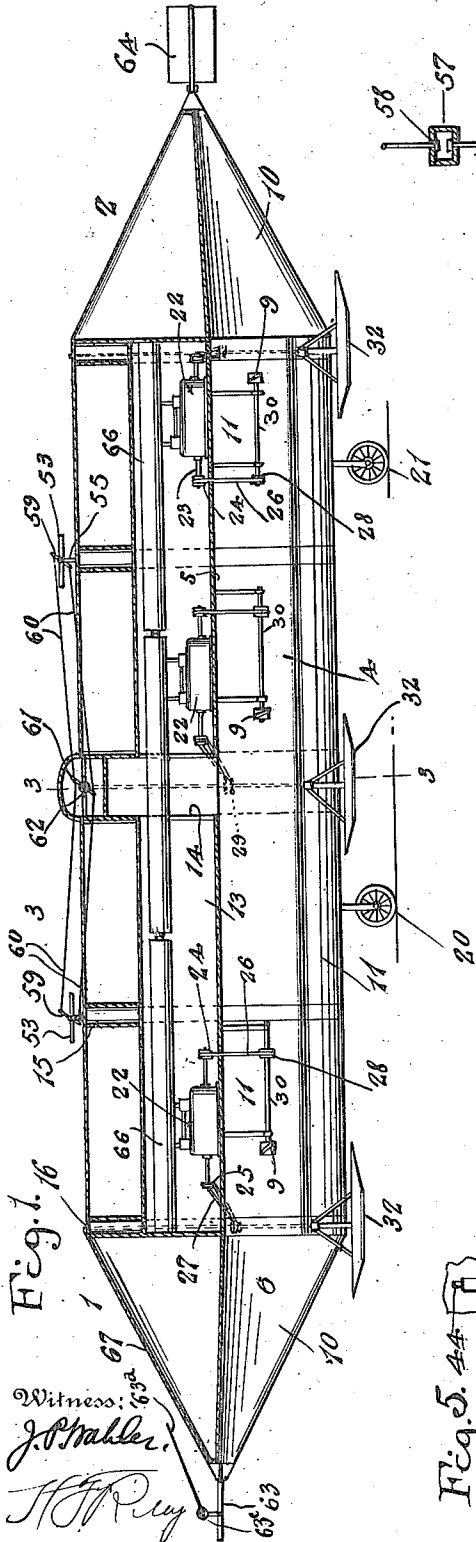


1,233,210.

T. M. FINLEY.
AIRSHIP.
APPLICATION FILED JUNE 30, 1916.

Patented July 10, 1917.
3 SHEETS—SHEET 1.



Witness:
J. P. Mahler.
T. M. Finley

Fig. 6.

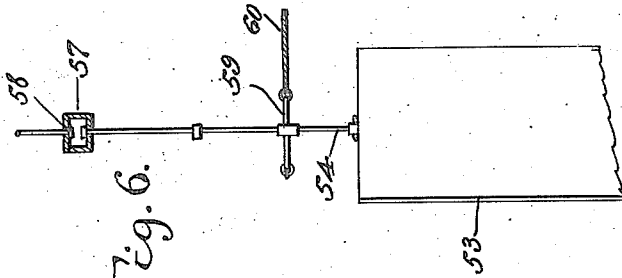


Fig. 7.

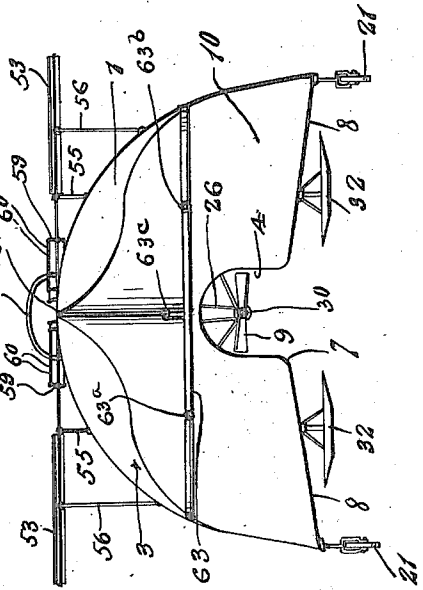
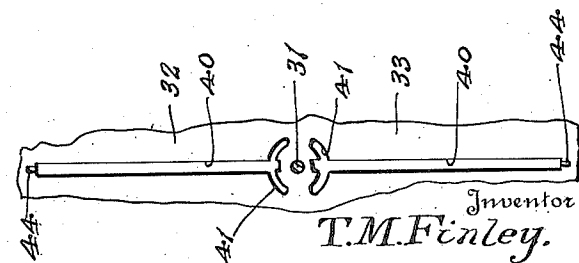


Fig. 5.



