

C. A. RUSH.

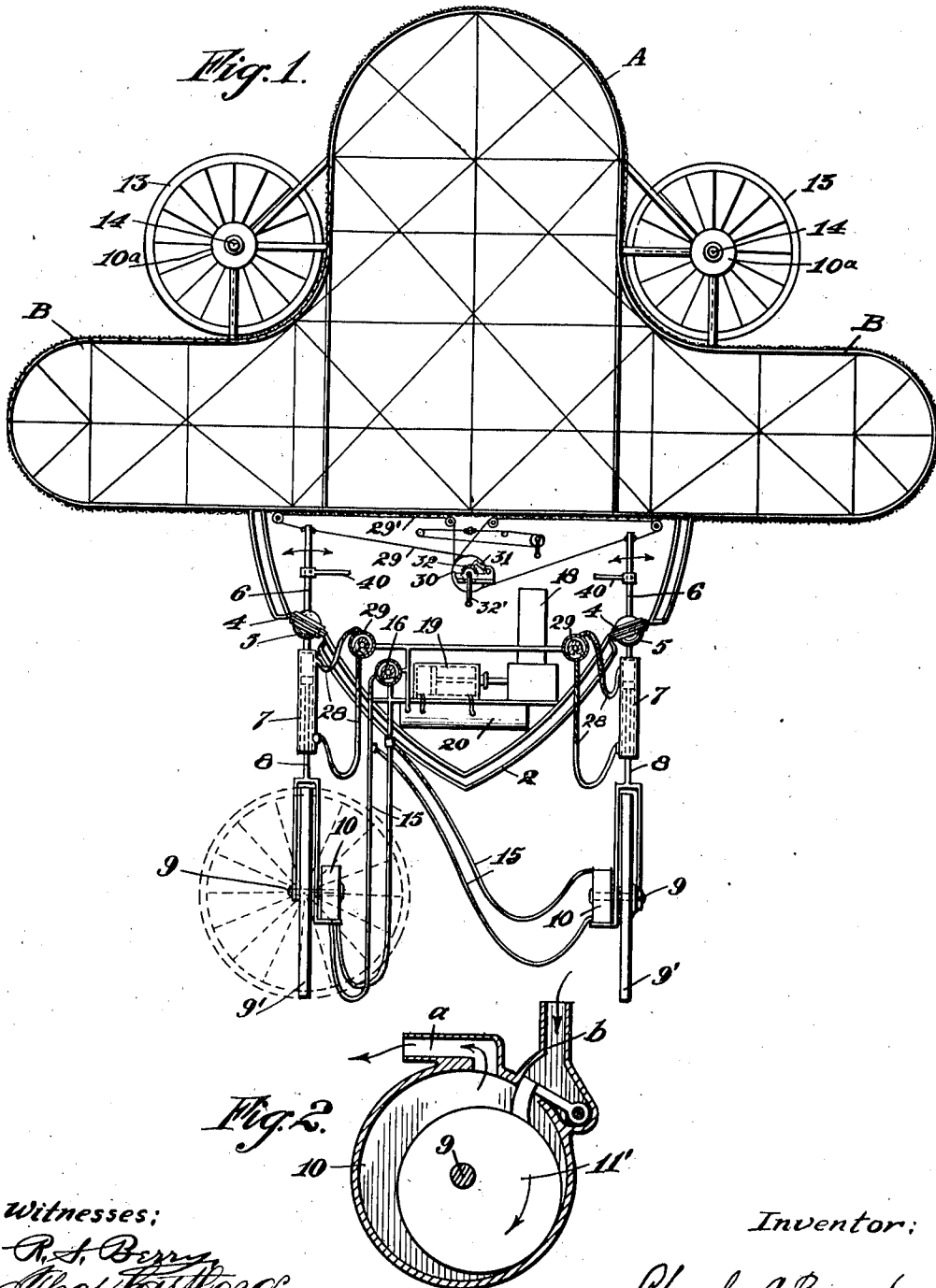
AIRSHIP.

APPLICATION FILED NOV. 23, 1911.

1,021,338.

Patented Mar. 26, 1912.

