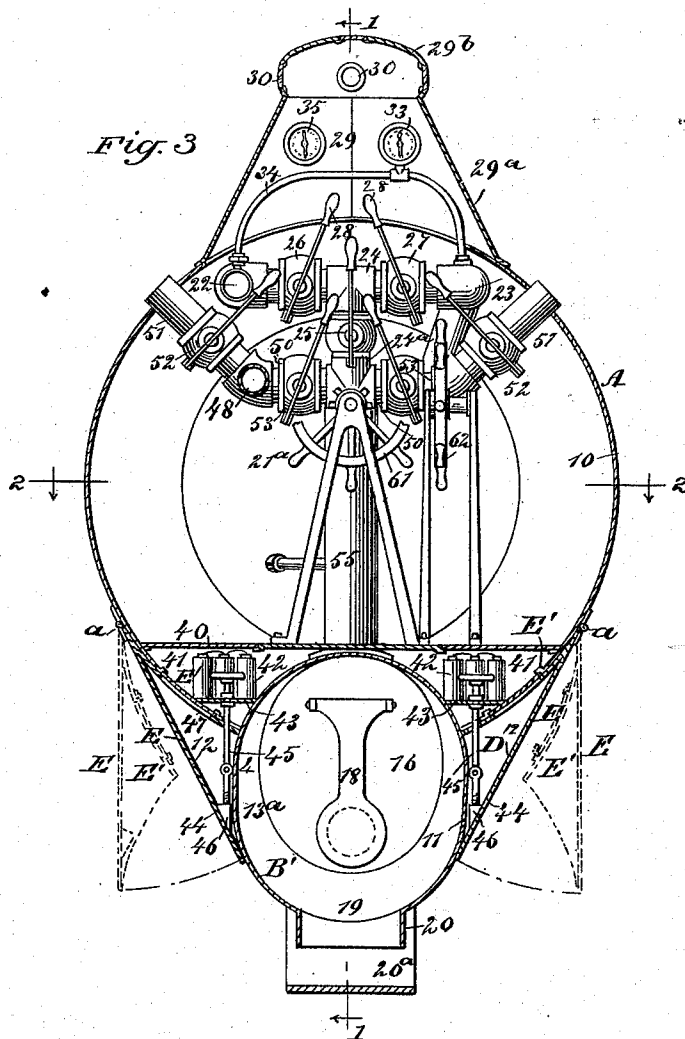
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UNITED STATES PATENT OFFICE.

JOHN F. AUER, OF NYACK, NEW YORK.

SUBMARINE BOAT.

SPECIFICATION forming part of Letters Patent No. 470,535, dated March 8, 1892.

Application filed October 4, 1890. Serial No. 367,138. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. AUER, of Nyack, in the county of Rockland and State of New York, have invented a new and Improved Submarine Boat, of which the following is a full, clear, and exact description.

My invention relates to an improvement in submarine boats, and has for its object to so construct the boat that it may be quickly and effectually submerged through the medium of compressed air and a water ballast and raised to the surface directly through the medium of compressed air, and to so regulate the water ballast and the action of the air thereon that either the bow or the stern may be dipped or elevated at will.

Another object of the invention is to provide for the storage of compressed air in the vessel before descending of sufficient bulk to meet all emergencies in the operation of the vessel and to entirely dispense with the use of pumps.

A further object of the invention is to provide for the constant circulation of pure air in the living-compartments of the vessel and to so construct the vessel that a sufficient quantity of air ballast may be discharged at a moment's notice, and the vessel thereby caused to rapidly ascend to the surface when such a movement is necessary.

The invention consists in the novel 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 and letters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal vertical section through the vessel, the said section being taken on the line 1 1 of Fig. 3. Fig. 2 is a horizontal section through the vessel, taken, practically, on the line 2 2 of Fig. 3, the flooring of the living-compartment of the vessel being broken away and the batteries removed to disclose the upper wall of the ballast-chambers. Fig. 3 is a vertical transverse section taken, practically, on the line 3 3 of Fig. 1; and Fig. 4 is a vertical section through a portion of the hull, illustrating the formation of the ballast-chamber.