Inventor
T. M. Finley.

By *[Signature]*
Attorney

T. M. FINLEY.

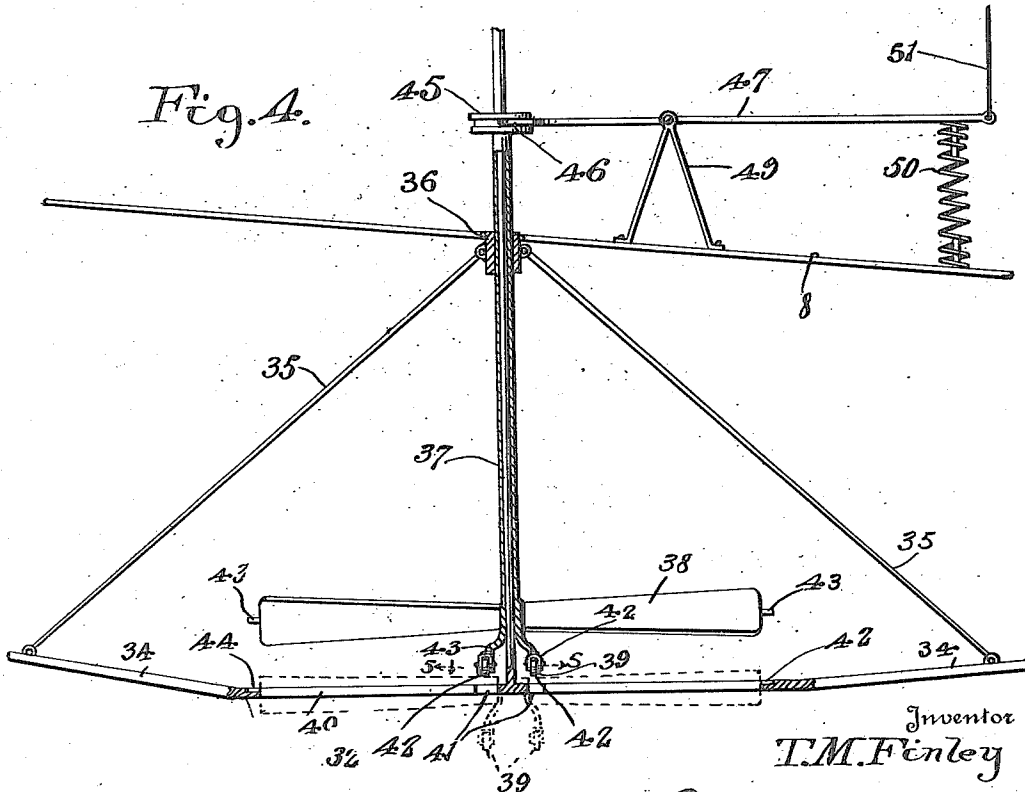
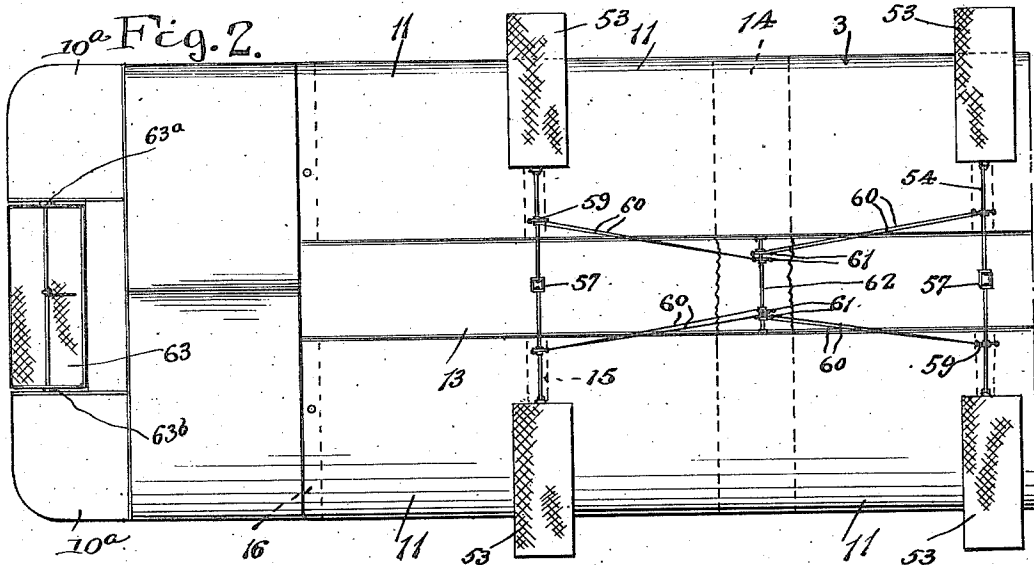
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3 SHEETS—SHEET 2.