2 SHEETS-SHEET 1.



Witnesses:

R. S. Berry
Thos. Kosterberg

Inventor:

Charles A. Rush

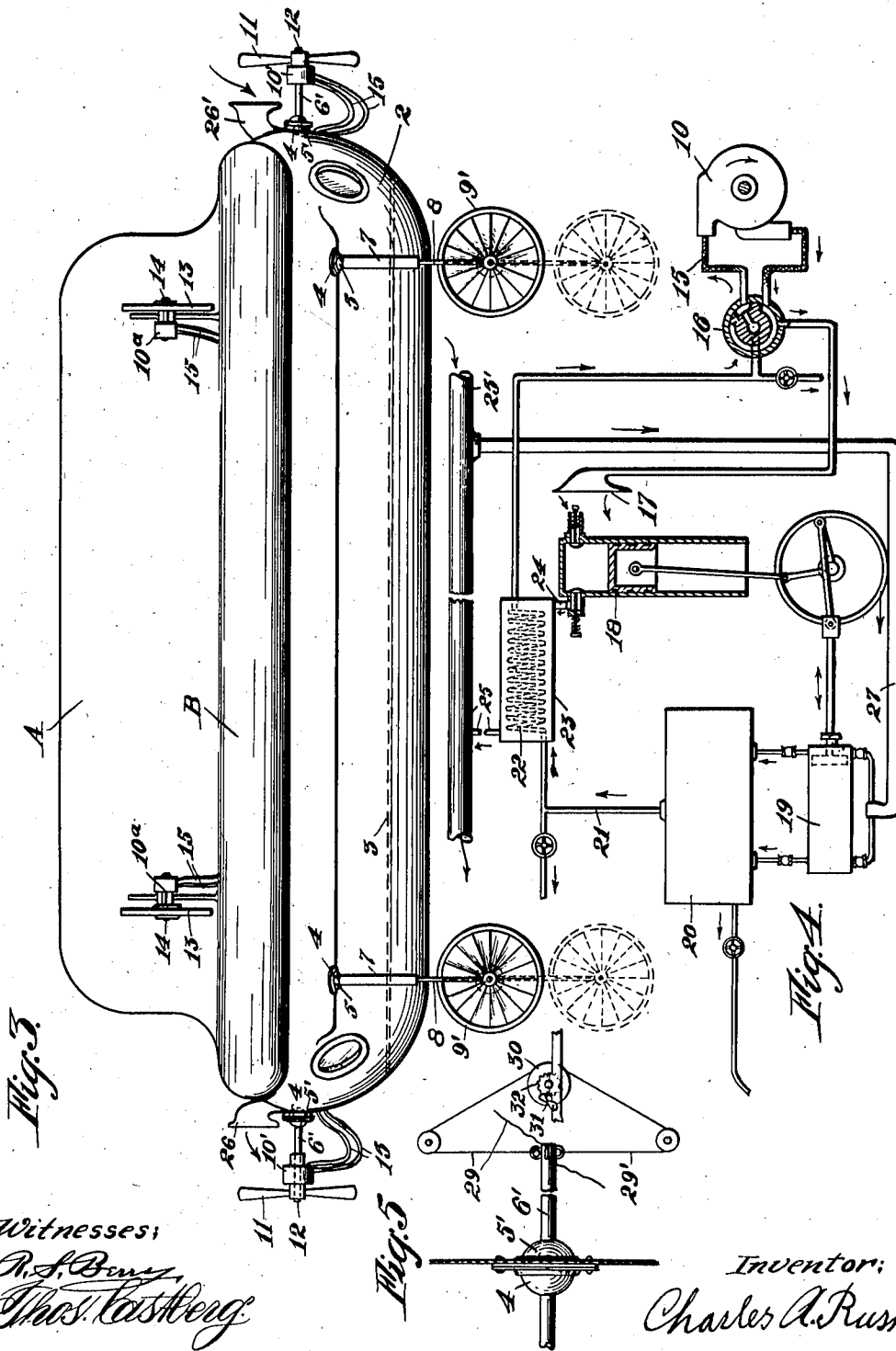
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2 SHEETS—SHEET 2.



Witnesses:
R. S. Bury
Thos. Castberg

Inventor:
Charles A. Rush

UNITED STATES PATENT OFFICE.

CHARLES A. RUSH, OF SAN FRANCISCO, CALIFORNIA.

AIRSHIP.

1,021,338.

Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed November 23, 1911. Serial No. 661,983.

To all whom it may concern:

Be it known that I, CHARLES A. RUSH, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Airships, of which the following is a specification.

This invention relates to an aerial vehicle of the dirigible balloon type.

10 It is the object of this invention to provide a flying machine which is adapted to be propelled on the ground and in the water, as well as in the air, and which embodies the principles of the aeroplane, hydroplane and balloon in a single structure.