The hull A is essentially circular in cross-section and tapers to a point at each end, whereby the vessel is in general contour somewhat cigar-shaped. The hull is virtually constructed in three sections, as shown in Fig. 3—a body section 10, which is round in cross-section and tapered to a point at each extremity, a keel-section 11, corresponding, practically, in shape to the body-section, and ballast-sections 12, one being located at each side of the body and keel sections at their junction. The keel-section 11 extends upwards some distance within the body-section through a proper longitudinal opening formed in its bottom, and the said keel-section, which is tubular, is divided into two or more, preferably two, compartments at each side of its center, the compartments at one side of the center being designated as 13 and 14 and the opposite compartments as 13^a and 14^a. The division of the keel-compartment into compartments is effected by a central vertical partition 15, which divides it into two main compartments B and B', and these compartments are subdivided into the compartments above mentioned by vertical partitions 16, in each of which partitions an opening 17 is produced, adapted at proper times to be closed by valves 18, preferably of the gravity type, opening in the direction of the central partition.

In the bottom of the keel-section, at the center, an opening 19 is provided, usually surrounded by a collar 20, and the central partition 15 crosses this opening, whereby a portion is in each main compartment B and B'. The keel-opening 19 is guarded by a strap-shield 20^a, so constructed that the water in which the vessel floats has constant access at the sides of the shield to the keel-opening. The compartments in the keel-section normally contain air at atmospheric pressure, which prevents water from entering the opening 19; but at proper time the air is exhausted from the compartments, whereupon said compartments receive the water ballast. This action takes place when the vessel is to be submerged.

The body-section 10 is provided at each end with an air chamber or compartment, designated, respectively, as 21 and 21^a, each chamber or compartment being capable of sustain-

ing a pressure of at least two hundred pounds to the square inch. The two compressed-air compartments are connected by two pipes 22 and 23, of which the pipe 22 is shown connected with the compartment 21 at the left-hand side thereof, and the pipe 23 with the opposite compartment at its right-hand side; but the order of said connection may be reversed, if found desirable. The pipes 22 and 23 lead, respectively, fore and aft to about the center of the vessel, at which point they are connected by a horizontal pipe or pipes 24, as shown in Figs. 2 and 3. A stand-pipe 24^a is projected downward from the center of the connecting-pipe 24, provided with a valve 25, and like valves 26 and 27 are located in the connecting-pipe 24, one at each side of its center. Each valve is preferably manipulated through the medium of lever-handles 28, extending upward beneath one side of a dome or lookout 29, erected upon the top of the body-section at or near the center. The lookout has direct communication with the interior of the vessel, and the body portion 29 thereof is preferably diamond-shaped in general contour, the top 29^b being cylindrical. In the top section of the lookout a number of dead-lights 30 is located, sundry of these being in the side surfaces and the others in the top, as shown in Figs. 1 and 3. Entrance to the vessel is obtained through a hatch 31, located at one side of the lookout. A valve 32 is placed in each air-pipe 22 and 23 near the air-storage compartments, which valves are designed as substitutes for the valves in the transverse connecting-pipe and stand-pipe, should the latter under any possibility leak, and the amount of air-pressure is determined by a gage 33, located upon a bridge-pipe 34, connected with both of the longitudinal circulating air-pipes 22 and 23, as shown in Fig. 3, while the pressure of the water upon the hull may be determined by a suitably-constructed gage 35 in the lookout.

Air is supplied to the interior of the vessel for breathing purposes through a valved pipe 36, communicating with the compressed air or storage chamber 21, and the air is constantly purified in the following manner: Near the air-storage compartment 21^a a chemical air-purifier 37 is located connected with said compartment, and also with an air-compressor 38, preferably driven by a dynamo 39, the entire apparatus being supported by a floor 40, which floor extends from side to side of the body-section and from one air-compartment to the other over the keel-section, as in the body-section, is the living-compartment for the men. Air is constantly supplied to the living-compartment through the pipe 36, and the compressor constantly forces the air through the purifier in the storage-compartment with which it is connected. Thus in the living-compartment a constant circulation of air is maintained, which is rendered as chemically pure as possible, as all the air supplied at any time to the storage-compartments 21

and 21^a is first passed through the purifier and the carbonic acid precipitated therefrom. As the body-section of the hull engages with the keel-section at a tangent and the flooring 40 is straight, a chamber 41 is formed at each side of the keel within the body beneath the floor, said chamber being utilized for the storage of batteries 42, as the vessel is preferably electrically propelled. The batteries rest upon a horizontal floor 43, as shown in Fig. 3, attached to the outer wall of the keel-section and the inner wall of the body-section of the hull.

The ballast-section 12, which, as its name implies, is to contain the ordinary ballast, is formed by attaching a plate or plates 44 at each side of the body and keel sections, following the contour thereof, and the plates engage tangentially at their upper edges with the interior of the body-section, preferably at or near the floor-line thereof. At their lower edges the plates engage in like manner with the interior of the keel-section immediately below its center line, the plates being secured to both sections in any suitable or approved manner. By this means a chamber D is formed below the battery-chamber at each side of the keel, adapted to contain ballast, and the said ballast-chambers are divided into compartments D' by partitions 45^a, as shown in dotted lines, Figs. 1 and 2.

