4 Sheets—Sheet 1.

A. L. BLACKMAN.

Vessel and Machinery for Aerial Navigation.

No. 224,510. **Patented Feb. 17, 1880.**

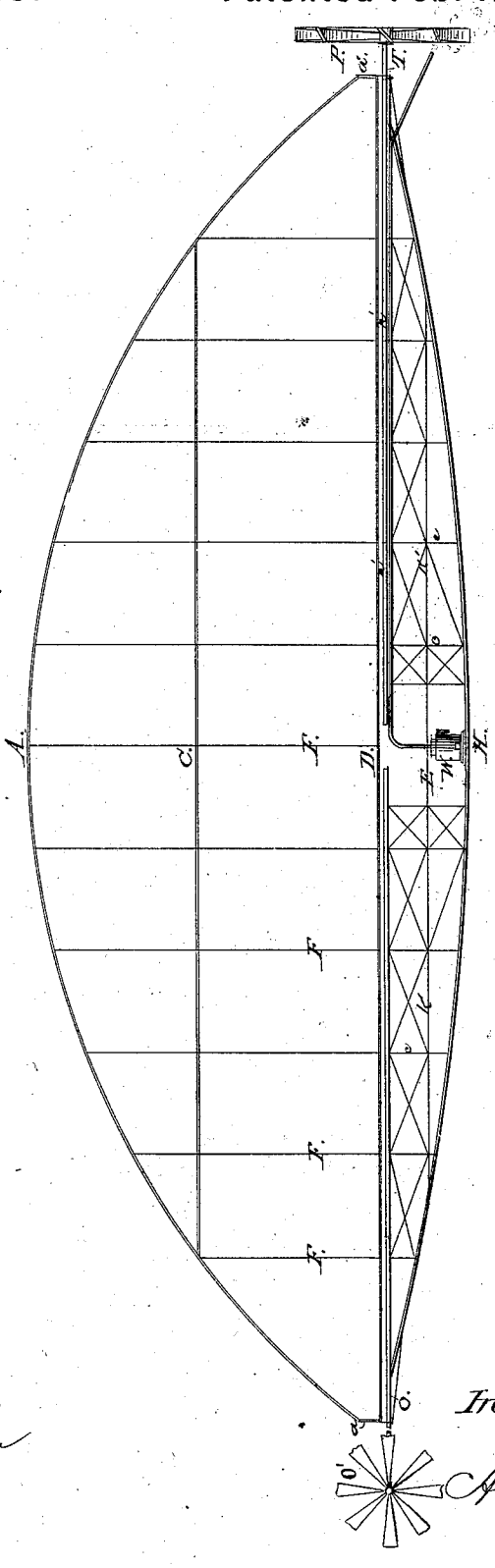


Fig. 1.

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I. N. Kalb

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4 Sheets—Sheet 2.

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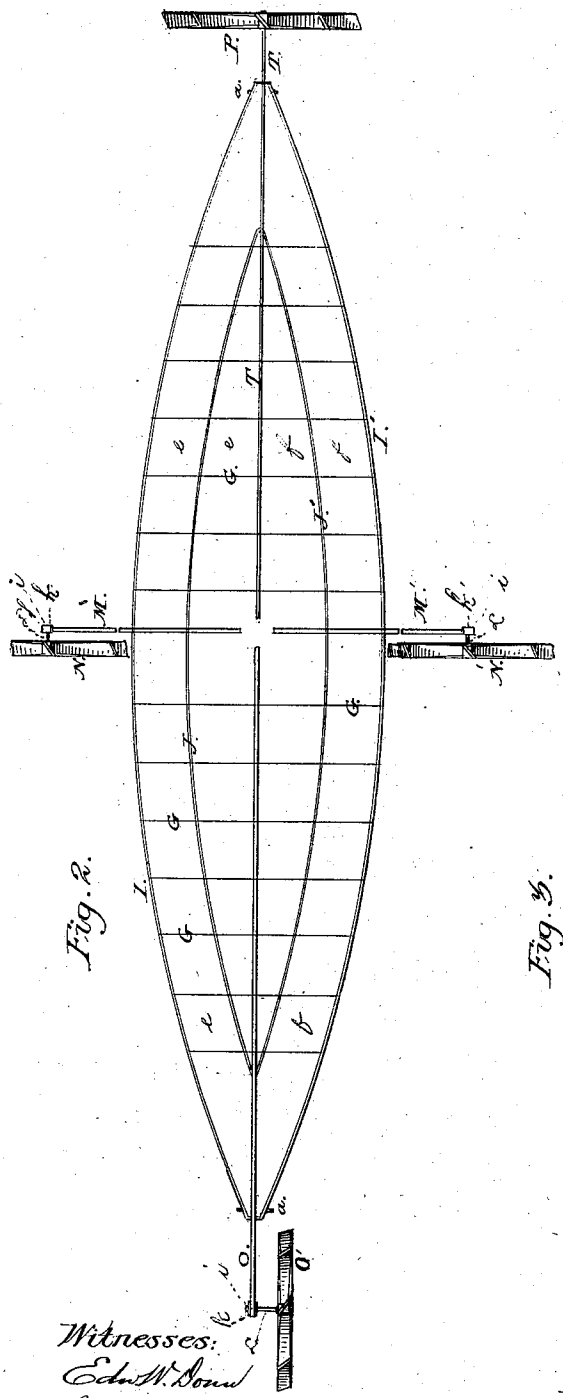