15 Another object is to provide a novel mechanism for propelling the machine and steering it in various directions, and which is simple in construction and efficient in operation.

20 Other objects of this invention will appear in the following specification.

The invention consists of the parts and the construction and combination of parts 25 as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the invention. Fig. 2 is a detail in section of an 30 air motor employed in the invention. Fig. 3 is a side elevation of the invention. Fig. 4 is a diagrammatic view of the driving mechanism. Fig. 5 is a detail of the ball and socket mounting of a propeller carrying 35 shaft.

The drawings show a gas container formed by stretching a suitable fabric over a frame, which gas container is shaped with a vertically extending central portion A, 40 flanked on both sides with horizontally extending portions B, which project some distance from the sides of the portion A forming inflated planes. Depended from the underside of the gas container is an inclosed hull-shaped structure 2, which is 45 substantially the length of the gas container A—B, and is rigidly connected thereto forming a part thereof. The hull 2 is provided as a housing for the driving mechanism and for the reception of passengers, 50 freight, and the like, and is designed and shaped so as to adapt it to floating and traveling on water; a deck 3 being provided therein with the usual bilge space 55 therebeneath.

Mounted on the sides of the hull 2 fore

and aft, are socket bearings 4, in which balls 5 are revolvably mounted. A rod 6 is attached to each ball 5, by means of which it may be rocked in any direction 60 in its bearing and extends into the interior of the hull 2. Rigidly mounted on each of the balls 5 and extending exterior of the hull 2 is a cylinder 7, in which a piston on a rod 8 is designed to be reciprocated, as 55 will presently be described; each rod 8 carrying a revolvable shaft 9 on its lower end. A wheel 9' is attached to each shaft 9, the rim of which is adapted to travel on the ground and the spokes of which are in the 70 form of fan-blades designed to act as air or water propellers when the machine is in the air or afloat. The shafts 9 are adapted to be driven by means of air motors 10 carried by the rods 8, which motors 75 may be of any suitable type, one form of which is shown in detail in Fig. 2, in which a disk 11' mounted eccentrically on the shaft 9 within the casing 10 of the motor is adapted to be rotated in either direction 80 by the admission of air under pressure to the interior of the casing through ports *a* or *b* from any suitable source of air supply.

Propellers 11 are provided at each end 85 of the hull 2 and are mounted on shafts 12 driven by air-motors 10' carried on rods 6' mounted on balls 5' supported in socket bearings 4, which balls are adapted to be 90 rocked in their bearings from the interior of the hull so as to dispose the propellers 11 at any desired angle in relation to the hull 2 and gas container A—B.

Propellers 13 are disposed above the inflated plane portion of the gas container, 95 adjacent the central portion A. The propellers 13 extend at right angles to the longitudinal center of the gas container A, and are mounted on shafts 14 rotated by 100 air motors 10^a.

The ports *a—b* of the various motors 10—10'—10^a are connected by means of flexible conduits 15 to controlling valves 16 which are so designed that air under 105 pressure may be delivered to the motors through either of the ports *a—b*; the air discharged from the motors returning through the valves 16 and, passing to a nozzle 17, is directed against the engine 18 employed for motive power, as shown 110 in Fig. 4.

The engine 18 is of any suitable type,

preferably a gasoline engine, and is designed to operate an air compressor 19, so as to compress air in a reservoir 20, from which the air employed in operating the
 5 motors 10—10'—10^a is drawn through a pipe 21 leading from the reservoir 20 to the several valves 16. The pipe 21 leads to, and from, a heating coil 22 arranged in a casing 23, into which the hot exhaust
 10 gases from the engine 18 are directed through a pipe 24, the exhaust gases thus acting to heat the compressed air before it is delivered to the motors, thereby increasing its pressure. The exhaust gases
 15 pass from the casing 23 to a pipe 25 and are delivered to the atmosphere through a cowl 26 to which the pipe 25 leads; the cowl 26 being disposed at the stern of the hull 2 adjacent the propeller 11 in such position that the latter will act to create a
 20 forced draft through the pipe 25.

The air acted on by the compressor 19 is delivered thereto through a pipe 27 leading from a pipe 25', which in turn leads
 25 from a cowl 26' disposed on the forward end of the hull 2 adjacent the propeller 11 thereon; the latter acting to force air into the cowl 26' when rotated in such direction as to move the machine in a forward
 30 direction.

