No. 867,083. PATENTED SEPT. 24, 1907.

A. G. RUSSELL.

AIR SHIP.

APPLICATION FILED SEPT. 14, 1905.

3 SHEETS—SHEET 1.

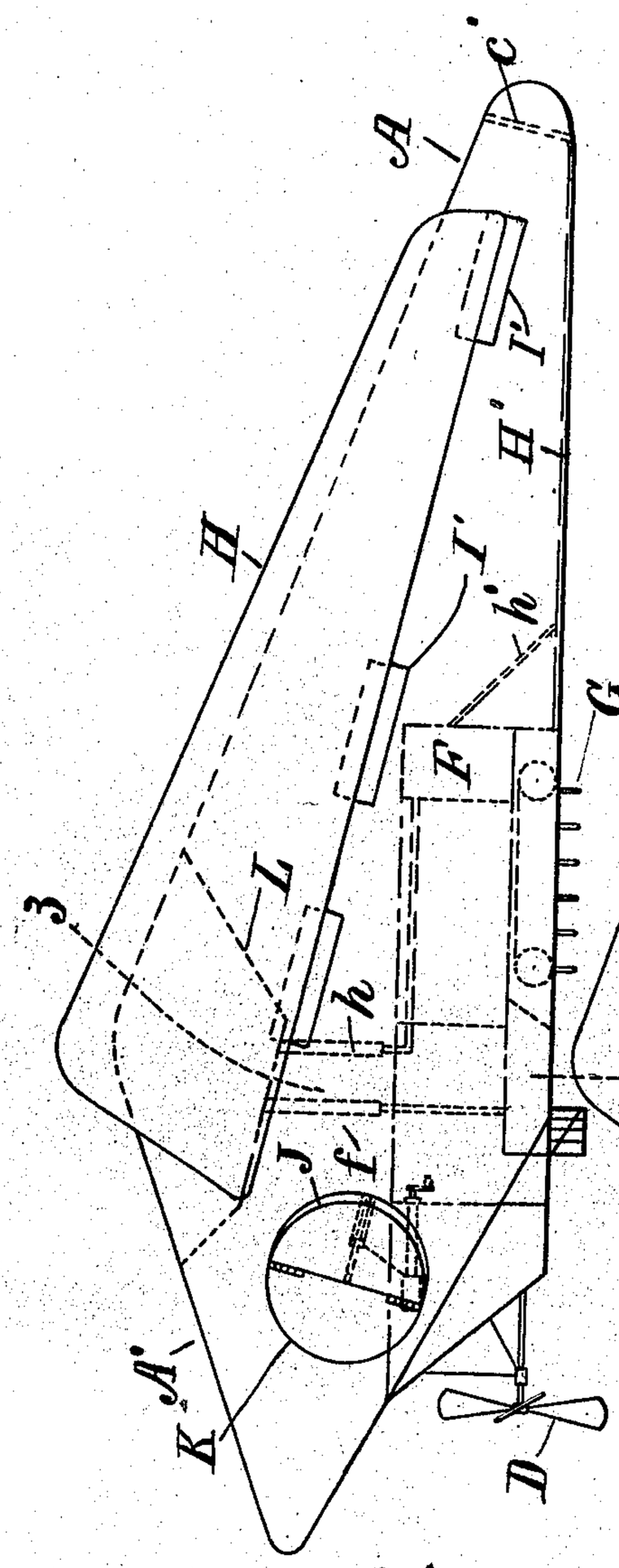

Fig. 1.

