J. O. BROOKBANK.

AIRSHIP.

APPLICATION FILED SEPT. 28, 1908.

986,434.

Patented Mar. 14, 1911.

3 SHEETS—SHEET 1.

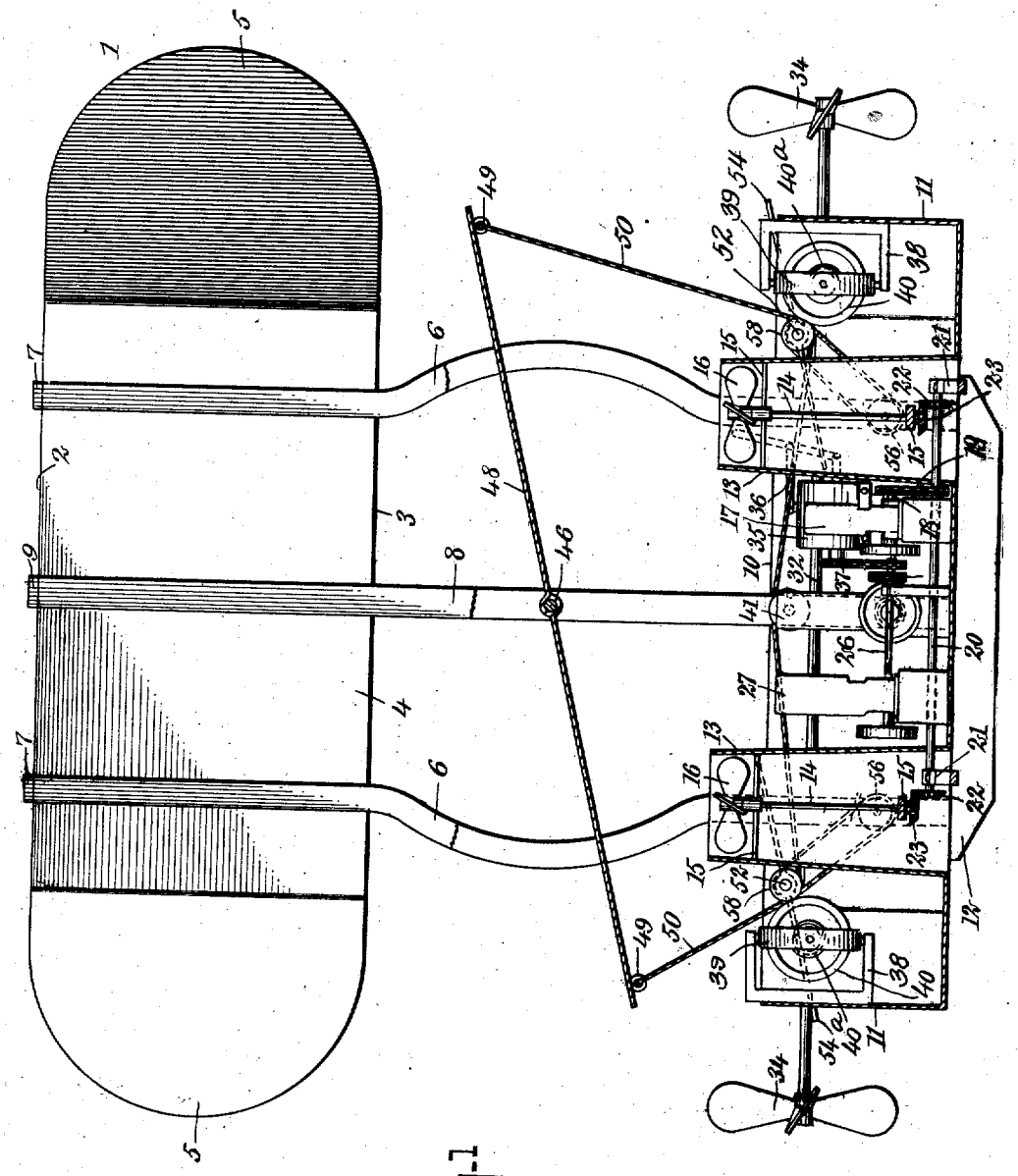

FIG. 1

WITNESSES

J. A. Brophy

John K. Buckhout

INVENTOR

James A. Brookbank

BY Munn & Co.

