No. 854,146. PATENTED MAY 21, 1907.

J. M. CAGE.

SUBMARINE BOAT.

APPLICATION FILED FEB. 21, 1906.

2 SHEETS—SHEET 1.

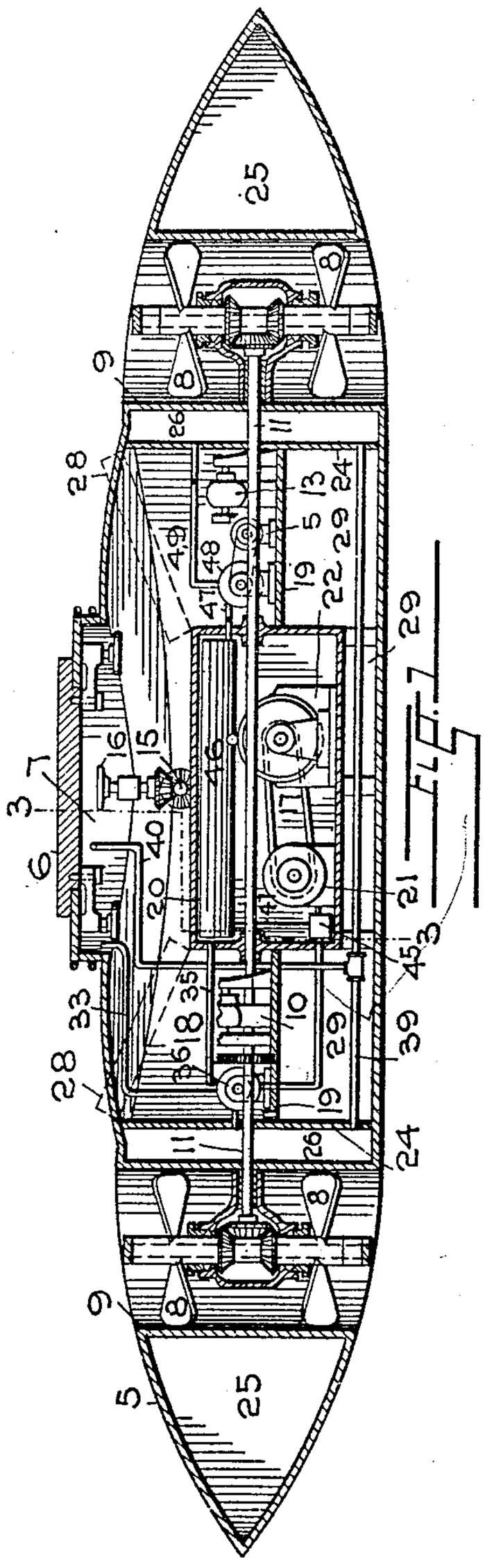

FIG. 1.

