

No. 659,264.

C. STANLEY.
AIR SHIP.

Patented Oct. 9, 1900.

(No Model.)

(Application filed Aug. 7, 1899.)

2 Sheets—Sheet 1.

Fig. 1.

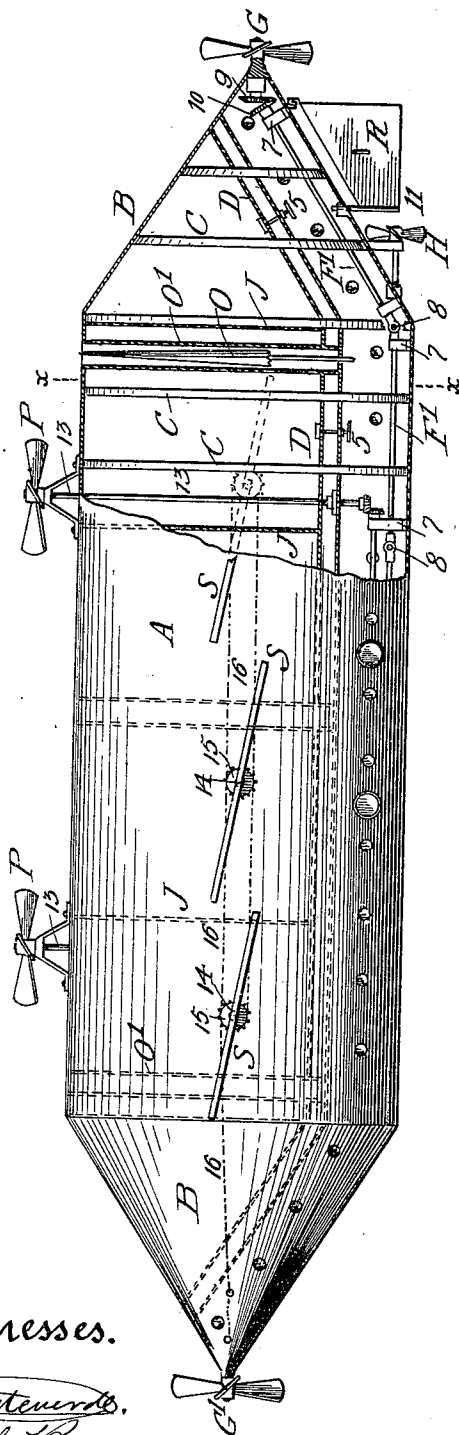


Fig. 2.

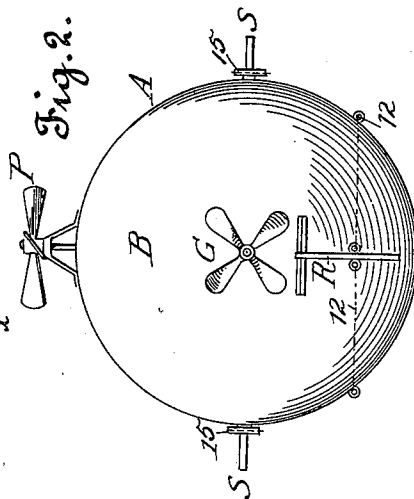
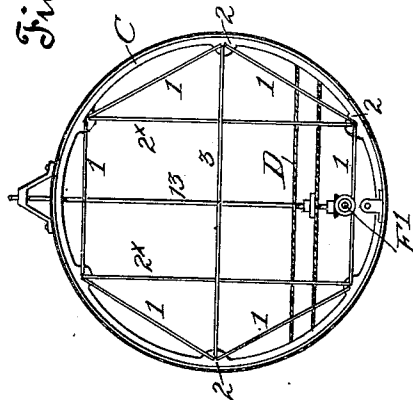


Fig. 3.



Witnesses.