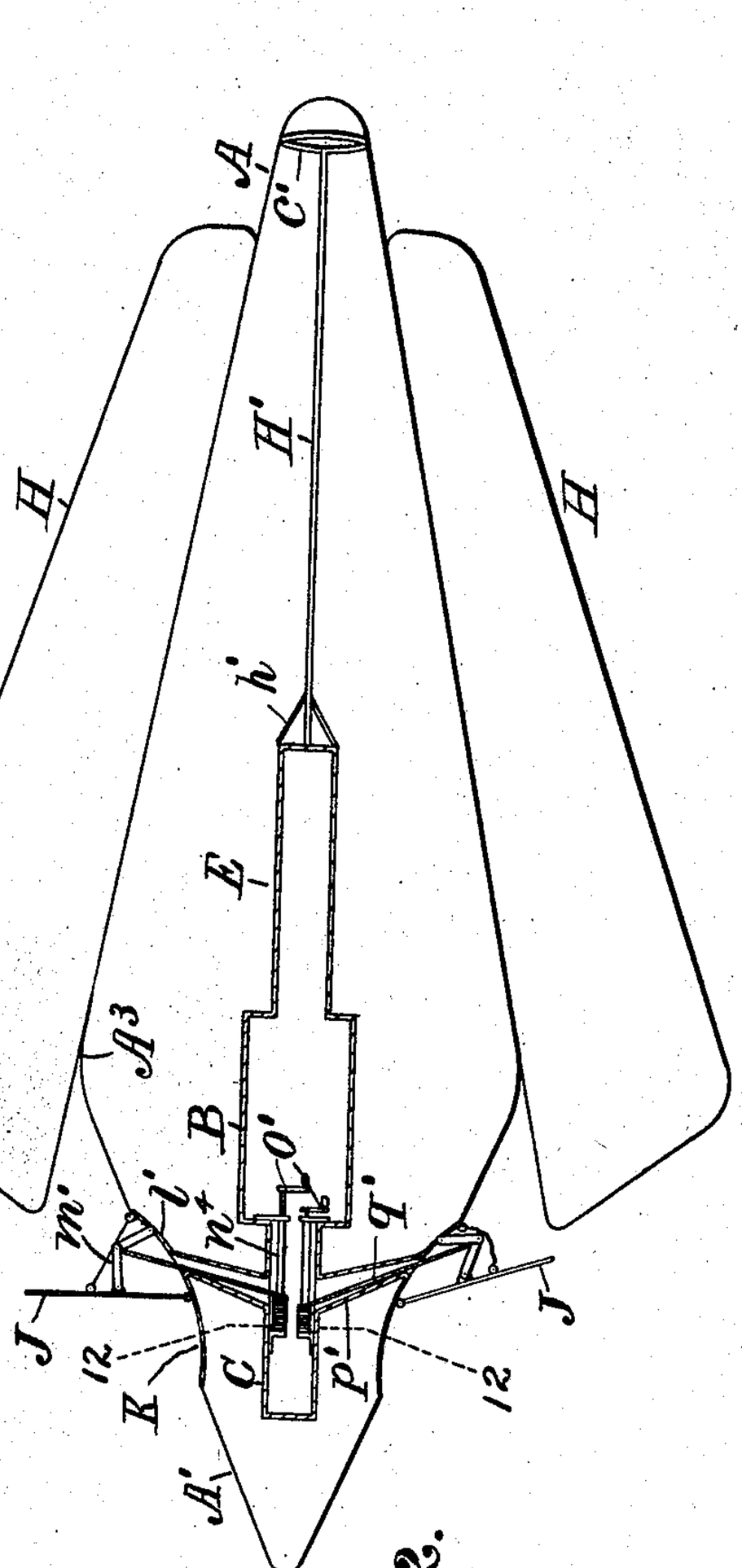

Fig. 2.

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Thomas S. Crane, Atty.

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3 SHEETS—SHEET 2.

Fig. 3.

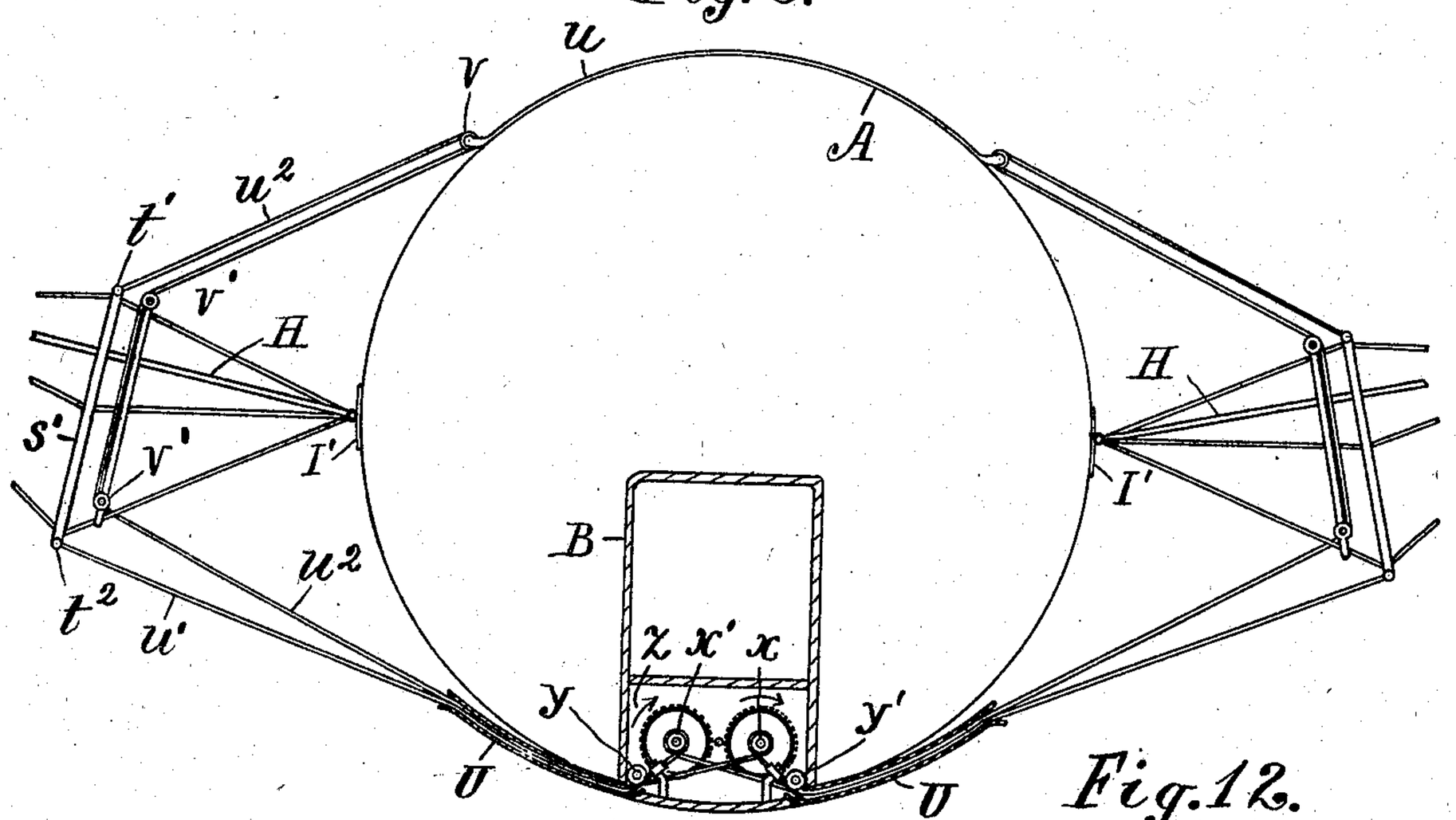


Fig. 12.