ATTORNEYS

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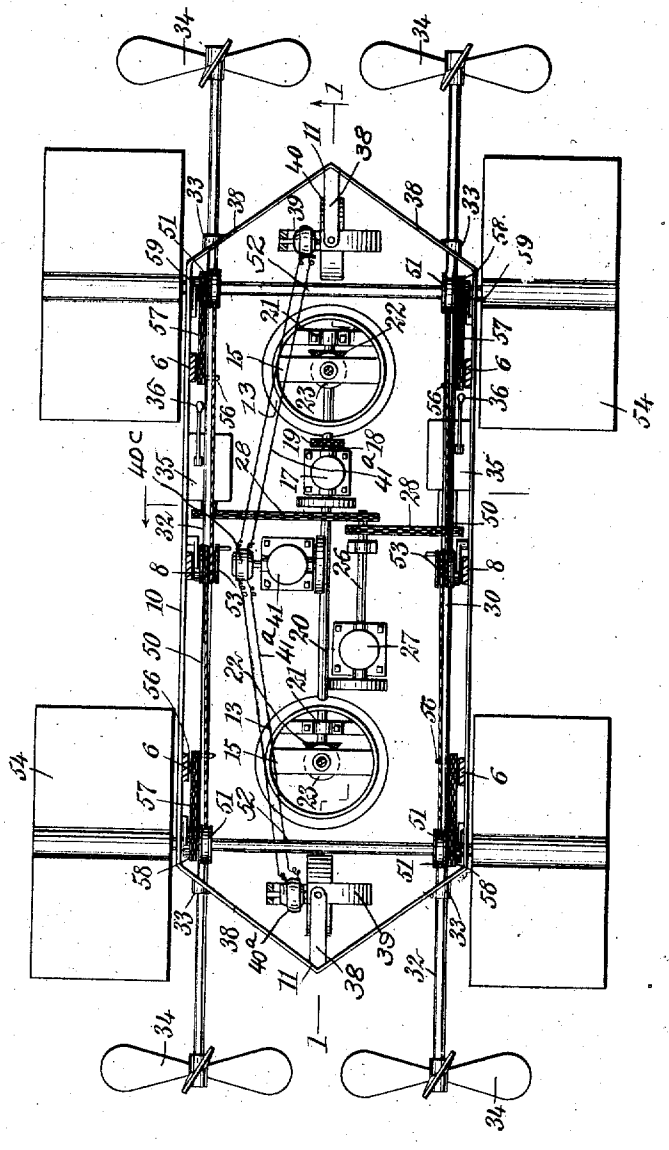
3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

J. A. Brophy

John K. Bachmeyer

INVENTOR

James O. Brookbank

BY Munn & Co.

ATTORNEYS

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3 SHEETS—SHEET 3.

Fig. 3

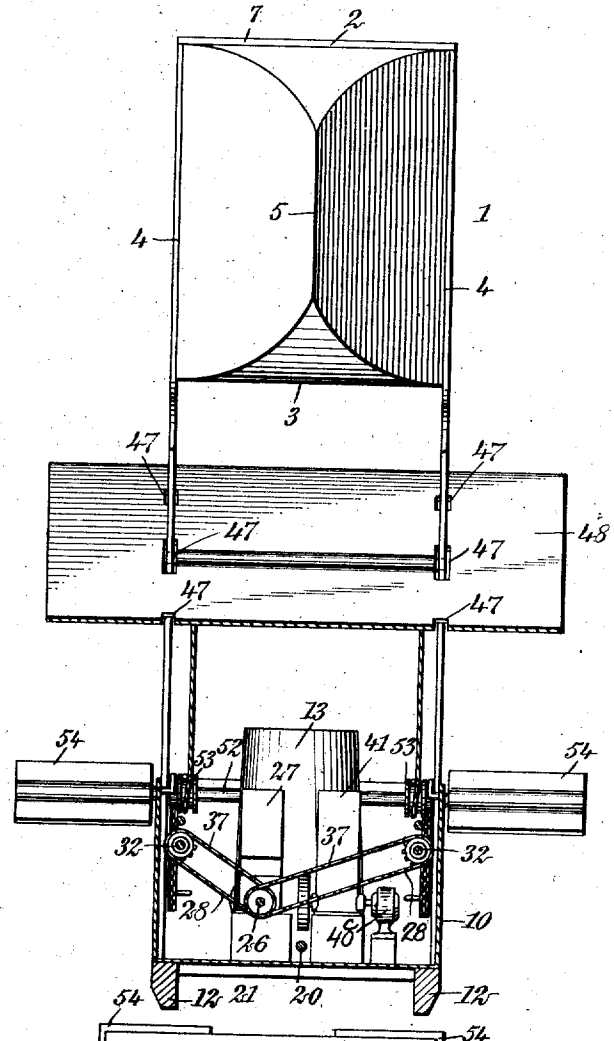
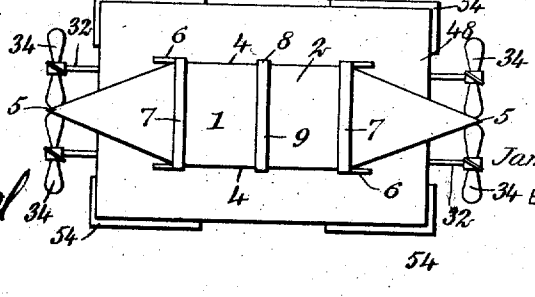