Fig. 2.

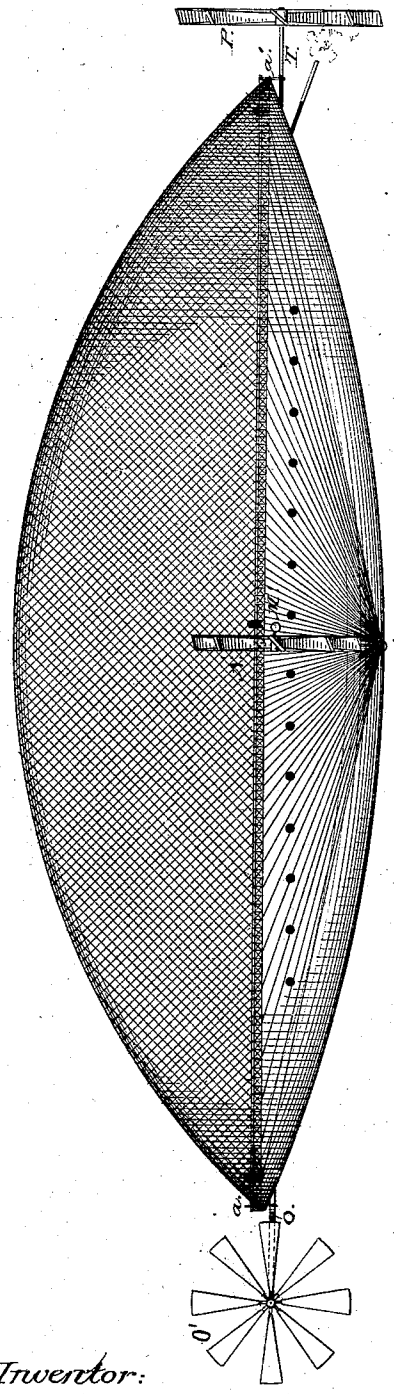


Fig. 3.

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Fig. 4.