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Inventor
T.M. Finley

Witness

J.P. Mahler,
H.H. Ruy

By

[Signature]
Attorney

T. M. FINLEY.

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3 SHEETS—SHEET 3.

1,233,210.

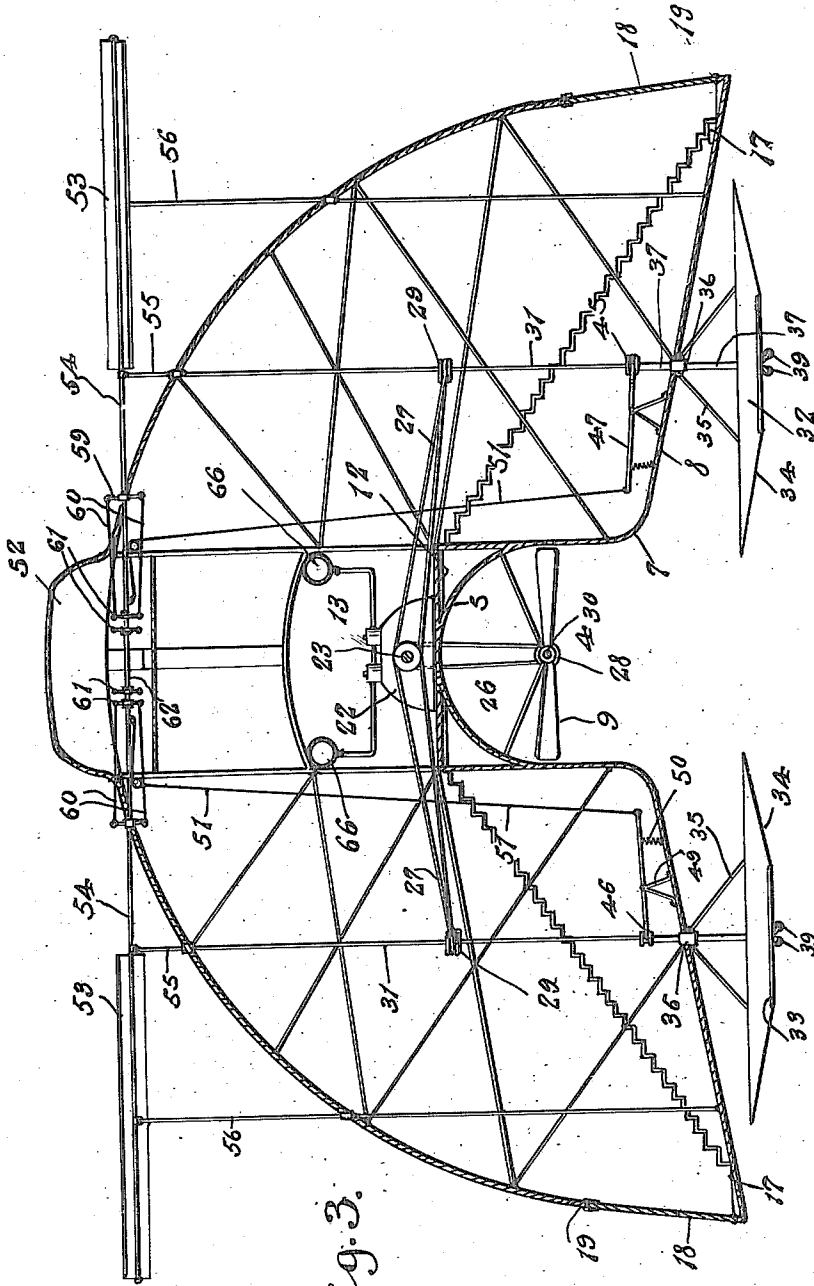


Fig. 3.