The pipes 25 and 25' may be connected so that there will be a continuous passage of air therethrough from the bow to the stern of the vessel, which flow of air is accelerated
 35 by the propeller 11.

Air under pressure is delivered to the cylinders 7 above or below the pistons therein from the reservoir 20 through flexible conduits 28 and controlling valves 29, so as to
 40 position the pistons at the outer or inner ends of the cylinders 7 and thereby dispose the propeller wheels 10 close to the hull 2 or some distance therefrom, as shown in Fig. 3.

The inner ends of the rods 6—6' may be attached to any suitable mechanism by which they may be rocked and retained in any desired position, so as to dispose the wheels 9' and propellers 11 carried on the outer ends
 50 thereof in any desired position. The mechanism here shown for operating the rods 6—6' consists of cables 29—29', which are connected to opposite sides of the ends of the rods and lead to drums 30; and are
 55 mounted on the latter in such manner that the cables 29 will wind thereon when the drums are rotated in one direction while the cables 29' will unwind, and vice versa. Pawls 31 engage square toothed ratchets 32
 60 on the drums 30, so as to prevent the latter from rotating; the pawls 31 being disengaged when it is desired to rotate the drums. Any means for rotating the drums may be employed as desired, cranks 32' being here
 65 shown for that purpose.

In the operation of this invention the engine 18 is set in motion so as to operate the compressor 19 and compress air in the reservoir 20. The machine being on the ground,
 70 it may be propelled thereover by directing compressed air from the reservoir to the motors 10 on the shafts 9 to rotate the latter and the wheel 9'; the wheels 9' being positioned parallel with the longitudinal center of the machine. The machine is steered on
 75 the ground by turning the rods 6 on the forward pair of wheels 9' from side to side; the piston rods 8 being so mounted in the cylinders 7 as to rotate with the latter when the rods 6 are turned. The turning of the
 80 rods 6 may be accomplished in any desired manner; lever 40 being here shown as attached thereto for that purpose. When it is desired to travel in the air, the gas container A—B is inflated for sustaining power,
 85 whereupon the wheels 9' may be turned at right angles to the longitudinal center of the machine and are then employed as propellers. They may also be employed in assisting the upward movement of the
 90 machine by rocking the rods 6 so as to dispose the wheels 9' in a horizontal position, in which position they will act as helicopters.

The propellers 11 are employed as rudders, and by disposing them at various angles, the machine may be directed through
 95 the air on both horizontal and vertical planes; the propellers 13 being employed for the purpose of driving the machine ahead.

If the machine should alight in water, the hull 2 will act to keep it afloat, while the wheels 10 would be employed as propellers for driving and steering the machine therein.

The hull 2 is formed with a double compartment, into the outermost of which air
 105 from the reservoir 20 is forced in event the outer covering is punctured, so as to prevent the water from entering the interior of the hull.

It is obvious that the details of construction and arrangement of parts as herein described and illustrated are subject to variations and modifications to adapt the invention to various conditions of use, and I do
 110 not limit myself to the exact structure here disclosed, but reserve the right to all such variations and modifications as properly fall within the scope of my invention and the terms of the claims.

By disposing the pistons in the rear cylinders 7 in their uppermost position, and the pistons in the forwardmost cylinders 7 in their lowermost position, when the wheels 9' are on the ground, the forward end of the gas container will be elevated so as to
 115 dispose the underside of the laterally extending portions B at an inclination, which position exposes the underside of the portions B to the action of air currents in such manner as to assist the upward movement of the ma-
 120
 125
 130

chine. This longitudinal inclination of the machine can be maintained during flight by disposing the forward cylinders 7 and the wheels 9' thereon in a horizontal position; the propeller blades in the forward wheels 9' on being rotated acting on the air to elevate the forward portion of the machine. By then reversing the direction of rotation of the forward wheels 9', when it is desired to descend, they will act to draw the prow of the machine downward.

In landing, the cylinders 7 are all disposed in a vertical position, with the pistons therein in their lowermost positions. The compressed air above the pistons thus acts to cushion the shock of the wheels 9' when they come in contact with the ground, thus enabling a gentle landing. The air in the reservoir 20 may be drawn off through a pipe 20' and utilized for any desired purpose, such as injecting a fire extinguisher, etc.