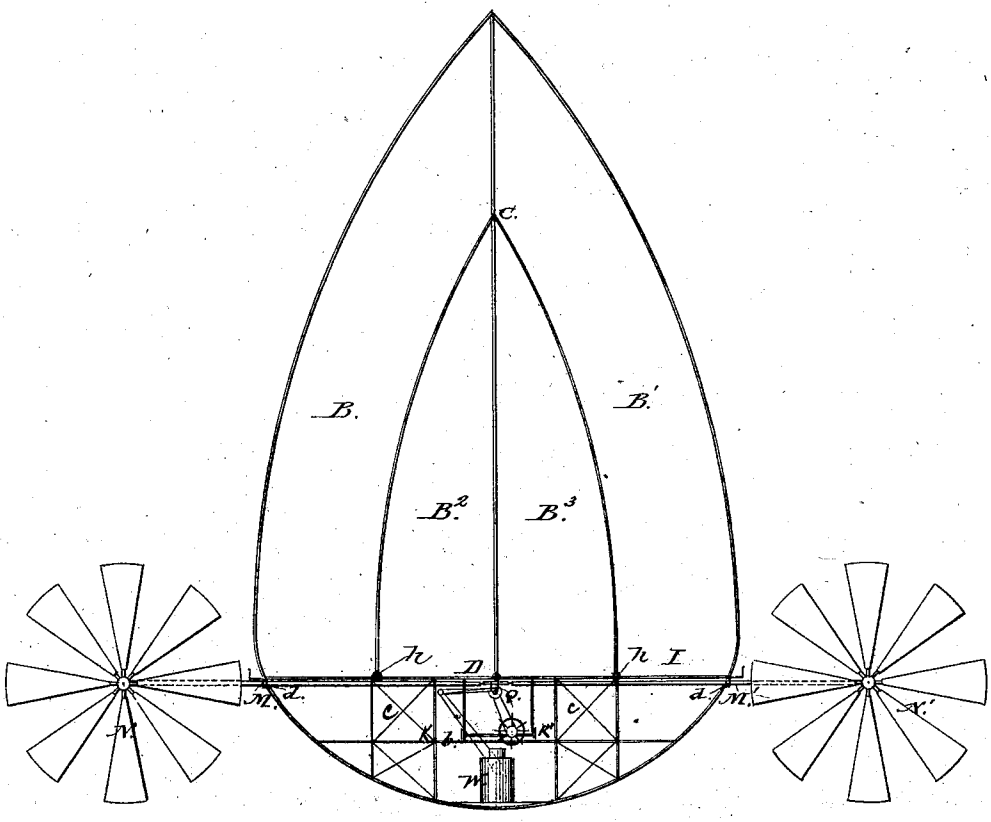
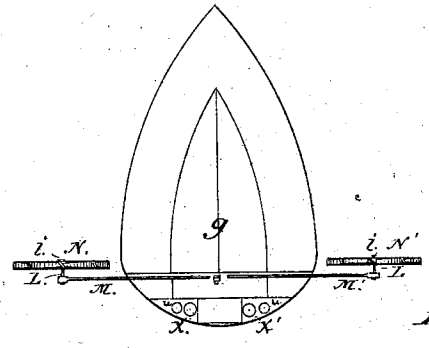


Fig. 5.



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Fig. 6.