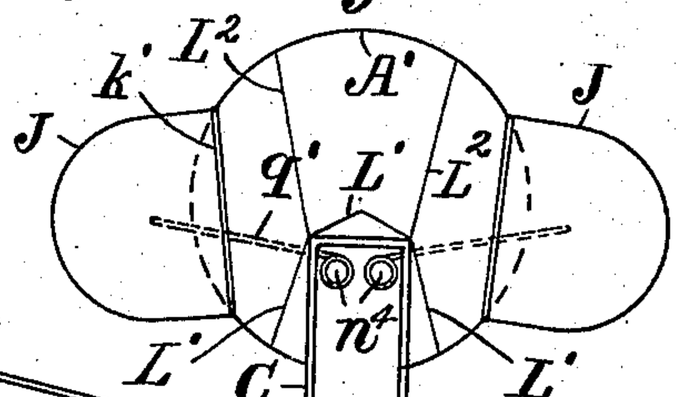


Fig. 4.

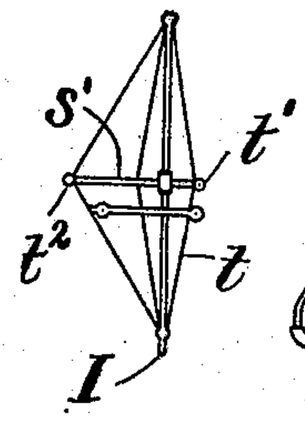


Fig. 5.

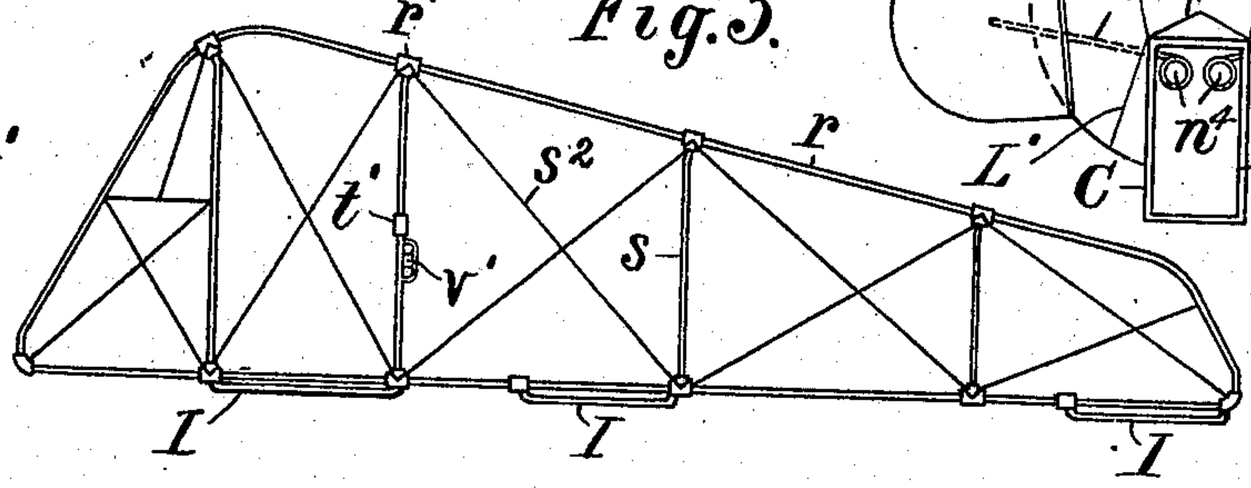


Fig. 10.