Fig. 4



WITNESSES

J. A. Brophy

John K. Buchanan

INVENTOR

James O. Brookbank

BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES O. BROOKBANK, OF DRIFTWOOD, PENNSYLVANIA.

AIRSHIP.

986,434. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed September 28, 1908. Serial No. 454,960.

To all whom it may concern:

Be it known that I, JAMES O. BROOKBANK, a citizen of the United States, and a resident of Driftwood, in the county of Cameron and State of Pennsylvania, have invented a new and Improved Airship, of which the following is a full, clear, and exact description.

This invention relates to airships.

An object of the invention is to provide a simple, strong, and mechanically efficient airship, which can be propelled with or against the wind, which can be raised or lowered in the air, and which resists any tendency to deflect it from its normal direction of movement.

A further object of the invention is to provide an airship combining in its construction the principles of both the heavier than air and lighter than air types of similar devices, and having self-contained driving means for propelling it.

A still further object of the invention is to provide an airship having a buoyant body, and means independent of the buoyant body for altering the elevation of the airship.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a sectional side elevation of the airship on the line 1—1 of Fig. 2; Fig. 2 is a plan view of the same; Fig. 3 is an end view showing certain of the parts in cross section; and Fig. 4 is a plan view of the air ship, on a reduced scale.

Before proceeding to a more detailed explanation of my invention, it should be understood that I employ both the buoyant body principle and the aeroplane principle, combining both features in my invention. The buoyant body, which may be filled with any substance lighter than air, for instance, hydrogen gas, is of peculiar form and has the top, bottom and side faces flattened. These faces play a certain part in the operation of the airship, as will appear more clearly hereinafter. In connection with the buoyant body I employ a large aeroplane, as well as guiding or directing aeroplane rudders. The large aeroplane and the aeroplane rudders are adjustable so that they can be set according to the direction of the wind and the desired direction of travel of the craft. The buoyant body in itself, is not sufficient to raise the airship from the ground and it merely constitutes, in that respect, an auxiliary for the elevating propellers I employ. These are arranged in normally vertical wells and when revolved rapidly in the proper direction, will have a tendency to drive the airship upward; that is, to raise it from the ground. The upward tendency given by the elevating propellers, together with the similar effect due to the buoyant body, is sufficient to cause the airship to rise. It will be understood that by increasing or decreasing the speed of revolution of the elevating propellers, the ship can be raised, lowered or maintained stationary in the air. I provide other propellers for causing the airship to advance in one direction or the other. By reversing the driving propellers the direction of the movement of the ship can be reversed. Consequently, it is unnecessary to turn the craft about in order to advance in an opposite direction, but it can be turned around when desired by revolving the end propellers on one side of the car more rapidly than those on the other side.

Referring more particularly to the drawings, 1 represents the buoyant body which may be formed from any suitable material, such as is usually employed for the purpose, preferably with the tapering ends and some portions of the sides overlaid with thin sheets of aluminum, or some other light, stiff material to reinforce the same and the whole properly braced and strengthened. The buoyant body is of angular—preferably rectangular—cross section. The top, bottom and side faces 2, 3 and 4, respectively, are flat. The side faces, near the ends are inwardly and equally inclined, and together with the curved ends of the top and bottom faces form the wedge-shaped tapered extremities 5 of the buoyant body. The edges of the wedge-shaped body extremities are curved as is shown most clearly in Fig. 1, and lie in substantially vertical planes when the body is in a normal position. Pairs of hangers 6 are arranged near the ends of the body and depend therefrom, being connected at the upper face of the body by cross-pieces

7. The hangers are curved outwardly and toward the ends of the body, for a purpose which will appear hereinafter. Between the hangers 6 is an intermediate pair of hangers 8 joined at the upper face of the body by a cross-piece, 9. The hangers 8 present no curvature and depend from the buoyant body as do the hangers 6.