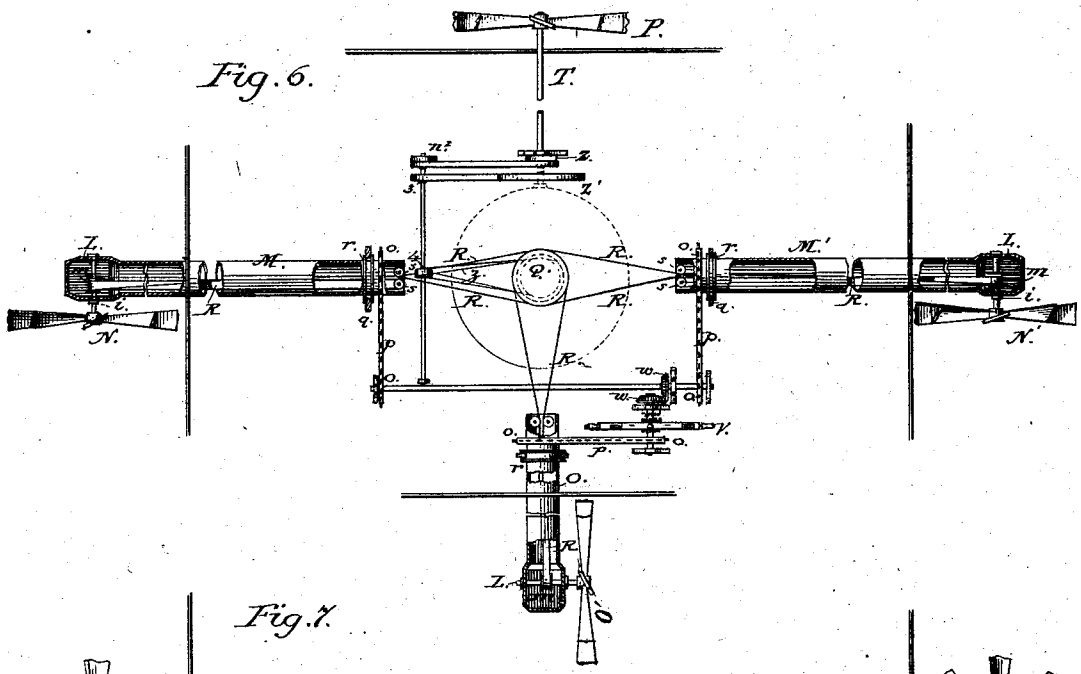
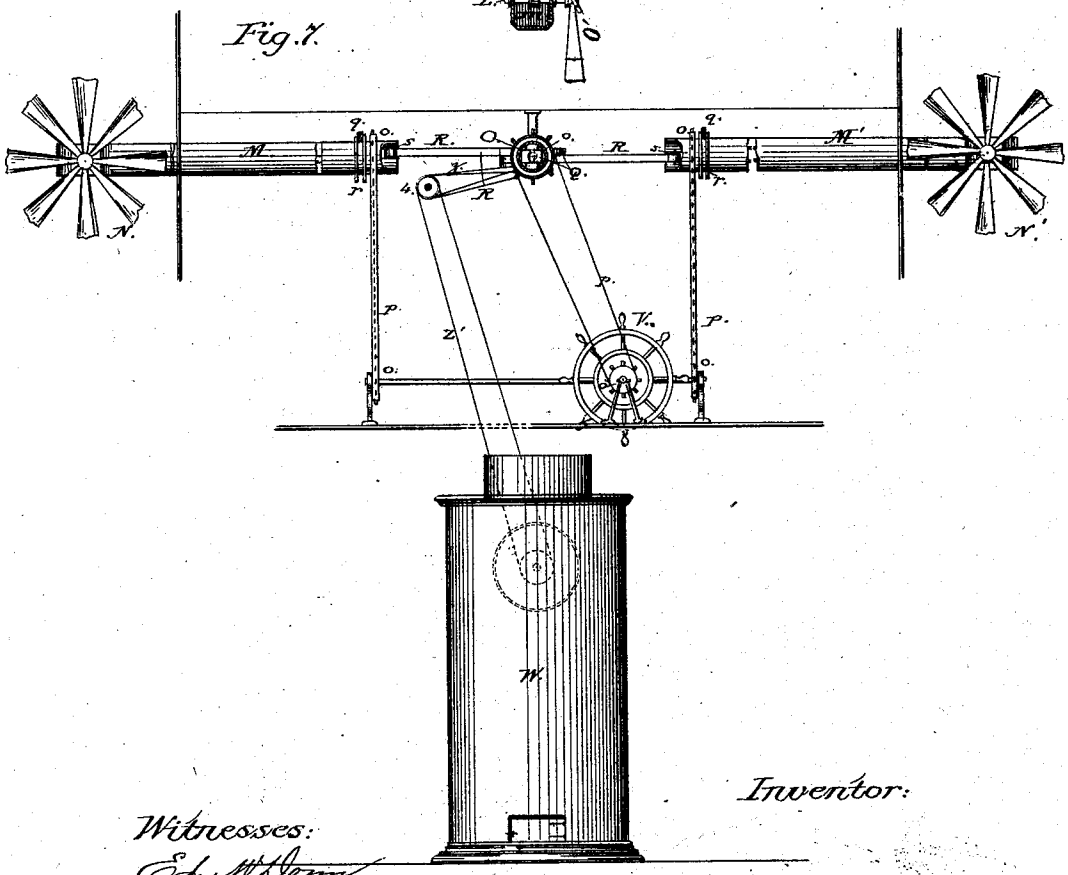


Fig. 7.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

ALBERT L. BLACKMAN, OF NASHVILLE, TENNESSEE.

VESSEL AND MACHINERY FOR AERIAL NAVIGATION.

SPECIFICATION forming part of Letters Patent No. 224,510, dated February 17, 1880.

Application filed January 6, 1880.