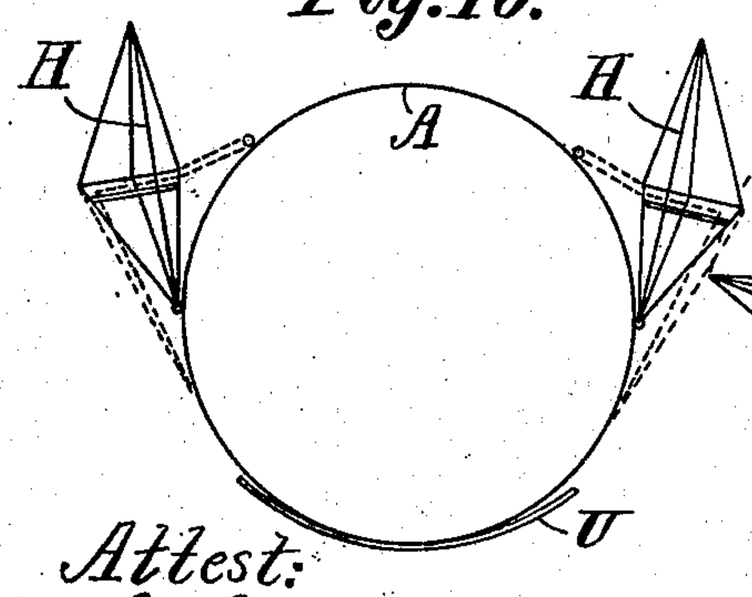
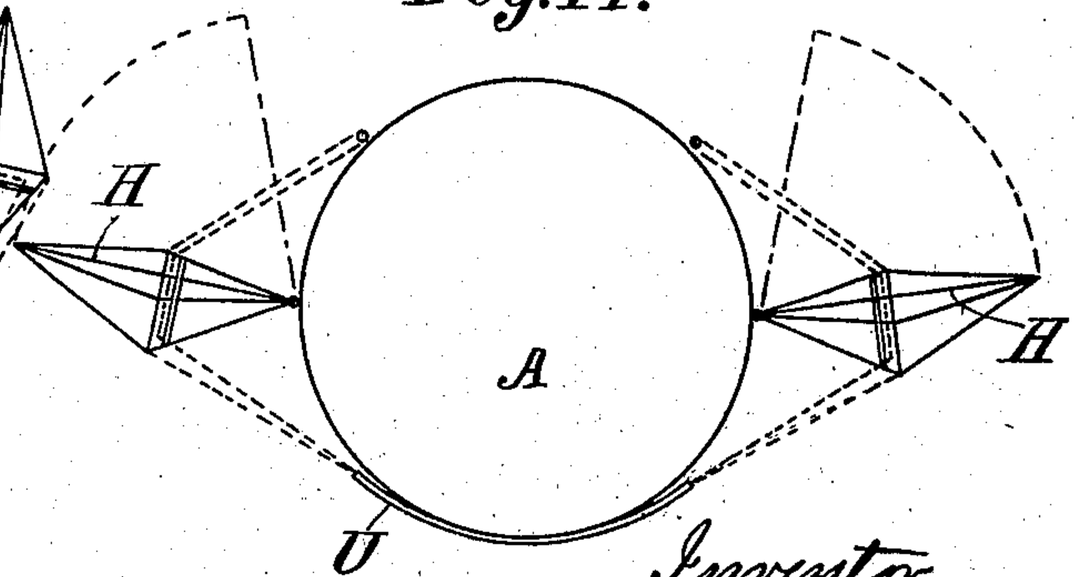


Fig. 11.



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3 SHEETS—SHEET 3.

Fig. 6.

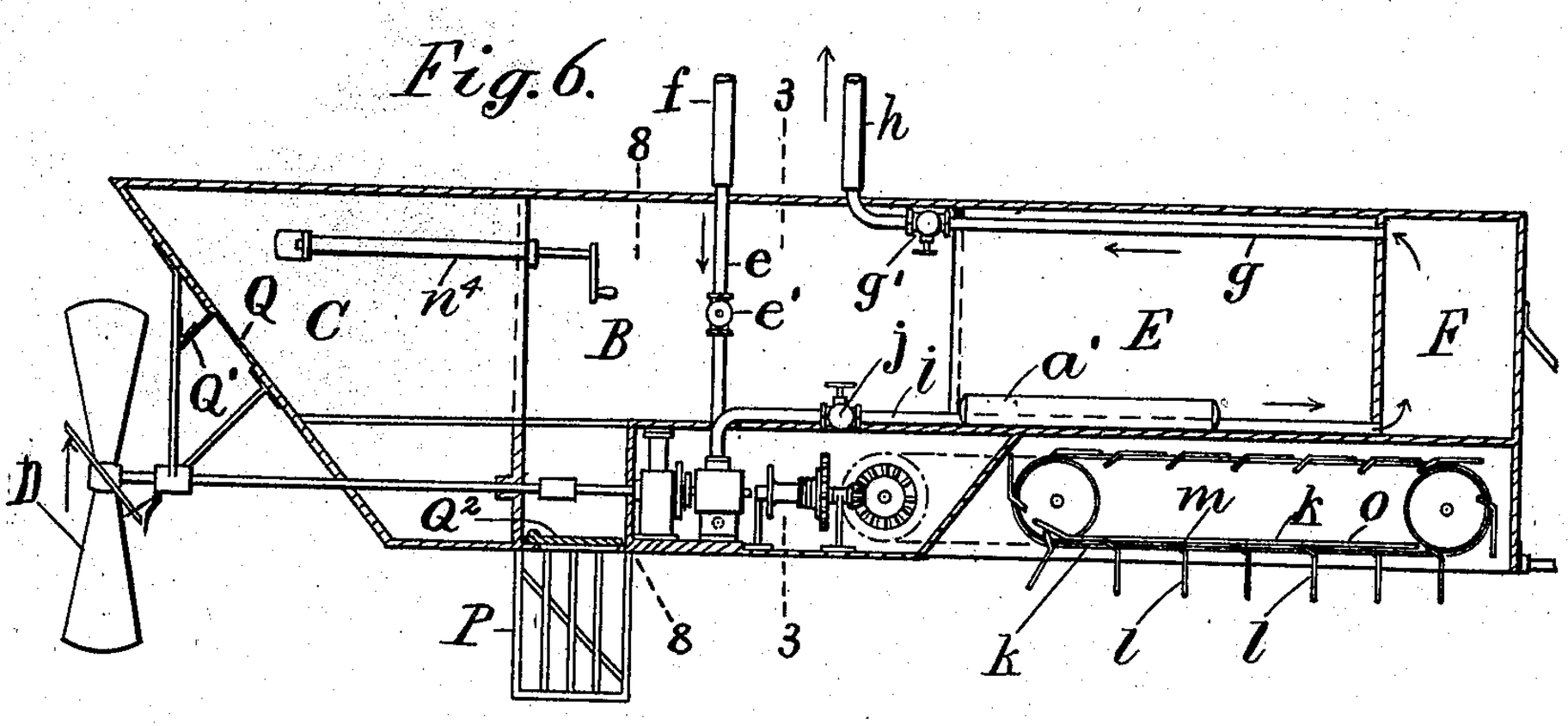


Fig. 7.