A car 10 having the opposite ends 11 tapered or wedge-shaped, is carried by the depending hangers 6 and 8. At the bottom of the car are runners 12 which prevent injury to the car when the airship comes into contact with the ground in descending from a flight. Near the ends of the car are arranged wells 13 open at the top and bottom and preferably having a slight upward taper. Shafts 14 are journaled upon suitable transverse carriers 15 within the wells, and extend longitudinally of the latter. Each of the shafts 14 has a propeller 16 which, when the shaft is revolving in the proper direction, tends to raise the airship. A prime mover 17 is located in the car. The prime mover may consist of any suitable variable speed motor, for instance, an internal explosion engine. The driving shaft 18 of the motor is connected by a chain and sprockets 19 with a shaft 20 journaled in bearings 21 mounted upon the bottom of the car, having at the ends bevel gears 22 in mesh with bevel gears 23 rigidly carried at the ends of the shafts 14, whereby the shaft 20 serves simultaneously to operate the shafts 14 and the propellers 16. If so desired, the shaft 20 can be omitted and the driving shaft 18 can be geared directly to the shafts 14.

At each side of the car and longitudinally thereof is arranged a shaft 32 extending beyond the ends of the car and arranged in suitable bearings 33 mounted upon the latter. At the projecting extremities, the shafts 32 have propellers 34. Variable speed and reversing gears 35 independently control the shafts 32 and have levers 36 by means of which they can be manually operated. Each of the variable speed gears 35 is operatively connected with the shaft 26 of a motor 27 by means of a chain and sprocket 28. If so desired, the motor may be of a reversible type, to drive the shaft in opposite directions. The arrangement of the propeller blades is such that the propellers at one end of the car pull the same in one direction, while the propellers at the other end of the car push it in the same direction; that is, all the driving propellers serve to advance the airship in the same direction when the shafts are properly driven for this purpose. By reversing the shafts, the direction of movement of the airship is reversed and consequently, it is unnecessary in every instance to turn the entire craft about in order to reverse the direction of travel, but the ship can be turned around entirely or partially by revolving the propellers at one side more rapidly than those at the other, the variable speed gear permitting this to be effected.

Mounted between superposed brackets 38 at each end of the car are annular frames 39, in which are journaled gyroscopic disks or wheels 40. These are provided with driving motors 40^a. The gyroscopic disks are rotatable at high speed, and serve to steady the airship in flight. The pivoted frames 39 permit the necessary processional movement to allow the gyroscopic disks to steady the machine. A motor 41 of any suitable type is arranged within the car, and is coupled with a dynamo 40^c which is connected by means of suitable conductors 41^a with the motors 40^a, to provide the latter with current to operate the gyroscopic disks. The auxiliary motor 41 is employed, as it is necessary to give the gyroscopic wheels a substantially uniform rate of rotation, and to render them independent of the other driving mechanism.

A spindle 46 is arranged, between the hangers 8 and carries, pivotally, an aeroplane 48. The aeroplane has slots 47 through which the outer and the intermediate hangers 6 and 8 pass. Owing to the curved form of the latter, the slots can be made of comparatively short length, while still permitting free movement of the aeroplane within wide limits. Near the ends of the plane are eyes 49 to which are secured the ends respectively, of lines 50, consisting of flexible members such as wire cables or the like. The lines 50 pass over rollers 51 arranged loosely upon transverse shafts 52 near the ends of the car. Each line 50 has a turn about a drum 53 which is adapted to be manually operated to tilt the aeroplane in one direction or the other. The shafts 52 have the ends projected laterally beyond the car, and carrying rigid aeroplane rudders 54. At the sides of the car, the hangers 6 carry manually operable sprockets 56. The latter are operatively connected by means of chains 57, with sprockets 58 rigid with the shafts 52. By turning the sprockets 56 in one direction or the other the shafts 52 can be adjusted to tilt the aeroplane rudders 54 in one direction or the other. It will be understood that the pairs of aeroplane rudders are independent of each other and can be tilted to any desired degree.

The large aeroplane 48 and the aeroplane rudders 54 can be employed in accordance with the practice usual in aeroplane flying machines, to assist in the upward and downward as well as horizontal movement of the airship. It will be understood that the large aeroplane and the aeroplane rudders can be easily turned or set at angles suited to the conditions of travel, the velocity of air cur-

rents, etc. The flat form of the buoyant body is of assistance in propelling the airship against a head wind, as the buoyant body because of its peculiar shape can then be used somewhat as a sail, in tacking; that is, the airship can be advanced against the wind on a zig-zag course, in the manner customary with marine sailing vessels. The flat form of the buoyant body with the tapering ends also renders it less liable to collapse or to be injured when being forced against the wind, than if it were constructed in any other manner or form.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an airship, a buoyant body adapted to be filled with a substance lighter than air, and having tapered extremities, the upper and lower faces of said body being flattened.