The arrangement of the cowl 26' behind the forward propeller 11, and forming a communication from this cowl to the cowl 26 adjacent the rearward propeller 11, by means of the pipe 25—25' causes the two propellers to act to maintain a forced passage of air into the forward cowl 26' and out the rearward cowl 26. The rapid flow of air into the cowl 26', together with the vacuum produced by the action of the forward propeller, acts to so agitate the air adjacent the forward end of the machine that when mist or fog are present, there will be a tendency to precipitate it and thereby clear the atmosphere for a short distance ahead of the machine.

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

1. The combination in a flying machine, of a gas container, a hull rigidly attached to the underside thereof, a plurality of cylinders mounted to be swung universally on the exterior of the hull, pistons reciprocally mounted in the cylinders, and wheels carried on said pistons.

2. The combination in a flying machine, of a gas container, a hull rigidly attached to the underside thereof, a plurality of cylinders mounted to be swung universally on the exterior of the hull, pistons reciprocally mounted in the cylinders, wheels carried on said pistons, said wheels fitted with propeller blades, and means for reciprocating said pistons by fluid pressure for disposing the wheels at various distances from the hull.

3. The combination in a flying machine, of a gas container, a hull rigidly attached to the underside thereof, a plurality of cylinders mounted to be swung universally on the exterior of the hull, pistons reciprocally mounted in the cylinders, wheels carried on said pistons, said wheels fitted with propeller

blades, means for reciprocating said pistons by fluid pressure for disposing the wheels at various distances from the hull, and means for rocking the cylinders in their universal mountings to dispose them at various angles in relation to the hull.

4. The combination in a flying machine, of a gas container, a hull rigidly attached to the underside thereof, a plurality of cylinders mounted to be swung universally on the exterior of the hull, pistons reciprocally mounted in the cylinders, wheels carried on said pistons, said wheels fitted with propeller blades, means for reciprocating said pistons by fluid pressure for disposing the wheels at various distances from the hull, means for rocking the cylinders in their universal mountings to dispose them at various angles in relation to the hull, and means for rotating the cylinders to dispose the wheels in various positions.

5. The combination in a flying machine, of a gas container, a hull rigidly attached to the underside thereof, a plurality of cylinders mounted to be swung universally on the exterior of the hull, pistons reciprocally mounted in the cylinders, wheels carried on said pistons, said wheels fitted with propeller blades, means for reciprocating said pistons by fluid pressure for disposing the wheels at various distances from the hull, means for rocking the cylinders in their universal mountings to dispose them at various angles in relation to the hull, means for rotating the cylinders to dispose the wheels in various positions, and means for rotating the wheels.

6. The combination in a flying machine, having a gas container and a hull rigidly attached thereto, of a series of cylinders mounted in universal bearings on the hull, pistons in the cylinders, rods on the pistons, shafts revolubly mounted on the rods, means for rotating the shafts carried on the rods, and wheels mounted on said shafts.

7. The combination in a flying machine, having a gas container and a hull rigidly attached thereto, of a series of cylinders mounted in universal bearings on the hull, pistons in the cylinders, rods on the pistons, shafts revolubly mounted on the rods, means for rotating the shafts carried on the rods, and wheels mounted on said shafts, said wheels having propeller blades formed thereon.

8. The combination in a flying machine, having a gas container and a hull rigidly attached thereto, of a series of cylinders mounted in universal bearings on the hull, pistons in the cylinders, rods on the pistons, shafts revolubly mounted on the rods, means for rotating the shafts carried on the rods, wheels mounted on said shafts, said wheels having propeller blades formed thereon, and means for reciprocating the piston in the

cylinders to position the wheels at various distances from the hull.

9. The combination in a flying machine, having a gas container and a hull rigidly
5 attached thereto, of a series of cylinders mounted in universal bearings on the hull, pistons in the cylinders, rods on the pistons, shafts revolubly mounted on the rods, means for rotating the shafts carried on the rods,
10 wheels mounted on said shafts, said wheels having propeller blades formed thereon, means for reciprocating the piston in the cylinders to position the wheels at various distances from the hull, and means for rock-
15 ing the cylinders in their bearings to dispose them at various angles in relation to the hull.

10. The combination in a flying machine, of a gas container formed with laterally extending inflated portions forming support-
20 ing planes and a central, vertically extending, inflated portion; propellers disposed on each side of the vertical portion above the laterally extending portions, and means for
25 rotating the propellers to move the machine longitudinally.

11. The combination in a flying machine, of a gas container formed with laterally extending inflated portions forming support-
30 ing planes and a central, vertically extending inflated portion, propellers disposed on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine
35 longitudinally, a hull attached to the underside of the gas container, propellers mounted at the ends of the hull, and means for disposing the last named propellers in various positions in relation to the hull.