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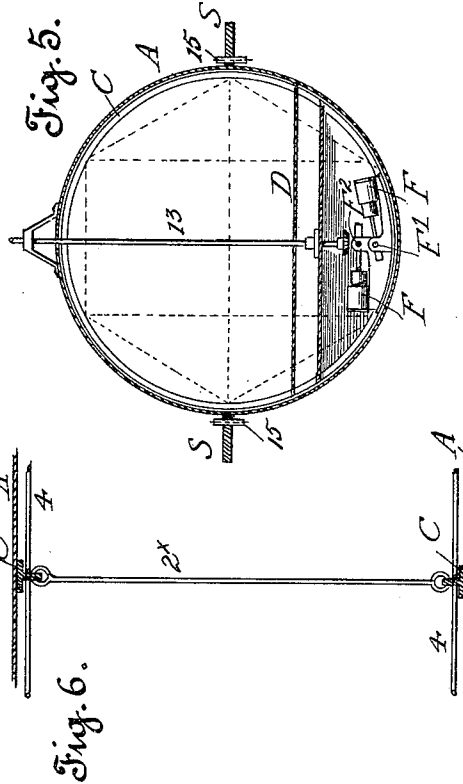
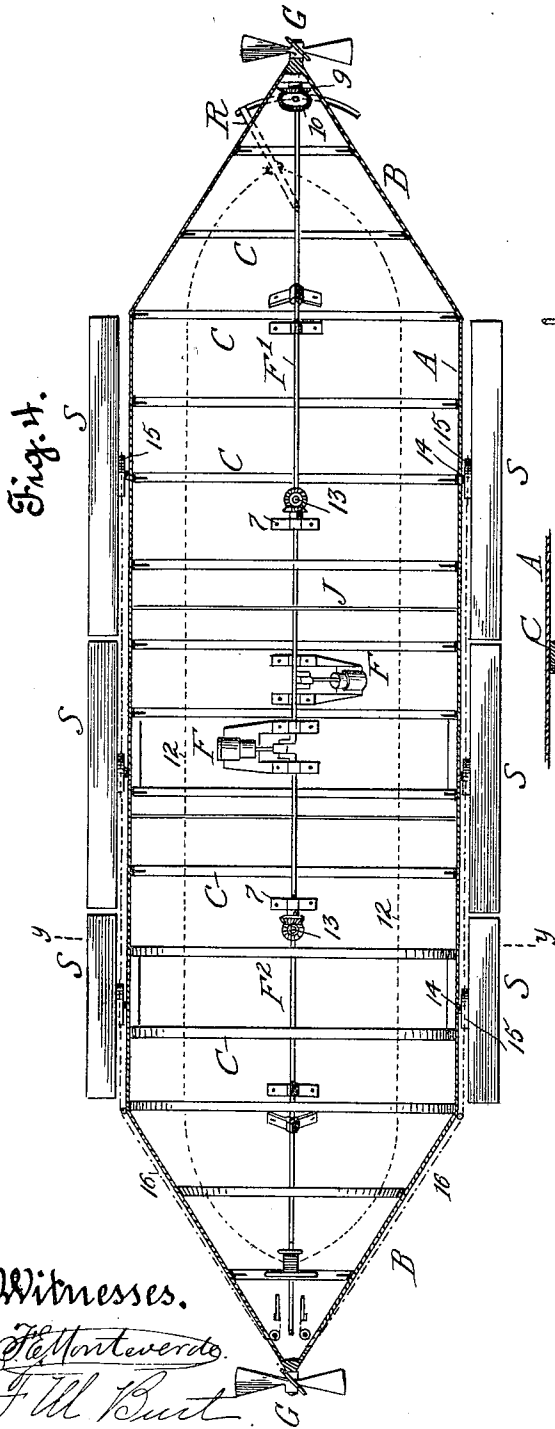
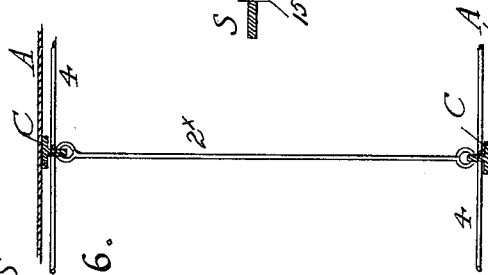


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES STANLEY, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO THE
STANLEY AERIAL NAVIGATION COMPANY, OF CALIFORNIA.

AIR-SHIP.

SPECIFICATION forming part of Letters Patent No. 659,264, dated October 9, 1900.

Application filed August 7, 1899. Serial No. 726,442. (No model.)

To all whom it may concern:

Be it known that I, CHARLES STANLEY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Air-Ships, of which the following is a specification.

My invention relates to aerial navigation, and more particularly to the construction of an aerial vessel or air-ship which shall be practically operative. The term last used is a comprehensive one to express the idea of a vessel which shall overcome the various difficulties of this kind of navigation, for some of which long experiment has provided no solution.

The structure in which the various improvements constituting my invention are embodied fulfils all the requirements of a practical air-ship. These are buoyancy, which enables it to float in the air; strength sufficient to withstand exterior air-pressure when it is filled with a gas lighter than air; a form or shape offering the minimum of resistance and best subject to control; "dirigibility," by which I mean the ability to direct the course of the vessel, not only in steering a course forward and backward, but in ascending and descending, and means for carrying freight and passengers and for containing the motive power of the ship. Such a structure is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my air-ship with the shell partly broken away to show the interior construction. Fig. 2 is an end elevation. Fig. 3 is a cross-section on the line $x x$ of Fig. 1. Fig. 4 is a horizontal section showing the main bottom of the structure with the partition which separates the buoyant or gas-holding space from the carrying-space removed. Fig. 5 is a cross-section on the line $y y$ of Fig. 4. Fig. 6 is an enlarged detail of part of the interior framing.