2. In an airship, a buoyant body having flat faces, and tapered, wedge-shaped extremities presenting curved edges.

3. In an airship, a buoyant body adapted to be filled with a substance lighter than air, and having the top, bottom and side faces substantially flat, said body having the ends tapered and presenting normally vertical, curved edges.

4. In an airship, a buoyant body, pairs of hangers secured thereto, a car depending from said hangers, and an aeroplane pivotally mounted between the hangers of one of said pairs, said aeroplane having gaps through which the others of said hangers pass.

5. In an airship, a buoyant body, hangers carried by said body at each side thereof, an aeroplane pivoted between certain of said hangers and having slots to receive the others of said hangers, said other hangers being curved with respect to the pivotal axis of said aeroplane, and a car depending from said hangers.

6. In an airship, a car, a shaft arranged longitudinally of said car at each side thereof, said shafts projecting beyond the ends of said car and having propellers at the projecting ends, wells arranged within said car and substantially vertical in a normal position of said car, said wells being tapered upwardly, shafts within said wells, propellers on said shafts within said wells, and means for driving said shafts at a plurality of speeds.

7. In an airship, a buoyant body, hangers secured to said body, a car suspended from said hangers, an aeroplane pivoted between said hangers, means for adjusting said aeroplane, aeroplane rudders at the sides of said car, and means for adjusting said aeroplane rudders independently of one another.

8. In an airship, a buoyant body, hangers carried by said body at each side thereof, an aeroplane pivoted between certain of said hangers and having slots to receive the other of said hangers, said other hangers being curved with respect to the pivotal axis of said aeroplane, a car depending from said hangers, transverse shafts carried by said car and projecting laterally therebeyond, aeroplane rudders arranged upon said shafts, and means for adjusting said aeroplane and said aeroplane rudders independently of each other.

9. In an airship, a buoyant body having flat faces and tapered extremities, a car secured to said body, propellers at each end of said car, means for driving said propellers simultaneously or independently and in either direction, at a plurality of speeds, further propellers revoluble about axes at an angle with the revolving axis of said first propellers, and means for driving said further propellers independently of said first propellers and at a plurality of speeds.

10. In an airship, a buoyant body adapted to be filled with a substance lighter than air and having the top, bottom and side faces substantially flat, a car secured to said body, shafts arranged longitudinally of said car and having the ends projecting beyond the ends of said car, said shafts at the ends projecting beyond the ends of said car carrying propellers, said car having wells open at the top and bottom, a shaft arranged within each of said wells and carrying a propeller, said first shafts and said shafts in said wells being arranged at an angle with each other, and means for independently driving said first shafts and said shafts in said wells at a plurality of speeds.

11. In an airship, a buoyant body adapted to be filled with a substance lighter than air and having tapered extremities, the side, top and bottom faces of said body being flattened, a car secured to said body, propellers at each end of said car, means for simultaneously or independently driving said propellers in either direction at a plurality of speeds, other propellers revoluble about axes at an angle with the revolving axes of said first propellers, independent means for driving said other propellers at a plurality of speeds, shafts carried by said car, a gyroscopic wheel upon each of said shafts, and means for driving said shafts independently of said first driving means.

12. In an airship, a buoyant body adapted to be filled with a substance lighter than air and having tapered extremities, the faces of said body being flattened, hangers secured to said body, a car suspended from said hangers, an aeroplane pivoted between said hangers, means for adjusting said aeroplane, aeroplane rudders at the sides of said car, means for independently adjusting said aeroplane rudders, shafts arranged transversely of said car and lying in a horizontal plane when said car is in a normal position,

a gyroscopic wheel carried by each of said shafts, means for driving said shafts at a practically constant speed, propellers at each end of said car, means for simultaneously or independently driving said propellers in either direction at different speeds, other propellers revoluble about an axis at an angle with the revolving axes of said first propellers, and means for driving said other propellers at different speeds.

13. In an airship, a buoyant body, hangers secured to said body, a car suspended from said hangers, an aeroplane pivotally mounted upon said hangers between said body and said car, means for adjusting said aeroplane, pairs of aeroplane rudders at the ends of said car, said rudders of each of said pairs being at opposite sides of said car, and means for adjusting said pairs of rudders independently of one another.

14. In an airship, a buoyant body, hangers secured to said body, a car suspended from said hangers, an aeroplane pivoted between said hangers, a line controlling said aeroplane, a drum for operating said line to adjust said aeroplane, aeroplane rudders at the sides of said car, and means for adjusting said rudders.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES O. BROOKBANK.

Witnesses:

AGNES MACDONALD,

P. M. HANES.