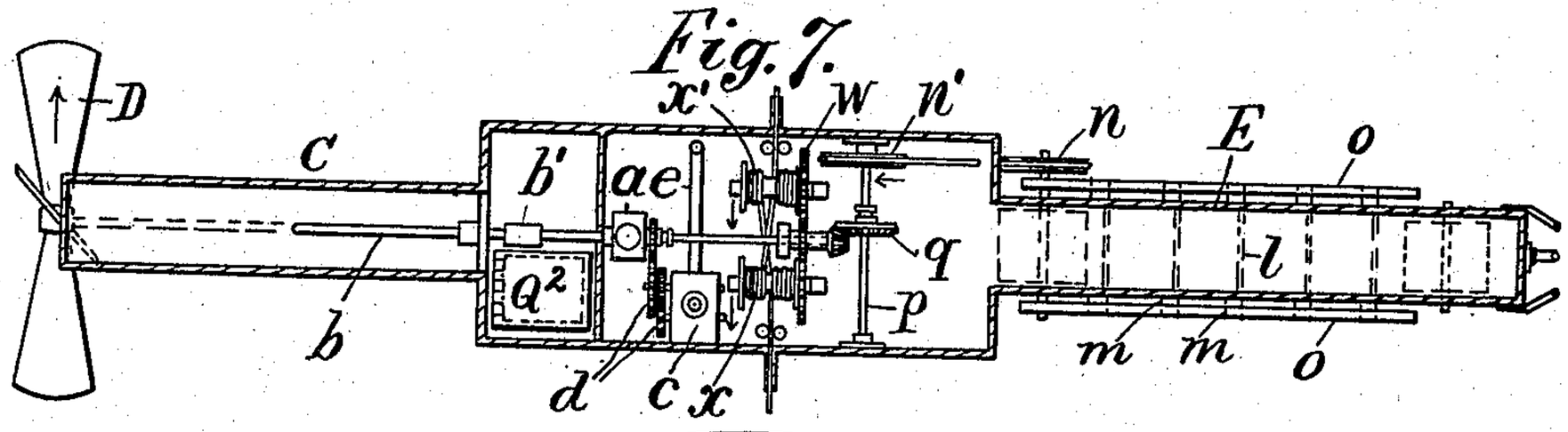


Fig. 8.

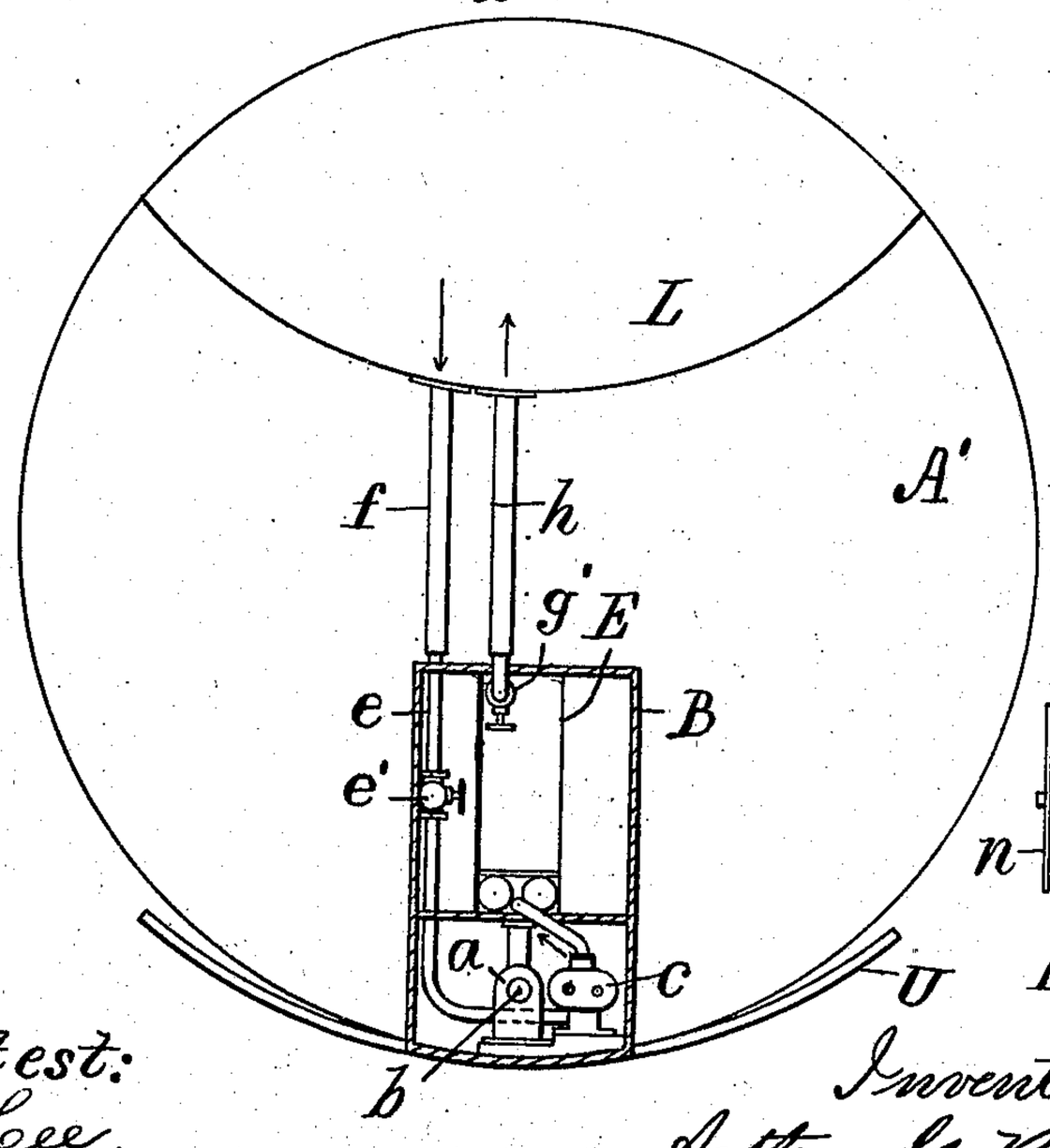
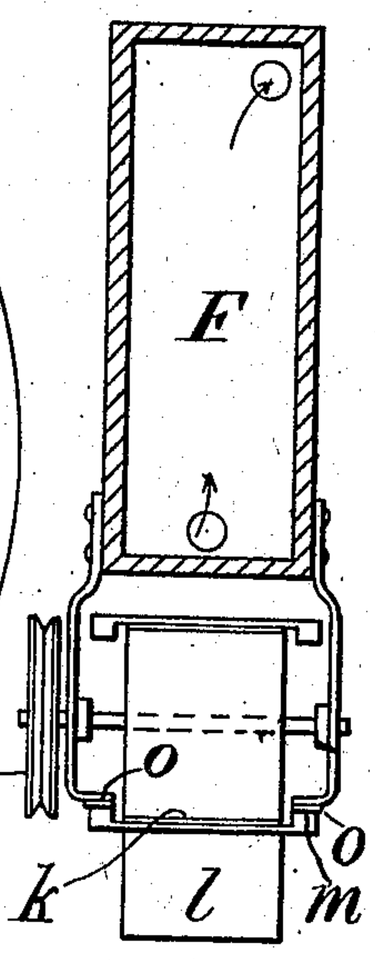