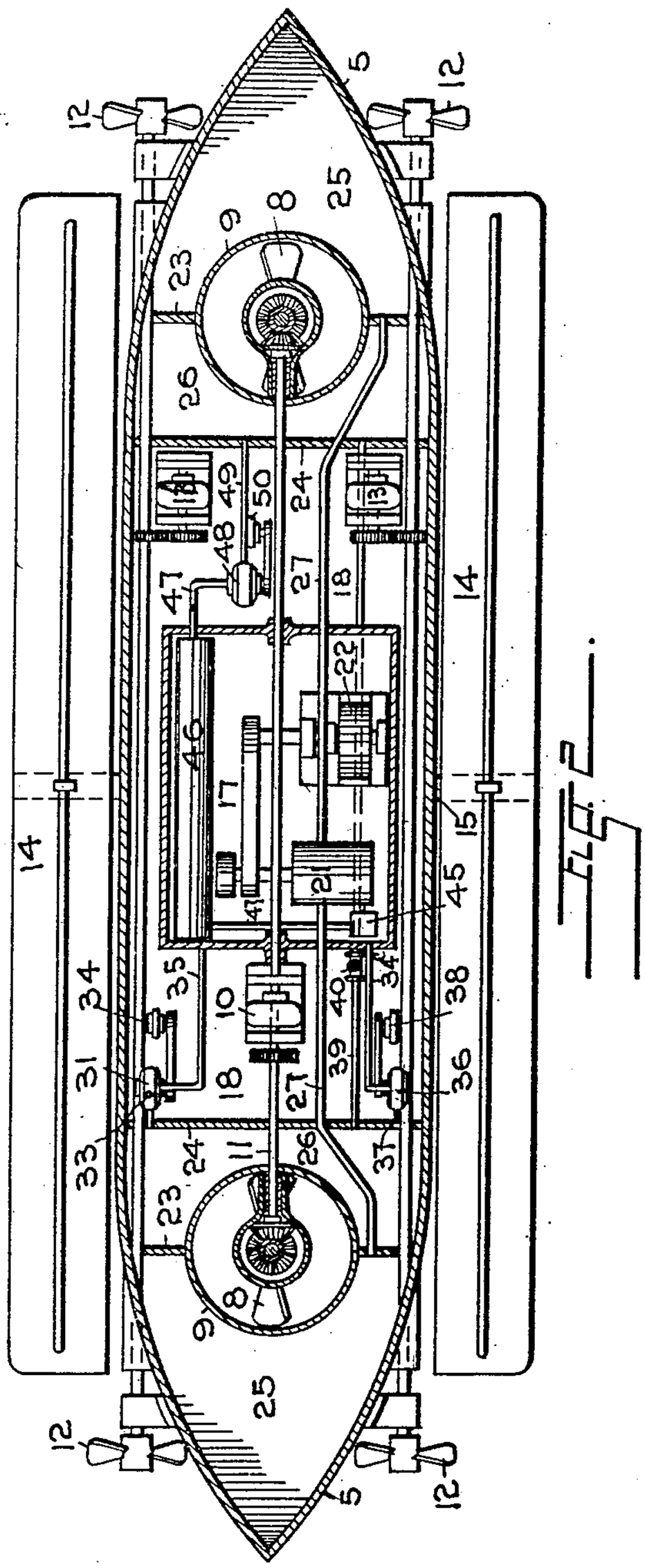

FIG. 2.

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2 SHEETS—SHEET 2.