Witness:
J. P. Mahler.

J. P. Mahler

Inventor
T. M. Finley.

By *A. H. Murphy, Jr.*

Attorney

UNITED STATES PATENT OFFICE.

THOMAS M. FINLEY, OF ORAN, MISSOURI.

AIRSHIP.

1,233,210.

Specification of Letters Patent.

Patented July 10, 1917.

Application filed June 30, 1916. Serial No. 106,872.

To all whom it may concern:

Be it known that I, THOMAS M. FINLEY, a citizen of the United States, residing at Oran, in the county of Scott and State of Missouri, have invented certain new and useful Improvements in Airships; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to an airship.

The object of the present invention is to improve the construction of airships and to provide an airship equipped with adjustable and rotating planes and also with a plurality of gas bags to cooperate with the planes in sustaining the airship whereby the carrying capacity of the same will be materially increased.

A further object of the invention is to provide an airship embodying some of the characteristics of an aeroplane and a Zeppelin adapted to offer a minimum resistance in its passage through the air and capable of operating in the nature of a parachute and of thereby tending to condense the air and cause the propellers to operate in air of maximum density whereby a maximum propelling effect and a relatively high speed will be attained.

Another object of the invention is to provide an airship provided with the rotary planes located beneath or above the machine and having propellers adapted to be brought into and out of operation whereby the airship is adapted to hover and is also capable of rising vertically in the air and of descending slowly and gradually and gently alighting and of thereby obviating the necessity of providing an aviation field for this purpose.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawing, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings—

Figure 1 is a longitudinal sectional view

of an airship constructed in accordance with this invention,

Fig. 2 is a plan view of the same,

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 1,

Fig. 4 is an enlarged vertical sectional view of one of the rotary planes illustrating the construction for throwing the lifting propeller into and out of operation,

Fig. 5 is a horizontal sectional view on line 5—5 of Fig. 4, parts being omitted.

Fig. 6 is a detail plan view partly in section illustrating the manner of mounting the side planes,

Fig. 7 is a front elevation of the airship.

Like numerals of reference designate corresponding parts in the several figures of the drawings.

In the accompanying drawings in which is illustrated the preferred embodiment of the invention, the airship which has tapered terminal portions 1 and 2 is provided with a body portion 3 of uniform cross sectional area of approximately crescent shape. The body is provided with a longitudinal trough 4 extending centrally of its lower portion from one end to the other and arched at the top at 5 and having tapered terminal portions 6 which gradually decrease in depth to the ends of the body as clearly illustrated in Fig. 1 of the drawings.

The tapered terminal end portions which are of the same width as the body of the airship are wedge-shaped and substantially in the form of the bill of a duck, the upper face being transversely rounded and the front terminal portion is provided with an extension or ledge 10^a which is preferably rounded at the corners as clearly illustrated in Fig. 2 of the drawings.

The sides of the trough are rounded or flared at opposite sides of the mouth portion 7 and the bottom of the body inclines downwardly and outwardly at opposite sides of the trough at 8 from the rounded portions to the exterior of the body forming a parachute like structure or formation which is adapted to tend to compress or condense the air and force the same upwardly into the trough where the air will have the greatest density so as to be most effectively operated on by main driving propellers 9. The oppositely tapered cross sectionally crescent shape body is composed of end and intermediate gas bags 10