Fig. 9.



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Arthur F. Keaton.

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UNITED STATES PATENT OFFICE.

ARTHUR G. RUSSELL, OF SAN DIEGO, CALIFORNIA.

AIR-SHIP.

No. 867,083. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed September 14, 1905. Serial No. 278,406.

To all whom it may concern:

Be it known that I, ARTHUR G. RUSSELL, a citizen of the United States, residing at 163 West Twenty-first street, San Diego, county of San Diego, State of California, have invented certain new and useful Improvements in Air-Ships, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to various improvements in an air ship for promoting its navigation, and particularly for causing the ship to rise or descend in the air without any loss of gas or ballast.

The air ship is provided with a gas balloon of so-called cigar shape and tapered from its largest diameter toward the ends, forming sides having straight lines to which aero-plane wings can be hinged.

A collapsible compartment is formed in the upper part of the balloon, and the balloon is provided with an inclosed car carrying a motor, a compression tank, and a pump actuated by a motor for drawing gas from the collapsible compartment, and compressing it in the said tank when the air ship is required to descend.

A separate pipe, with cock located in the car, is extended from the compression tank to the collapsible compartment to restore the gas thereto when it is desired to ascend. The outer side of the compartment shrinks when the gas is abstracted therefrom for compression, and the bulk of the air ship is thus diminished without altering its gravity, which causes the whole to descend.

Means is provided for setting the aero-plane wings in an operative position, so that when the ship is descending the wings may cause a forward movement of the ship. A screw-propeller is actuated by the motor to drive the air ship forward, and the aero-plane wings may be operated to cause an ascent of the ship during its forward movement. The coöperation of the compression apparatus the aero-plane wings, and the propeller, thus enables the ship during its descent to be advanced or propelled forwardly by the operation of the air upon the wings without the use of the propeller. When the propeller is working the ship may also be elevated without the consumption of any additional power, by the operation of the air upon the wings, and the ship may be raised and lowered, without propelling it, by compressing or expanding the gas from the upper compartment.

The invention also includes a belt-propeller having blades projected below the bottom of the car to use with or without the screw propeller.

In the annexed drawing, Figure 1 is a diagrammatic elevation of the air ship with the aero-plane wings in an inoperative position. Fig. 2 is a plan of the same with the aero-planes extended, the parts connected with the rudders being shown in section. Fig. 3 is a cross section of the balloon on line 3, 3, in Figs. 1 and 6; Fig. 4 is an end view of the frame for one of the wings; Fig. 5 is a side view of the same; Fig. 6 is an elevation of the car and its attachments with the nearer wall removed to show the interior; Fig. 7 is a plan of the same with the roof removed to show the interior; Fig. 8 is a cross section of the car on line 8, 8, in Fig. 6, with lines showing the balloon and the collapsible compartment. Fig. 9 is a view of the right hand end of Fig. 6 enlarged with the end wall of the compression tank removed; Figs. 10 and 11 are diagrams showing the aero-planes respectively in their inoperative and operative positions. Fig. 12 is a cross section on line 12, 12, in Fig. 2. Fig. 13 shows one of the sewed patches.

A designates the rear end of the balloon tapering backwardly, and A′ the front end of the balloon tapering forwardly from the largest part A^3 which is nearest the forward end.