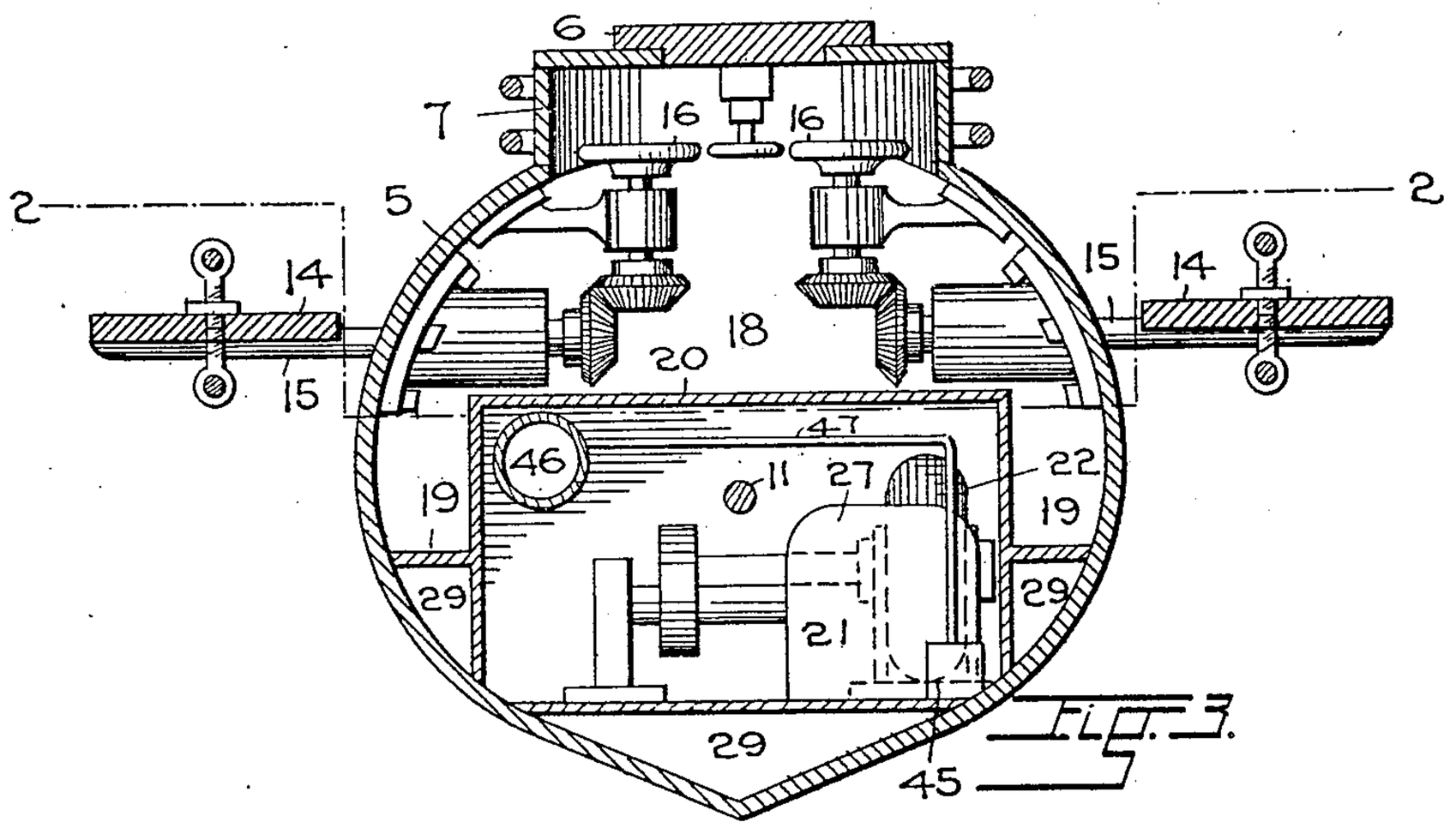

Fig. 3.