and 11 which are supported by a suitable frame structure preferably made of aluminum to secure a maximum strength and lightness but the frame may be constructed in any desired manner and of any suitable material as will be readily understood. The top 5 of the trough is formed by an arch which is braced by metallic members or frame sections 12 and the gas bags are shaped to conform to the configuration of the trough and are provided with central longitudinal openings of greater height than the trough 4 so as to extend above the top of the trough and form a longitudinal space or compartment 13 which communicates with the central transverse compartment 14 formed by spacing the central gas bags or receptacles from each other. The intermediate or central gas bags which constitute the body portion of the airship are arranged in pairs in advance and in rear of the central space 14 and the spaces 15 and 16 between the gas bags of each pair and also between the tapered gas bags 10 and the adjacent intermediate gas bags 11 are designed to be relatively small, just sufficient to accommodate the framework for connecting the gas bags and the spaces between the gas bags are designed to be closed or covered so that the airship body will present a smooth continuous exterior. The floor of the central longitudinal compartment 13 is level and the floor of the central transverse compartment has inclined portions 17 which extend downwardly and outwardly from the central horizontal portion of the floor. The framework may be braced in any desired manner to secure the requisite strength and lightness and the space within the central longitudinal compartment is designed to contain the engines and the freight and other equipment. The said space is designed to be provided with side doors 18 and to have openings 19 to enable freight to be readily hauled up into the body of the airship which is supported when on the ground by front and rear wheels 20 and 21 of any preferred construction. The airship may be of course constructed of any desired size and the number of engines may of course be varied to provide the necessary power for operating the airship. In the accompanying drawings three engines are shown and are located at the center and front and rear portions of the body. Each engine 22 is preferably of the internal combustion type and its shaft 23 is extended in advance and in rear of the engine and carries pulleys 24 and 25 which are connected by belts 26 and 27 with pulleys 28 and 29 mounted on a horizontal propeller shaft 30 and on vertical propeller shafts 31. The horizontal propeller shafts 30 are journaled in suitable bearings or supports each engine having a separate longitudinal propeller shaft 30;

and the vertical propeller shafts 31 extend entirely through the body portion of the machine and are adapted to constitute bracing means for increasing the strength of the machine. These vertical propeller shafts 70 which are arranged in pairs carry rotary propeller or stabilizing planes 32 which are constructed of aluminum or other suitable material and which have flat horizontal central portions 33 and inclined outer portions 75 forming circular saucer shaped planes, the inclined portions being adapted to increase the lifting effect of the airship when the same is traveling forwardly. The rotary planes 34 constitute gyratory elements and 80 serve to maintain the airship in a firm stable position and prevent the body of the airship from rolling and the ends of the same from whipping. This will enable the airship to maintain a steady position while 85 hovering and will prevent or eliminate the objection to airships of the Zeppelin type in attempting to hover or remain stationary and a condition of stability will be assured under all the conditions to which an airship 90 may be subjected, in the use of the same. The rotary planes 34 are supported by suitable braces 35 arranged at an inclination and extending upwardly and inwardly from the outer portions of the planes 32 and secured at their upper ends to sleeves 36 95 arranged on tubular members 37 which extend between the sleeves 36 and the propeller shafts. Each of the tubular members 37 is provided at its lower end with a pair of propeller blades 38 adapted to be carried 100 upwardly and downwardly by the sliding movement of the tubular member or shaft section 37 on the vertical propeller shaft to arrange the propeller blades in interlocked 105 relation with the rotary propeller planes 32 as clearly illustrated in dotted lines in Fig. 4 of the drawings. When the propeller blades 38 are in the position illustrated by dotted lines in the said Fig. 4 they project 110 above and below the central horizontal portion of the rotary plane 32 and they are adapted to exert a lifting power and according to the speed with which they are driven they may operate to raise or lower the airship or cause the same to hover at an elevation while the main or driving propellers are thrown out of operation. 115

The vertically slidable tubular member 37 is equipped at its lower end with anti-friction wheels 39 arranged to ride upon the flat central portion of the rotary propeller plane 32 until the blades of the propeller move downwardly into the opening 40 provided in the horizontal portion of the rotary propeller 120 plane for the reception of the said blade. The inner portions 41 of the radial slots or openings are enlarged to receive the rollers and lugs 42 which support the said rollers and the blades are also provided at their 130

outer ends with lugs 43 that fit in notches 44 at the outer ends of the radial openings of the rotary propeller planes.