Figs. 1 and 2 show the car with wide body B, having a narrow projection C at the forward end which carries the screw-propeller D, and a narrow projection E at the rearward end which carries the compression tank F and the belt propeller G.

Alleys are formed in the projections C and E to gain access to the ends. The wings H are shown connected by straight line hinges I to the sides of the balloon-part A, and fin-shaped rudders J are shown hinged upon aluminium plates K secured upon the cheeks of the forward balloon-part A′. The top and sides of the car are inclosed within the bottom of the balloon, and the car is formed of frame-work of aluminium tubes and aluminium wire netting, with a skin of suitable material, as silk, to make it gas-tight, where immersed in the gas of the balloon. The collapsible compartment L is shown in Figs. 1, 2 and 8 in the upper central part of the balloon.

Figs. 6 and 7 show an engine *a* connected by forwardly extending shaft *b* with the screw-propeller D. Gasolene or fuel tanks *a′* are shown in the bottom of the alley E for supplying the engine. The engine is connected with a rotary pump *c* by gears *d*, the inlet of the pump having a pipe *e* extended through the roof of the car and connected by a flexible pipe *f* with the bottom of the collapsible compartment.

The outlet of the pump is connected by a pipe *i* and cock *j* with the compression tank F, so that gas drawn from the compartment may be compressed in the tank.

The tank is connected independently with the compartment by a pipe *g* and hose *h*, the pipe having a cock *g′* in the car or engine room B, by which the gas may be restored to the compartment at pleasure.

The bottom of the car, under the narrow projection E is provided with a belt-propeller, consisting of two

pulleys having a canvas belt k extended over the same and carrying propeller blades l which are hinged thereon by sewed canvas flaps, so as to lie flat on the upper side of the belt, and to be projected below the bottom of the belt (and below the bottom line of the car) by cam-lugs m, which move (when in their lower position) in contact with a cam-bar o which holds the blades projected. A pulley n drives the belt, by connection with a pulley n' upon a shaft p inside the car, which is connected to a backward extension of the engine shaft b by gearing q which can be disconnected when desired.

A coupling b' is shown in the propeller shaft b to disconnect such shaft from the engine, and the screw-propeller and the belt-propeller can thus be operated singly or in conjunction. The aero-plane wings are made, as shown in Figs. 3, 4 and 5, of longitudinal aluminium tubes r connected by fittings r' to transverse tubes s.

The frame is stiffened by tie-rods s^2, and the lower part is shown formed with hinge pintles I to engage fabric loops I′ which are shown in Figs. 1 and 2 formed of patches of fabric sewed or secured on the skin of the balloon.

The frame of the wings is covered with silk or suitable fabric. The transverse tubes are trussed, as shown in Fig. 4, by a cross-piece v' at the center, and brace-rods t. One of the cross-tubes which lies over the middle of the car is braced, as shown in Figs. 3 and 4, with a longer cross-piece s' than the others, and the opposite ends of such cross-piece furnished with eyes t', t^2, to which cords u' and u^2 are attached and extended through a tube U to windlasses in the car.

A strap u is shown in Fig. 3 across the top of the balloon with pulleys v upon the ends over which the cord u^2 is extended, and led past pulleys v' upon the wings. A pull upon the cord u' serves to lower the wings to their operative position, as shown in Fig. 11, while a pull upon the cord u^2 operates (on application of the pulleys v) to raise the wings, as shown in Fig. 10.

The windlasses x, x', as shown in Fig. 7, are connected by gears w with the rearwardly extending engine shaft by means of a reversible clutch-box on the shaft.

The cords entering the car from the tubes U are guided over pulleys y, y', to the barrels of the windlasses.

The cords u' are wound each upon one end of the two barrels, and the cords u^2 are wound upon the opposite ends of the same barrels, and are wound upon such sides of the barrels, and the barrels so rotated (as shown by the arrows z in Fig. 3) that the cord u' is drawn in when the cord u^2 is let out, and vice versa. The windlasses operate simultaneously, so as to raise or lower both of the wings at the same time, and the gearing may be locked by a brake upon the reversible clutch-box when the wings are properly adjusted.

The hinge-pins of the rudders J (see Fig. 1) which must necessarily lie in a straight line, are applied transversely to the balloon-part A′, and thus necessitate the use of the inwardly curved metallic plates K to form a seat for the hinge and also a fulcrum l' for toggle-links m' which are used to actuate the rudders when required. Windlasses n^4 provided with cranks o' are shown in Figs. 2 and 13, in the narrow forward extension C of the car, and the sides of the extension C are connected with the plates K by tubes p', through which cords q' are extended from the joint of the toggle-links to the windlasses. By means of the windlasses, a rudder may be thrown forwardly, as shown at the upper side of Fig. 2, to steer the air ship toward that side, and when the tension of the cord q' is relaxed, the air current forces the rudder backwardly to an inoperative position.

Operation of the air ship.—The balloon is proportioned so that it may carry rather more than the load imposed upon it, so that it tends normally to rise, but can be caused to descend by pumping gas from the compartment L into the tank F. When thus descending, the aero-planes may be set to cause a forward movement, so that the ship is propelled forwardly without the use of any propeller. The ship may be again raised by expanding gas from the tank into the collapsible compartment, and the wings may then be set to again cause a forward movement, by which the ship is advanced without using the propellers. The propellers may be used singly or in conjunction to drive the ship forward, and the wings set during such propulsion to cause the ship to ascend or descend as desired, either of the rudders being thrown outwardly to steer the ship in the desired direction. A window Q is shown in the front end of the extension C by which the operator can look forward, and a mirror Q′ is shown inclined before such window by which the view of the landscape below can also be seen.