To all whom it may concern:

Be it known that I, ALBERT L. BLACKMAN, of Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Vessels and Machinery for Propelling and Handling Vessels for Aerial Navigation; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a vertical longitudinal section of the ship, showing the propelling-wheel aft, the steering-screw forward, engine, and smoke-pipe passing out at the driving-screw, ridge A, chord C, stanchions F, chords D and E, and keelson H. Fig. 2 is a horizontal section of same, showing the side screws and cylindrical shafts M, M′, and O. Fig. 3 is a side elevation of the ship, showing the netting and gallery and cabin-light and ventilating-windows. Fig. 4 is a vertical section of the vessel, showing the location of the engine, propelling machinery, cylindrical shafts, and side screws. Fig. 5 is a transverse section of the vessel, showing the gas-condensers, water-tanks, and a changed position of the side screws. Fig. 6 is a broken horizontal section, showing, in detail, the driving, steering, and actuating machinery. Fig. 7 is a broken vertical section of the same, showing the manner of securing the machinery to the deck of the vessel's hull.

My invention relates to new and useful improvements in vessels for aerial navigation; and it consists in a frame-work constructed of wires, rods, thin metal tubing, and cordage, or other suitable material, substantially secured at its intersections in any manner to obtain strength and lightness, the whole covered and incased with silk, linen, thin metal, or other suitable material secured to the frame-work, presenting, preferably, the form of the grayling or salmon fishes.

The upper part or gas-field of the vessel is made air and gas tight by paint, varnish, or any compound in use, and divided into a number of compartments, subdivided by partitions into chambers of suitable form and dimensions, also made air and gas tight, each chamber being provided with valves, stop-cocks, and suitable connecting-pipes to admit of the egress and ingress of gas. The lower part or hull of the vessel is subdivided into one or more decks, comprising the cabin, cut into compartments, the machinery, engine and store rooms, gas-condensing compartments, &c., all substantially stayed by braces, cross-braces, supports, and suspenders of metal, or any other light material that will give strength without materially impairing its buoyancy; also provided with revolving and rotating screw-wheels geared to revolving shafts on its sides, a propelling-screw aft, and a revolving steering-screw forward, and the machinery for propelling and handling the vessel, together with a guard and walk on the outside, gas-condensers, and automatic valves.

My invention also relates to an improvement in the construction and combination of machinery for propelling and managing the vessel, which consists in combined reciprocating and revolving shafts and belt-sheaths, provided with pulley-wheels, idlers, knotted gear for endless chain, yokes and levers, a compound steering-gear, and a cone-pulley connected through a driving-pulley by belting or shafting to the motive engine.

Similar letters of reference indicate corresponding parts.

The dome-ridge A, forming an ellipsoidal curve over from the stem to the stern of the vessel, preferably of tubing, secured at the ends in metal collars *a a′*, fixed at the nodes, is the main upper shaping-support of the vessel. At a proper distance down from the top, and running fore and aft, the ends secured in the ellipsoidal ridge A, is a girder or chord, *l*, preferably of tubing, which, in addition to staying the dome-ridge, serves as a support and stay for the gas-bags, as hereinafter shown. At the foot of the ellipsoidal ridge A, running parallel with girder or chord C, is a second girder or chord, D, preferably of tubing, secured at the ends in the metal collars *a a′* at the stem and stern at the nodes. The chord D is the base of the gas-field and the main girder of the hull's deck.

Passing beneath the vessel's hull in an ellipsoidal curve from the metal collars *a* to *a′*

at the stem and stern at the nodes, to which it is by the ends secured, is a keelson, H, preferably of tubing, which gives form and strength to the vessel's keel. To the keelson, at a proper distance from the bottom and running parallel with chord D, is another girder or chord, E, preferably of tubing, secured by the ends to the keelson H, to which it imparts stiffness and strength.

Secured in a substantial manner to and depending from the ellipsoidal ridge A at proper intervals from the stem to the stern of the vessel are a series of stanchions, F F F, &c., preferably of tubing, which, passing down through girders or chords C, D, and E, to which they are made secure, take foot in and are firmly secured to the keelson H, thus uniting, strengthening, and supporting firmly in position the perpendicular frame-work of the vessel.