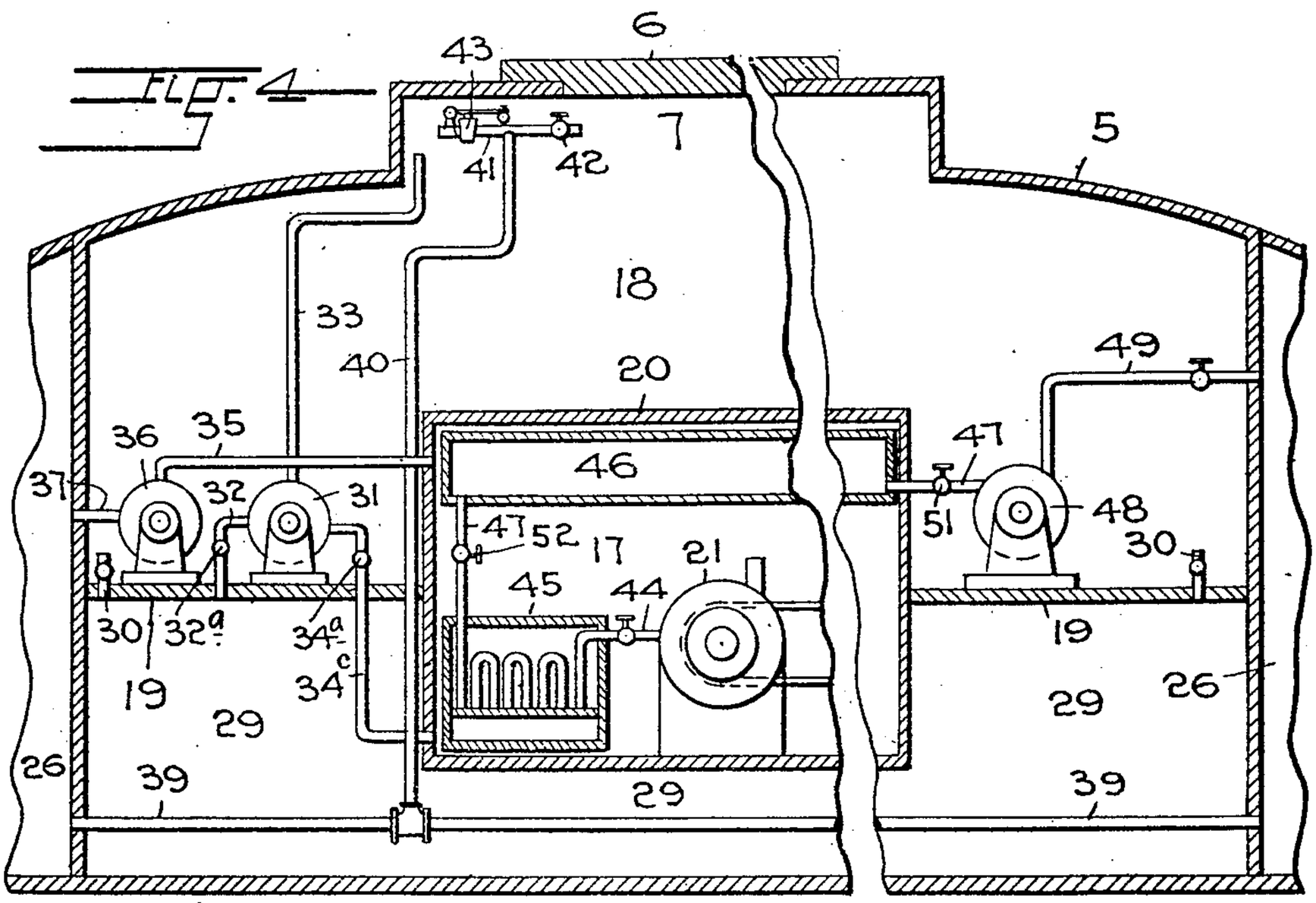

Fig. 4.

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UNITED STATES PATENT OFFICE.

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SUBMARINE BOAT.

No. 854,146. Specification of Letters Patent. Patented May 21, 1907.

Application filed February 21, 1906. Serial No. 302,245.

To all whom it may concern:

Be it known that I, JOHN M. CAGE, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Submarine Boats, of which the following is a specification.

This invention relates to improvements in submarine boats, and has for its object to produce a vessel of the class named, which, by a simple and effective system of air-, storage-and transmission means, may remain submerged during an extensive period, in which the gasolene engine employed to actuate the various electrical appliances, may be operated under all conditions, and in which, by proper and economical distribution and circulation, the stored air may be employed to the greatest advantage.

The benefits derived from the improvements herein described will be appreciated when it is observed that to prevent contamination of the air by the gases ejected from the engine, the electricity required to operate the various contrivances in submarine boats now in use during the period of submergence, is supplied by batteries which are charged while the boat is on the surface.

Recent tests have furthermore established the average length of the period of submergence to be approximately eight hours at the expiration of which time the boat has to be brought to the surface for the purpose of replenishing the air tanks.

I attain my objects by the system and mechanism illustrated in the accompanying drawings, in the various views of which, like parts are similarly designated and in which,

Figure 1:—represents a vertical, longitudinal section through a submarine boat, equipped in accordance with my improved system, Fig. 2—a horizontal, longitudinal section through the same, taken along a line 2—2, Fig. 3, Fig. 3—an enlarged cross section taken along the line 3—3, Fig. 1 and Fig. 4—an enlarged sectional, fragmentary view of the various elements comprised in my system of air-storage and trasnmission.