Fig. 6 shows a cage P suspended below the car B with a trap-door Q^2 in the floor of the car, by which the operator can descend into the cage for taking an extended view.

I prefer to make the body of the balloon in pieces of fabric between two and three feet square, sewed together with reinforced seams, by which the balloon is made very much stronger and is more easily constructed than when formed in large sections or strips which extend all the way around the body or extend longitudinally along its length.

Where the long wings are hinged upon the body of the balloon, the body may be made of double thickness for about two feet in width for the length of the wing.

It will be understood that large frames, as those of the car, the rudder and the wings are made of aluminium tubing covered with wire netting and suitable fabric. The wire netting upon the frames of the car would be covered with sheets of asbestos to make it incombustible and to prevent the conduction of heat to the gas in the surrounding balloon. To further prevent the conduction of heat (to the gas in the balloon) or fire from the car which contains the engine and combustible material, inclosed air spaces may be provided upon the sides and top of the car where inclosed in the balloon.

Partitions L′ forming such air spaces are shown in Fig. 12, the air spaces being of triangular form and filled with air to prevent the conduction of heat. The fastenings for the car may also be made by sewing canvas or leather patches upon the body of the balloon and sewing to such patches the rods or tubes of which the frame of the car is formed.

The weight of the car may be sustained by straps or ropes secured at one end to patches upon the body of the balloon, and at the other end to the frame-work of the car, as merely indicated by the lines L^2 in Fig. 12.

To prevent the rear end of the balloon from turning upwardly by its levity, a rigid brace rod H′ is extended backwardly from the rear end of the car along the lower side of the balloon, as shown in Fig. 2, such rod being supported upon the rear end of the car by braces *h′*. The rod may be connected strongly with the rear end of the balloon by a ring of aluminium *c′* which supports the fabric strongly upon the rear end of the rod.

Instead of using the windlass n^4 for operating the rudders J, the cords *q′* may be fastened to the car bottom, and the rudders worked by pressing the cords laterally: The partition L which forms the collapsible compartment in the upper part of the balloon is held in its normal position, and prevented from bulging outwardly when emptied by means of the pipes *f* and *h* which are extended from the top of the car.

An open passage extends from one end to the other of the car through the body B and projections C and E, and the elevation or depression of the balloon, by inclining its body upwardly or downwardly when in motion, is effected by the operator moving backward or forward within the car, as is common in such constructions.

With the various features described, a perfectly safe construction is provided in which the heat of the engine cannot reach the gas in the balloon so as to explode or ignite the same.

It is preferable to have two operators, one serving as a pilot to steer and guide the balloon, and the other as engineer acting under the pilot's directions to operate the motor and propeller. The front end of the car, which is shown sloping downward adjacent to the propeller is furnished with window pane Q by which a view can be taken forward or downward; and a cage P is shown below the car, with trap door Q^2 in the bottom of the car, by entering which cage the pilot can have an extended view in every direction. The pilot can thus direct the engineer and control the movement of the car with perfect facility.

I am aware that curved wings have been hinged upon a balloon body near the top, and I do not therefore claim such wings, but flat wings projected from the sides of the body diametrically from one another, and in my claims I have therefore termed such wings "aeroplanes."

Having thus set forth the nature of the invention what is claimed herein is:

1. In an air ship, the combination, with a gas balloon having a conical body, of flat aeroplanes, of diminished width toward the rear end, having longitudinal hinges jointed upon the sides of said body diametrically opposite one another, a car carried by the body, and a motor and means located upon the car with connections for raising and lowering the aeroplanes when desired.

2. In an air ship, the combination, with a gas balloon having a conical body, of flat aeroplanes of diminished width toward the rear end, having longitudinal hinges jointed upon the sides of said body diametrically opposite one another, a car inclosed within the bottom of the balloon and having curved guide tubes extended from its bottom upwardly along the sides of the balloon, a motor and windlass carried within the car, and cords extended from the aeroplanes to the bottom of the balloon body, through the guide tubes, and thence to the windlass within the car for moving the aeroplanes when desired.

3. An air ship comprising a gas balloon A, A′, having an inclosed car B, the body of the balloon being made of woven fabric, a member, as the wing H, hinged upon the woven fabric and having a straight hinge-pin I, and the balloon fabric having reinforcing patches I′ sewed thereon and furnished with loops to engage said hinge-pin.

4. An air ship comprising a gas balloon A, A′, having an inclosed car B, the body of the balloon being made of woven fabric, fin-rudders J projected at opposite sides of the balloon upon the conical front part A and provided with straight hinge-pins, and a metallic frame or plate K fitted to the conical part A′ and secured to the balloon fabric and furnished with loops to engage the hinge-pins upon the rudders.

5. An air ship comprising a gas balloon tapered toward both ends and having an inclosed car, fin rudders hinged transversely to the conical front end of the balloon, toggle-links having their ends attached respectively to the rear sides of the rudders and to the conical front end, and cords extended from the joint of the links to the inclosed car for moving the rudders.

6. An air ship comprising a gas balloon having an inclosed car, and provided within the upper part with a partition forming a collapsible compartment, and connections extended from the top of the car to the bottom of the compartment to hold the partition of the compartment in position.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ARTHUR G. RUSSELL.

Witnesses:
J. L. FREELAND,
W. HOLLINGTON.