At right angles to the dome-ridge A, on a plane with girder or chord D, both ends of each secured in the metal collars *a a'* at the nodes in the stem and stern of the vessel, are two corresponding ellipsoidally-curved gunwales, I I', preferably of tubing, which give breadth to the vessel. On the same plane, running within and parallel to the gunwales I I', are two other ellipsoidally-curved what may be called "thwarts," J J', secured at the ends to the girder or chord D. Intersecting and secured to the girder D, thwarts J J', and gunwales I I', at proper intervals from stem to stern, are a series of cross-girders, G G G, &c., which maintain the vessel's beam, sustain the ceiling of the vessel's hull, and support from below the base of the gas-bags.

Secured by the ends to and on the same plane with girder or chord E, and running parallel with the thwarts J J', is a second ellipsoidal frame, K K', supported from above by stays and suspender-braces *c c c c*, &c. Secured by the ends at proper intervals, fore and aft, to the ellipsoidal frame K K', and passing through girder or chord E, to which they are also made fast, are a series of cross-girders, *b b b b*, &c., which form the support for the floor of the lower deck.

The metal collars *a a'*, fixed in the stem and stern of the vessel, in addition to being the nodes in which the main frame of the vessel has footings, form the journal-bearing *a* for the revolving shaft T, which carries the powerful propelling-screw P aft, and *a'* the journal-bearing of the revolving cylinder O, to which is attached the rotating and revolving steering-screw forward.

Collars *d d'*, fixed securely to the gunwales I I', form the journal-bearings for the revolving cylinders M M', to which are secured the elevating, propelling, and depressing side screws, N N'.

The gas-bags B, B', B^2, and B^3, filling the entire area on both sides of the stanchions F F, &c., between the vessel's deck I and the dome-ridge A, are constructed of silk, linen, thin metal, or other suitable material, made air and gas tight by paint or any other proper compound in use, and preferably divided into grand compartments, as shown by B B' and B^2 B^3, by partitions of suitable material, made also air and gas tight; and as a means of protection against accident, and to provide against the loss of gas by tearing, leakage, &c., each compartment is again subdivided into chambers *e f*, of proper dimensions each, by preferably vertical partitions *g*, of any suitable material, made air and gas tight, and each chamber is, by stop-cock or valve, connected, through educt and induct tubes *h h*, with the gas-condensers X X', where the gas may be stored, to reduce the supply in the gas-bags, or from whence they may be refilled. Gas-bags B B' and B^2 B^3 are securely lashed at the top to the dome-ridge A, the girder or chord C, and at the bottom to the gunwale I on one side and the gunwale I' on the other, and to the thwarts J J' the entire length of the vessel, and may also be lashed to the stanchions F F, &c., as well as the girder or chords D, and the vessel overlaid, stayed, and supported by a substantial netting, after the improved mode of netting on balloons.

N N' are two screws of very large propulsive power, constructed of strong light frame-work, covered with any material that combines great strength with lightness, placed, respectively, on the right and left of the aerostat or vessel. In describing one of these wheels or screws and its connections, I describe as well the two side wheels or screws as the steering-screw forward. The hub of the screw terminates in a shaft, L, on which are journals *k k'*, which work in boxings *i i'*, fixed on or in the barrels of the cylinder-shafts M, M', and O. Shoulders or collars *j j'* on the shafts L secure the screws in position and give them bearings, upon which they revolve. Secured to the shafts L, within the cylinder, are vaults or pulley-wheels *m*, through which from a general driving or cone pulley or belt-wheel, Q, by means of an endless belt, R R', is conveyed a rapid rotary motion to the screw, without regard to the position the screw may be placed, by rotating the cylinder on its axis.

In constructing my vessel, when I so desire it, I permit the cross-girders G G, &c., to so extend beyond the sides of the vessel that I may be enabled to construct thereon a light gallery or corridor on the sides of the vessel, reached from the doors fore and aft by steps, as seen in the drawings.

M, M', and O are hollow sleeves, tubes, or cylinder-shafts of any required diameter, in which side screws, N N', and the steering-screw are secured. These shafts have journal-bearings in the collars *d d'* and the node-collar *a*, as well as in the shaft-hangers *n n n*, secured to the frame-work above. On the inner end of these shafts or tubes is firmly secured a corrugated rack, *o o o*, on which the endless-chain belt *p p p* works, and by which, through the wheel V, beveled gearing *w*, provided with a friction-clutch, *x*, and the pulleys *y y y*, the cylinders, tubes, or shafts are revolved; also

with a double-flanged muff or collar, *r r r*, straddled by a lever, *q q q*, used in moving the shaft or tube laterally when it becomes necessary to slacken or tighten the belting, or in starting or stopping the screws to them respectively attached. Two idlers, *s s*, are fixed at the entrance of these shafts, between which the belting R R R passes while conveying motion from the drum or cone-pulley Q to the side screws, N N′, and the steering-screw O′.