Referring to the drawings, 5 represents the cigar-shaped hull or shell of a submarine boat, access to the interior of which may be had by means of a normally hermetically closed hatch 6, opening in the upper surface of the conning-tower 7.

The vertical movements of the boat are controlled by the horizontal submerging-screws 8, which are revolubly mounted inside vertical transversely arranged conduits 9 and which are actuated by a motor 10, through instrumentality of a longitudinally extending shaft 11.

The boat may be propelled while upon or under the surface of the water by four screw-propellers 12, which receive their rotary movement from the electric motors 13, while the steering apparatus of the vessel, consists of two horizontal, longitudinally extending planes 14, pivotally mounted on shafts 15, and controlled by means of hand wheels 16.

The submerging, propelling and steering means have respectively been made subjects of separate applications for patent.

The interior of the boat is divided into a centrally located engine room 17 and the operating room 18, the floor 19 of which surrounds the former.

The roof 20 of the engine room extends below the conning-tower and forms the floor which, in practice, is occupied by the operator and steersmen of the vessel.

The electric switches and rheostats employed to control the movements of the various appliances and which together with the electrical connections have been omitted from the drawings, are to this end preferably located in the conning-tower.

Engine room 17 contains the gasolene engine 21 and the therewith operatively connected dynamo 22, by which the various motors employed in propelling and governing the boat are energized.

The interior of the boat is furthermore divided by means of bulkheads 23 and 24 into two end compartments 25, located respectively at the stern and prow of the boat and two thereto adjoining compartments 26.

Chambers 25 are intended for the storage of the gasolene required for the operation of the engine and are connected with the engine room by means of pipes 27, while the adjoining chambers 26 are designed to contain the foul air exhausted from the operating and engine rooms and which being compressed therein, may subsequently be employed to operate the torpedo and dynamite guns, the position of which is indicated in broken lines 28, Fig. 1.

The space 29 surrounding the engine room

below floor 19 is employed to store the compressed air required to supply the vital oxygen to the occupants of the operating and engine rooms during submergence of the boat.

Compartment 29 is supplied with compressed air while the boat is on the surface of the water by means of an air compressor 31 operated by a motor 34 and connected with the said compartment by the eduction pipe 32, while the induction pipe 33 extends inside the conning-tower. When the air compartment is filled, valve 32^a in pipe 32 is closed and the boat is ready to be submerged.

The operating room 18 is, during submergence of the vessel, supplied with vital air by means of the valve-controlled inlet-pipes 30, which extend from compartment 29 through floor 19, while the foul or impure air is exhausted from the upper portion of the said room by means of the before named compressor 31 and the induction pipe 33 and led into the lower portion of the engine room 17 by the auxiliary eduction pipe 34^c, the valve 34^a of which, was closed while compartment 29 was being filled.

The air which rises in the upper portion of the engine room, being unsuited for further use in the living compartments, is exhausted through a pipe 35 by means of a compressor 36 and conducted into one of the foul air chambers 26 by the eduction pipe 37. The compressor is actuated through instrumentality of an electric motor 38.

The two foul air compartments 26 are connected by a pipe 39, a branch 40 of which, leads to the conning-tower 7.

The upper extremity of pipe 40 is provided with a cross pipe 41, which has an outlet-valve 42 and a safety-valve 43. The latter guards against over-compression of the air in the foul air tanks, while the former permits the discharge of the impure air when the boat has returned to the surface.