40 12. The combination in a flying machine, of a gas container formed with laterally extending, inflated portions forming supporting planes and a central, vertically extending inflated portion, propellers disposed
45 on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine longitudinally, a hull attached to the underside of the gas container, propellers mounted
50 at the ends of the hull, means for disposing the last named propellers in various positions in relation to the hull, and means for rotating said propellers to steer the machine in various directions.

55 13. The combination in a flying machine, of a gas container formed with laterally extending, inflated portions forming supporting planes and a central, vertically extending inflated portion, propellers disposed
60 on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine longitudinally, a hull attached to the underside of the gas container, propellers mount-
65 ed at the ends of the hull, means for dis-

posing the last named propellers in various positions in relation to the hull, means for rotating said propellers to steer the machine in various directions, a series of cylinders mounted in universal bearings on the hull, pistons in the cylinders, rods on the pistons, shafts revolubly mounted on the rods, means for rotating the shafts carried on the rods, wheels mounted on said shafts, said wheels having propeller blades formed thereon, means for reciprocating the piston in the cylinders to position the wheels at various distances from the hull, and means for rock-
70 ing the cylinders in their bearings to dispose them at various angles in relation to the hull.

14. The combination in a flying machine, of a gas container formed with laterally extending, inflated portions forming support-
85 ing planes and a central, vertically extending inflated portion, propellers disposed on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine longitudinally, a hull attached to the under-
90 side of the gas container, propellers mounted at the ends of the hull, means for disposing the last named propellers in various positions in relation to the hull, means for rotating said propellers to steer the machine
95 in various directions, a cowl arranged adjacent the propellers through which air is forced by the propellers, and conduits leading from the cowl to an air compressor.

15. The combination in a flying machine, of a gas container formed with laterally extending, inflated portions forming support-
100 ing planes and a central, vertically extending, inflated portion, propellers disposed on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine longitudinally, a hull attached to the under-
105 side of the gas container, propellers mounted at the ends of the hull, means for disposing the last named propellers in various positions in relation to the hull, means for rotating said propellers to steer the machine
110 in various directions, a cowl arranged adjacent the propellers through which air is forced by the propellers, an air compressor, conduits leading from the cowl to the intake
115 ports of the compressor, an engine for operating the compressor, a reservoir for compressed air, and valved means for drawing the air from the compressor for operating the various propeller driving means.

16. The combination in a flying machine, of a gas container, formed with laterally extending, inflated portions forming support-
125 ing planes and a central, vertically extending, inflated portion, propellers disposed on each side of the vertical portion above the laterally extending portions, means for rotating the propellers to move the machine
130

longitudinally, a hull attached to the under-
side of the gas container, propellers mount-
ed at the ends of the hull, means for dispos-
ing the last named propellers in various po-
5 sitions in relation to the hull, means for ro-
tating said propellers to steer the machine
in various directions, a cowl arranged adja-
cent the propellers through which air is
forced by the propellers, an air compressor,
10 conduits leading from the cowl to the intake
ports of the compressor, an engine for oper-
ating the compressor, a reservoir for com-
pressed air, valved means for drawing the
air from the compressor for operating the
15 various propeller driving means, and means
for heating the compressed air as it leaves
the reservoir by the exhaust from the
engine.

17. The combination in a flying machine,
20 of a gas container, formed with laterally ex-
tending, inflated portions forming support-
ing planes and a central, vertically extend-
ing, inflated portion, propellers disposed on
each side of the vertical portion above the
25 laterally extending portions, means for ro-
tating the propellers to move the machine
longitudinally, a hull attached to the under-

side of the gas container, propellers mount-
ed at the ends of the hull, means for dispos-
ing the last named propellers in various po- 30
sitions in relation to the hull, means for ro-
tating said propellers to steer the machine
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cent the propellers through which air is
forced by the propellers, an air compressor, 35
conduits leading from the cowl to the intake
ports of the compressor, an engine for oper-
ating the compressor, a reservoir for com-
pressed air, valved means for drawing the
air from the compressor for operating the 40
various propeller driving means, means for
heating the compressed air as it leaves the
reservoir by the exhaust from the engine, and
means for utilizing the air after it operates
the propeller driving means for cooling the 45
engine.

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

CHARLES A. RUSH.

Witnesses:

CHARLES EDELMAN,
JOHN H. HERRING.