In the event an accident should happen to any portion of the vessel it is very necessary that the vessel should rise quickly to the surface. Therefore, in addition to the regular means for raising the vessel, to be hereinafter described, I provide a means whereby sufficient ballast may be quickly and conveniently discharged to render the vessel sufficiently buoyant to immediately approach the surface of the water, if submerged. This is accomplished by hinging a midship-section E, containing a number of compartments D' of the ballast-section of the hull, to the body-section thereof, the hinge connection being illustrated at *a* in Figs. 1 and 3, and a section E' of the body of the hull below the floor-line and corresponding in length to the hinged ballast-section E is rendered independent of the remaining portions of the body and is secured to the ballast-section, as illustrated in Fig. 3. The hinged section E of the ballast-section and the corresponding section E' of the body are not attached to the keel-section; nor is the section E' of the body attached to the floor 43 of the battery-chamber. The hinged sections are normally held in water-tight engagement with the keel-section of the hull by bolts 45, together with suitable packing, the bolts being made to pass up through the body-section and held to turn in the floor 43 of the battery-chamber 41. The bolts are provided at their upper ends with suitable hand-wheels, and their lower ends are threaded to screw into sockets 46 in the plates 44 of the hinged sections E and E'. The bolts are accessible through traps in the body-floor 40,

or they may be extended upward through said floor. When the bolts 45 are disengaged from the hinged sections E and E', the said sections will drop perpendicularly downward, as shown in dotted lines in Fig. 3, and the ballast carried thereby will be discharged, and the vessel, thus rendered much more buoyant than ordinary, will immediately rise to the surface. The atmospheric pressure in the living-compartment in the vessel will prevent the water from flowing therein, even if the traps in the floor 40 are not closed. The ballast is placed in the compartments D' through openings in the body beneath the floor, normally closed by lids 47, as shown in Figs. 2 and 3.

An air-exhaust pipe 48 is connected with the outer end of the sub-compartment 13 of the main compartment B in the keel-section, and a similar pipe 49 is connected with the outer end of the corresponding compartment 13^a of the main compartment B' of the keel-section. The pipes 48 and 49 are disposed in like manner to the air-circulating pipes 22 and 23 and are located substantially below said pipes. The air-discharge pipes 48 and 49 are connected with the stand-pipe 24^a by branch pipes 50, and each pipe 48 and 49 at its connection with the stand-pipe is provided with a branch 51, the said branches being carried outward through the hull and communicating with the atmosphere. Each branch pipe is provided with a valve 52, and valves 53 are arranged one at each side of the stand-pipe in the pipes 50, and all of the valves 52 and 53 are preferably manipulated through the medium of levers similar to the levers 28, heretofore referred to. The location of the branch pipes and the connection of the air-exhaust pipes with the air-supply pipes are best illustrated in Fig. 3. The compartments 13 and 14 of the keel-section are connected by an inverted-U pipe 54, which pipe connects with the compartments at each side of the partition 16 and extends upward in the living-compartment of the vessel some distance above the exhaust-pipe 48, and a similar U-pipe 55 connects the keel-compartments 14^a and 13^a, the two U-pipes being of essentially the same height. In the stern of the vessel a propeller 56 is located, the shaft, which passes through a sleeve 57, extending through the air-storage compartment 21, and the said shaft is preferably electrically driven through the medium of a dynamo 58.

Upon the upper surface of the vessel, at the stern, a rudder 59 is located, adapted to steer the vessel laterally, and a second rudder 60 is located at the stern beneath the vessel, which rudder is utilized to steer the vessel in a vertical or a diagonal position. These rudders may be controlled in any suitable or approved manner.

I have illustrated in the drawings two steering-wheels 61 and 62, both located in the living-compartment of the vessel beneath the lookout, one of said wheels being adapted for connection with the upper and the other with