The gases or vapors, which during the operation of the gasolene engine are constantly exhausted therefrom, are connected through a pipe 44 into a condenser or purifier 45 in which solid and other impurities contained in the gases are separated therefrom and from which the vapors are led through a pipe 47 into the expansion and storing tank 46. The accumulated gases are exhausted from tank 46 through a pipe 47 by means of a compressor 48, which discharges into the foul air tanks 26 through a pipe 49. The compressor is actuated by the electric motor 50.

Tank 46, being sufficiently large will, together with check valves 51 and 52, prevent reaction of the accumulated gases on the engine.

Having thus described my invention what I claim is:—

1. In a submarine boat, a normally watertight shell comprising an operating room, fresh air and impure-air chambers, means to compress air in the fresh air chamber, means to conduct air therefrom into the operating room, and means to exhaust the impure air from the latter into the foul air chamber.

2. In a submarine boat, a normally watertight shell comprising separated engine,-operating-, foul-air-and fresh air-compartments, means to compress air in the latter, means to conduct air therefrom into the operating compartment, means to exhaust air from the latter into the engine compartment, and means to exhaust air from the latter into the foul air compartment.

3. In a submarine boat, a normally watertight shell comprising an operating room, an engine room, compartments adapted to contain gaseous fluids connected therewith, fresh-air and foul-air compartments, and means to lead air from the fresh-air compartment consecutively through the operating and the engine rooms into the foul-air compartments.

4. In a submarine boat, a normally watertight shell comprising an operating room, an engine room, fresh-air and foul-air compartments and means to lead air from the fresh air compartment consecutively through the operating and the engine rooms into the foul-air-compartment.

5. In a submarine boat, a normally watertight shell comprising a centrally located engine room, the surrounding space being horizontally divided into an operating and a fresh-air chamber, foul-air chamber separated therefrom and means to lead air from the fresh-air chamber through the operating room and the engine room, into the foul-air compartment.

6. In a submarine boat, a normally watertight shell comprising a centrally located engine room, the surrounding space being divided into an operating room and a compressed air compartment, compartments adapted to contain gaseous fluids at the extreme ends of the boat and connected with the engine room, communicating foul-air compartments interposed between the last named compartments and the operating room and compressed air compartment, and means to conduct air from the latter through the operating and engine rooms into the foul-air compartments.

7. In a submarine boat, a normally watertight shell comprising separated fresh-air and foul-air chambers, means to compress air in the former and to conduct it into the interior of the shell, and means to subsequently exhaust said air and to compress it in the foul-air compartment.

8. In a submarine boat, a normally watertight shell comprising fresh-air and foul-air compartments, an engine adapted to be actu-

ated by means of gaseous fluids, in said shell, and means to conduct gases exhausted from said engine into said foul-air compartment.

9. In a submarine boat, a normally water-tight shell comprising fresh-air and foul-air compartments, an engine adapted to be actuated by means of gaseous fluids, in said shell, and means to conduct and compress gases exhausted from said engine into said foul-air compartments.

10. In a submarine boat, a normally water-tight shell comprising fresh-air and foul-air compartments, an engine adapted to be actuated by means of gaseous fluids in said shell, an expansion chamber, means to lead gases exhausted from said engine therein, and means to conduct gases from said chamber and compress them in the said foul air compartments.

11. In a submarine boat, a normally water-tight shell comprising fresh-air and foul-air compartments, an engine adapted to be operated by gaseous fluids in said shell, a purifying contrivance, an expansion tank and means to lead gases exhausted from said engine consecutively through the said purifying contrivance and the said tank into the said foul-air compartments and to compress said gases therein.

12. In a submarine boat, a normally water-tight shell, comprising an operating room fresh-air and foul-air compartments, an engine adapted to be operated by means of gaseous fluids in said operating room, means to conduct air from the fresh-air compartment through the said operating room into the foul-air compartment, means to conduct gases exhausted from the said engine into the said foul-air chamber, and means to compress said air and gases therein.

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

JOHN M. CAGE.

Witnesses:

G. J. ROLLANDET,

K. M. STUMP.