The revolving shaft T, which carries the propelling-screw P, has journal-bearings in the collar *a′* in hangers *n′ n′*, and receives its motion on a pulley, *z*, through an endless belt, *z′*, from a pulley, 1, on the driving-shaft, on which is also a loose pulley, to which the belt may be transferred when it is desired to stop the propelling-wheel.

W is the motive engine, surrounded by fire-proof casings, carrying a shaft or the working-belt *t*, which conveys the power from the engine to pulley 3 on the driving-shaft 4, journaled in hangers n^2 n^2.

Z is an endless driving-belt, conveying power and motion to the perpendicular cone-pulley or drum Q, which carries the endless belts R R R, through the cylinders or tubes M, M′, and O, around the vaults *m m m*, giving motion to the side screws, N N′, and the steering-screw O′.

The deck of the vessel's hull, the ceiling of the cabin, the partitions, and floorings may be of any light substantial material, though I prefer to underlay the floors with a substantial netting. In the hold, fore and aft of the engine-room, I provide fuel-bunkers, water-tanks *u u*, and gas-condensers X X′. These latter are connected with the gas-bags above the cabin-deck by suitable induct and educt pipes *h h*.

In sailing, operating, and handling, my vessel having been provided with the necessary ground tackle and grapplings before starting, gas sufficient to give buoyancy to the vessel and cargo, allowing ample space for expansion when in the higher altitudes, is admitted into the gas-bags, equally distributed through the various chambers, and a reserve quantity stored in the gas-condensers. The side screws and steering-screw wheels are turned so as to impact the air toward the earth and give an upward tendency to the vessel. The machinery having been arranged as pointed out, the engine is started, conveying to the screws a rapid rotating motion, which carries the vessel upward and forward, and when in the upper air it is obedient to the steering-screw to guide and the propelling-screw to drive it forward.

When desiring to return again to earth, by turning the wheel V the side screws and steering-screw are turned so as to impact the air above, thus carrying the vessel downward to the earth. These screws are also used for propelling purposes.

Having now fully described my invention, what I esteem as new, and desire to protect by Letters Patent, is—

1. A vessel for aerial navigation divided into a hull and a gas-field, constructed on one general frame-work, of tubing or other light material inclosed with silk, linen, thin metal, or other equally light substantial substance, resembling in form the grayling or the salmon fishes, having the gas-field divided into compartments and subdivided into chambers, the hull divided into rooms, the whole arranged and constructed substantially as described, and for the purposes set forth.

2. A vessel for aerial navigation constructed as set forth, provided with rotating shaft and revolving screws on the sides for propelling, raising, and lowering the vessel, a rotating shaft and revolving steering-screw forward, and a rotating driving-screw astern, for propelling the vessel forward, substantially as shown, and for the purpose described.

3. A vessel for aerial navigation constructed as shown, having the propelling, raising, and lowering screws on the sides, a steering-screw forward and driving-screw aft, provided with internal propelling power and machinery, gas-condensers, and apartments for the accommodation of passengers and freights, substantially as shown, and for the purposes described.

4. Rotating screws having shafts provided with journals, collars, and vaults or pulleys having bearings in and carried by revolving cylindrical shafts with a lateral movement, for propelling, raising, and lowering, as well as steering, vessels for aerial navigation, substantially as shown and described.

5. Rotating screws having shafts provided with journals and collar-bearings, sustained by and operating in cylindrical revolving shafts, and carried by endless belts, for propelling, raising, and lowering, as well as steering, vessels for aerial navigation, substantially as shown and described.

6. Combined revolving cylindrical shafts and belt-sheaths which revolve on their own axes, as well as having a lateral movement to loosen or tighten the machinery-belts, provided with racks *o*, idlers *s s*, a double-flanged muff or collar, *r*, a lever, *q*, for conveying the lateral movement to the shafts, and journal-boxings *i i′*, supported in journal-bearings and hangers, for carrying and revolving screws for raising, lowering, and propelling, as well as steering, vessels for aerial navigation, substantially as shown and described.