the lower rudder. The vessel is adapted to carry two men, the station of one being in the tower, and his duties are to direct the movements of the vessel. The duties of the other man are to attend the dynamo and air-compressor. Before screwing down the hatch the valves 26 and 27 and a valve 63 in the pipe connecting the purifier with the air-storage compartment 21^a are opened. The air-compressor is set in operation and kept so until a pressure of two hundred pounds or more of air to the square inch is obtained in the storage-compartments 21 and 21^a. The valve 63 is then closed, the hatch is secured, and the vessel is in condition to be submerged. This operation is accomplished in the following manner: The valves 52 and 53 in the air-exhaust pipes 48 and 49 and their branches are opened, which permits the air in the keel-section of the hull to escape through said pipes into the atmosphere, and as the air leaves the compartments of the keel-section water enters at the opening 19 and takes its place, causing the vessel to sink. The depth to which the vessel will sink can be regulated by the amount of water ballast received or discharged. When the required depth is reached, the valves 52 are closed. The vessel is brought to the surface again by opening the valves 26 and 27 in the air-supply pipes, and likewise the valves 53 in the air-exhaust pipes. When this is done, the valve in the stand-pipe connecting the exhaust and supply pipes is opened, which will allow the compressed air from the air-storage compartments 21 and 21^a to pass through the supply and exhaust pipes and enter the compartments 13 and 13^a of the keel-section of the hull, and as the pressure of air is greater than the pressure of water contained in the compartments of the keel the water will be forced from the compartments 13 and 13^a through the U-pipes 54 and 55 into the compartments 14 and 14^a and from thence through the keel-opening 19 into the sea. As the water ballast is discharged and air substituted the vessel rises to the surface.

If, as heretofore stated, a speedy rise of the vessel is necessary, the hinged sections of the ballast-section of the hull are dropped and a predetermined quantity of ballast is discharged. The bow or stern of the vessel may be raised or lowered at will by forcing the water ballast from one main keel-compartment and allowing the water to fill or to partially fill the other compartment.

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

1. A submarine boat provided with a tubular keel-section having an opening in its bottom and valved air supply and exhaust pipes connected with the keel-section, whereby the admission of water to the keel through the opening and its discharge therefrom are controlled by the air-pressure in the keel-section, substantially as described.

2. In a submarine boat, a tubular keel-section provided with an opening in its bottom and divided into compartments, which compartments are subdivided, the subdivisions of each compartment being connected substantially as described, and air-exhaust pipes connected with the compartments of the keel, as set forth, whereby water ballast may be admitted to either main compartment of the keel for the purpose of dipping the stem or stern of the vessel, as and for the purpose specified.

3. A submarine vessel provided with compressed-air-storage compartments and means for utilizing the said air in expelling the water ballast and raising the vessel, as and for the purpose set forth.

4. In a submarine boat, the combination, with a body-section provided with compartments containing compressed air, of a tubular keel-section normally containing air and having an opening in its under side, air-supply pipes connected with the compressed-air compartments, air-exhaust pipes connected with the keel-compartments, and a valve-connection between the supply and exhaust pipes, substantially as and for the purpose specified.

5. In a submarine boat, the combination, with a body-section provided with compartments for compressed air, of a tubular keel-section normally containing air and having an opening in its under side, air-supply pipes connected with the compressed-air compartments, air-exhaust pipes connected with the keel-compartments, valves arranged in the air supply and exhaust pipes, substantially as described, and a valve connection between the supply and exhaust pipes, as and for the purpose specified.

6. In a submarine boat, the combination, with a body-section pointed at its ends and provided in its end surfaces with compressed-air compartments and a tubular keel-section provided with an opening in its lower surface and divided into compartments over said opening, whereby the opening leads into both compartments, of air-supply pipes connected

with the air-storage compartments, air-exhaust pipes connected with keel-compartments, valves located in the supply and exhaust pipes, substantially as described, and a valve connection between the supply and exhaust pipes, as and for the purpose specified.

7. In a submarine vessel, the combination, with the body thereof, circular in cross-section and provided with pointed ends and air-storage compartments in said ends, and a keel-section connected with the body-section, having an opening in its bottom partially encircled by a shield, a central partition dividing the keel-section into two compartments, the partition being located over the keel-opening, valved partitions subdividing the compartments, and inverted-U-shaped pipes connecting the sub-compartments of each main compartment, of air-supply pipes connected with the air-storage compartments, air-exhaust pipes connected with the outer of the keel-compartments, valves located in the supply and exhaust pipes, substantially as described, and a valve connection between the supply and exhaust pipes, as and for the purpose set forth.

8. In a submarine vessel, compartments located at the ends thereof and adapted to contain compressed air, the said air being adapted to be utilized in raising the vessel, a discharge-pipe connected with one compartment, leading into the living-compartment of the vessel, an air-compressor, an air-purifier connected with the compressor, and a valve connection between the purifier and the opposite storage-compartment, substantially as shown and described, whereby the air may be purified before entering the storage-compartments, and whereby, also, a circulation of pure air may be obtained at all times in the living-compartment of the vessel, as and for the purpose set forth.

Dated October 1, 1890.

JOHN F. AUER.

Witnesses:

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DENNIS O'BRIEN.