The main body of the ship is a cylindrical hollow shell A, having at each end a conical extension B, and I prefer to construct it of aluminium in order to secure the necessary lightness. This shell is internally braced and strengthened to resist the tendency to collapse under external air-pressure by a framing,

which I prefer to construct as shown in Fig. 3. Circular ribs C, of T cross-section, Fig. 6, are disposed at intervals in the shell and secured to it. These ribs support a framing or bracing structure composed of rods 1, which are preferably tubes arranged as chords of arcs formed by the circular ribs C. These rods may be connected, as shown, to eyes 2, formed with the ribs. Vertical and horizontal transverse rods 2^x and 3 and longitudinal rods 4 coöperate with the chords 1, the whole forming a well-braced structure or truss of exceedingly strong and yet light construction. Any number of these framings can be used, according to the size of the ship, giving the structure ample strength to resist external air-pressure. By making this framing of aluminium the weight of the structure will not be increased sufficiently to detract from the required buoyancy.

Within the shell is secured a longitudinal and horizontal partition D, which is made double to allow for expansion of the gas through valves 5 and which extends from end to end and divides the interior into two compartments of unequal size. In a structure with a diameter of fifty feet the partition D should be placed about fifteen feet above the bottom. The space above the partition is to be filled with a buoyant gas, preferably hydrogen. The space below is intended to contain all the operative machinery and the accommodation for the crew, passengers, freight, and supplies. This accommodation-space is lighted by a row of port-holes on each side, as shown. The proportion between the accommodation-space and the gas-chamber is of course calculated to give sufficient buoyancy to lift the ship and whatever load the former space is able to carry. The gas-chamber may be partitioned off by gas-tight transverse plates J into non-communicating compartments in order that a possible leak from any cause at any point will affect only one compartment and not destroy the buoyancy of the entire structure. The lifting power of the ship is thus derived from a buoyant gas, but is modified and controlled by mechanical means hereinafter described. The propelling power is transmitted to propeller-wheels located at

the ends of the ship. For propulsion I may use any force and any means of producing it, whether steam, explosive gas, compressed air, or electricity applied through engines or motors of any desired kind. In the drawings, Figs. 4 and 5, I have illustrated two reciprocating engines F F', one of which transmits power to a shaft F' and the other to a shaft F². The engines are situated amidships and on the bottom of the hull and are located on both sides of the axis of the ship, so as to equalize and distribute the weight. The two driving-shafts are of similar construction. Bearings 7 7' are provided at proper intervals, and jointed shafting is used, as shown at 8, to compensate for any possible twist or displacement in the structure. Such a joint is also provided at the angles formed by the cone-shaped ends, up which the shaft is carried to the apex. The propellers G and G' are journaled in bearings at the ends of the cones and are shown as geared to the driving-shafts by the angle-gears 9 and 10.

In propelling the ship such a motion is given the respective propellers as to cause the bow-propeller to pull and the stern-propeller to push the ship forward. These co-operating forces at both ends tend to hold the ship to her course and at the same time greatly increase the speed. They also tend to balance the structure. The ship is backed by reversing the engines in the ordinary way and is steered by an ordinary rudder R, of which there may be one at each end. The rudder swings on a vertical rudder-post 11 and is connected by rudder-chains 12 to any suitable operating device in the end of the ship.

One of the most important and essential features of practical aerial navigation is the ability to handle the ship in ascending and descending in order to land with the structure under control and to rise without shock or jar. I have devised special means for accomplishing these purposes and have illustrated the preferred construction of them in the drawings. Such means can be used to resist the tendency of the buoyant ship to rise, so as produce a gradual ascension, and can also be used to completely overcome such tendency and produce a positive descent at controllable speed. The construction and operation of such means are in no way related to the wings employed in so-called "flying-machines," which can never produce vertical motion, and hence can never cause an aerial vessel to rise or fall on an even keel. It is one of my objects to produce a construction which enables my ship to ascend and descend while maintaining a horizontal position. The means referred to may be of any suitable construction adapted to act against the air at right angles to the horizontal plane of the ship. I prefer to use, and in practice have used, one or more propeller-wheels P P', located on top of the structure and in the vertical plane of the longitudinal axis. These propellers are