7. Rotating screw secured to a shaft extending under the gas-field to the central machinery, having bearings in the node at the stern of the vessel, and secured to chord D, substantially as shown and described.

8. Rotating screw secured to a shaft extending under the gas-field to the central machinery, having bearings in the node at the stern of the vessel, and secured to chord D, provided with and operated by endless belts, propelling vessels for aerial navigation, substantially as shown and described.

9. A vertical cone-pulley receiving a driving-belt from a driving-shaft connected with

a motive engine and carrying three endless belts, one to the right and one to the left of the vessel and one to the bow, for driving the side screws and the forward steering-screw, substantially as shown and described.

10. In combination, the cone-pulley Q, endless belts R R R, idlers *s s*, cylindrical shafts M, M′, and O, vaults *m*, screw-wheels N, N′, and O′, working in journal-bearings *i i′*, for propelling, lowering, raising, and steering vessels for aerial navigation, substantially as shown and described.

11. In combination, driving-shaft and pulley-driving belt, with cone-pulley Q, endless belts R R R, cylindrical shafts M, M′, and O, idlers *s s*, vaults *m*, screws N, N′, and O′, rotating on journals *j j′* in boxings *i i′*, for propelling, lowering, raising, and steering vessels for aerial navigation, substantially as shown and described.

12. In combination, propelling-engine W, endless belt, driving-shaft and pulleys, driving-belts Z and *z′*, with pulley *z* on shaft T, and the driving-screw for propelling vessels for aerial navigation, and with cone-pulley Q, endless belts R R, passing through revolving cylindrical shafts M, M′, and O, vaults *m*, and screws N, N′, and O′, for raising, lowering, and steering vessels for aerial navigation, substantially as shown and described.

13. In combination, the propelling-engine W, endless belt, driving-shaft, pulley, power-belt Z, with cone-pulley Q, endless belts R R R, laterally-moving and revolving cylindrical shafts M, M′, and O, pulleys or vaults *m*, and rotating screws N, N′, and O′, for raising, lowering, and steering vessels for aerial navigation, substantially as shown and described.

14. In combination, propelling-engine W, endless belt Z′, pulley 4 on driving-shaft 3, endless belt *z′*, pulley-wheel *z*, revolving shaft T, hangers *n′ n′*, journal-bearings *a′*, and driving-screw P, for propelling vessels for aerial navigation, substantially as shown and described.

15. Corrugated pulley *o* on the revolving cylindrical shafts M, M′, and O, in combination with endless-chain belts *p*, corrugated pulleys, friction-clutch *x*, wheel V, and bevel-gear *w*, for revolving simultaneously the cylindrical shafts M M′, changing the direction of screws N N′ to positions for raising, lowering, or propelling the vessel, and the steering-screw O′, for steering vessels for aerial navigation, substantially as shown and described.

16. Corrugated pulley-wheels *o′*, wheel V, and friction-clutch *x*, in combination with endless-chain belts *p*, corrugated pulleys *o*, cylindrical shafts M, M′, and O, screws N, N′, and O′, for handling vessels for aerial navigation, substantially as shown and described.

17. Levers *q* and double-flanged muffs or collars *r*, in combination with and for the purpose of conveying a lateral motion to cylindrical shafts M, M′, and O, for throwing in and out of gear the endless belts R R R in starting, stopping, slackening, and tightening the belts that convey motion to screws N, N′, and O′, used in raising, lowering, propelling, and steering vessels for aerial navigation, substantially as shown and described.

18. In combination, the cone-pulley Q, endless belts R R R, idlers *s s*, cylindrical shafts M, M′, and O, vaults *m*, collars *r*, levers *q*, racks *o*, chain-belt *p*, corrugated pulleys, friction-clutch *x*, wheel V, and bevel-gear *w*, substantially as shown and described.

In testimony that I claim the foregoing as my own improvements I affix my signature in presence of two witnesses.

ALBERT L. BLACKMAN.

Witnesses:

THOMAS J. BURKE,

D. H. GLASSIE.