mounted on vertical counter-shafts 13, geared to the main shaft or otherwise, deriving motion from the driving power. If one propeller be used, it is placed amidships; but if two are used, as shown, they are placed in the same relative positions between the midship vertical line and the bow and stern in order to balance each other. I do not limit myself to propellers for these purposes, nor to propellers located above the ship, nor to propellers arranged in line with the longitudinal axis of the ship. It is evident that one or more propellers can be located in the same relative positions beneath the structure, and also that such propellers or equivalent devices can be supported outside and at the sides of the vessel and be driven so as to act on vertical lines of force against the atmosphere. Wherever they are located they are capable of being reversed in order to act upon the ship in either an upward or downward direction, as may be required. Any suitable device, many of which are known to machine-designers, can be employed for disengaging the counter-shaft 13 from the main shaft in order to leave these propellers inactive when their use is not required. These propellers are all that is required in ascending and descending substantially-vertical directions; but in addition I have devised means for changing the course of the ship on oblique ascending or descending lines without inclining the structure from the horizontal position in which it is desirable to maintain it. Upon each side of the structure is pivoted a series of side planes or rudders S, which are arranged substantially in the central horizontal plane of the cylinder and which taken together extend along the sides for approximately the length of the cylindrical portion. Each plane is centrally pivoted by means of a shaft 14, which projects through the wall of the ship, and all the shafts are geared together, so as to be operated simultaneously. I have shown sprocket-wheels 15 on the shafts 14, all connected together by chains 16, which lead into the pilot-room at the bow. Any number of these side planes can be used; but in practice I have found that three on each side of increasing length from the bow toward the stern make an efficient and practical controlling device. They are placed in horizontal position normally, Fig. 2, but in use are capable of being moved in either direction on their pivots, so as to present an inclined surface to the atmosphere when the ship is proceeding. Taking Fig. 1 for illustration, where the planes are slightly raised toward the bow they present an inclined lower surface to the air displaced by the ship in its forward motion, which produces a lifting action on the structure; but as the planes extend along the whole side of the ship and the air-pressure is equal upon the combined surfaces of all the planes the lifting action, although on an oblique upward and forward line, will be equally exerted along the whole series, the

members of which, as stated, are of increasing length toward the stern and will not tilt the hull from the horizontal. If the planes are inclined downwardly toward the bow, the reverse effect of a change of motion on an oblique forward but downward line will be produced. Of course in pursuing a course at a certain elevation the planes are adjusted to and kept in a horizontal position, in which they tend to steady the ship and prevent any side roll.

In case of descending upon water by accident or design the cylinder will float and can be operated and propelled. The engines and appurtenances act as ballast to submerge the hull to a proper depth for safe flotation, and I provide an auxiliary propeller H at the stern, which can be geared to the main shaft and used to propel the ship as a floating structure.

Under ordinary circumstances and conditions the propelling and controlling means herein described will be sufficient to regulate the movements of the ship safely and effectively. As precautionary measures under extraordinary circumstances which may arise—for instance, in time of war—and which might result in the disabling of the motive power or the controlling apparatus or in the piercing of the hull and the escape of an excessive amount of gas, I provide the structure with parachutes O, of which any number may be used. These are preferably located in tubes O', which extend from the top of the shell down through the gas-chamber to the accommodation-space. I have shown one of such parachutes in the drawings in normal inoperative position concealed within one of these tubes and held there by any suitable means which allows it to be released by connections operable from below. When these parachutes

are released, they project above the top of the ship and expand in the ordinary way, with the result of checking the speed of the descent.

I do not limit myself to the details of construction herein described or shown in the drawings, because I desire to avail myself of all modifications and equivalents that fall properly within the spirit of my invention.

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

1. In an air-ship, the combination with a buoyant shell, of a series of side planes arranged along the side of the ship in a normal horizontal line and substantially continuous, such planes being independently pivoted and connected together so as to be simultaneously and pivotally movable, the planes in the series increasing in length from the bow toward the stern.

2. In an air-ship, a buoyant structure having bow and stern propellers, and also vertically-acting propellers for transmitting ascensional and descensional force, and provided further with a series of side planes pivoted along each side and connected together for simultaneous adjustment.

3. In an air-ship, a buoyant shell having a gas-space separated from an accommodation-space below, in combination with parachute-tubes extending vertically through the gas-space, and parachutes adapted to be concealed in folded form within such tubes and to expand above said tubes and the shell.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 31st day of July, 1899.

CHARLES STANLEY.

Witnesses:

S. W. SEELY,
FRANCES M. BURT.