The rotary lifting propeller is preferably provided with a pair of blades as shown but any desired number of blades may be employed and while three sets of propellers are shown the number may of course be varied to suit requirements. When the rotary lifting propeller is moved downwardly and engages with the openings of the rotary propeller plane, the blades extend above and below the central portion of the said plane and the horizontal propeller is interlocked with the plane and is caused to rotate and exert its lifting power which varies of course with the speed of the rotary movement so that the machine may be made to rise or fall or hover without progressing. By disengaging the propellers from the rotary plane and rotating the latter the body of the airship will be maintained in a steady position and there will be no rolling of the body or the whipping of the ends to interfere with the aim or the accurate dropping bombs and the like.

The tubular section or shaft 37 is equipped at its upper end with a head 45 consisting of a peripherally grooved wheel and receiving a fork 46 of a lever 47 which is fulcrumed intermediate of its ends on a suitable support 49. A coiled spring 50 is connected with the outer end of the lever 47 for urging the lever in one direction and an operating wire or connection 51 extends from the lever to a pilot house or cab 52 preferably located at the top of the body as shown and designed to contain the various operating levers and means for controlling the airship. The coiled spring may be employed for holding the horizontal propeller either in or out of engagement with the rotary propeller plane and a simple operating lever may be employed for moving the lever in the opposite direction; in practice suitable locking means being provided for holding the lever against the action of the spring.

The airship is equipped at opposite sides with laterally extending adjustable planes 53 arranged in pairs and mounted on laterally extending horizontally disposed shafts 54 constructed of suitable material and journaled in spaced bearings or braces or standards 55 and 56 and also in bearing boxes 57 which receive the inner terminals of the transverse plane carrying shafts 54. The shafts 54 are provided at their inner ends with heads 58 which are located within the bearing boxes and the said shafts are also provided with oppositely disposed arms 59 which are connected by suitable connections 60 with operating levers 61. The operating levers 61 which are fulcrumed at a point intermediate of their ends at 62 have the connections 60 attached to them above

and below the pivotal points 62 and the said levers 61 which are equipped with suitable locking means are adapted to be shifted to tilt the planes which are adapted to be operated simultaneously or independently. Each plane is provided with an operating lever and the partial rotary movement of each shaft will enable it to be turned from a horizontal position to an inclined position with its front portion either elevated or depressed above or below the horizontal and it will be clear that by the independent adjustment of the laterally extending side plane the equilibrium of the machine may be controlled. The operating levers 61 are located within the pilot house or cab and the connections extend from the levers at opposite sides of the crest of the body portion of the machine. The operating levers are preferably mounted on a single transverse shaft and the side planes are located in advance and in rear of the same.

The airship is equipped at the front end of its body portion with an elevating plane 63 and at its rear end with a rudder 64 which will of course be connected with suitable operating means and as any preferred form of operating mechanism may be employed illustration of the same is deemed unnecessary. The elevating plane 63 is mounted in a recess or opening 63^a in the ledge or extension 10^a and it is hinged or pivoted by a transverse shaft 63^b. The shaft 63^b which is journaled in suitable bearings of the ledge or extension is provided with a central operating arm 63^c to which a reach rod 63^d is connected. The reach rod 63^d extends into the body of the airship to suitable operating means. The airship is designed to be equipped at opposite sides of its longitudinal space or compartment with tanks 66, preferably of cylindrical form extending longitudinally of the body and designed in practice to be divided into a plurality of separate compartments, each compartment to be connected with the engines, and the connections to be made at the terminal portions of the compartments so that a supply of oil will be assured to each engine in whatever position the airship may assume. Also the partitions dividing the compartments of the tank will be provided with suitable valves to enable the liquid to flow through the partitions and equalize the contents of the several compartments.

The airship in practice is designed to be equipped with the necessary means for enabling access to be had to the various portions of the airship and with all the usual equipment for the accommodation of the occupants and for the control of the machine.

The crest of the body portion of the airship is substantially an arch while the crest

of the end portions of the machine is sharp and forms a ridge 67 for the purpose of dividing the air and enabling the ends of the machine to move upwardly with a minimum resistance and in the forward movement of the machine of the said relatively sharp crest or ridge in dividing the air sends the same along the sides of the body and thereby resists and materially eliminates the tendency of the air to retard the forward progress of the machine and depress the front end of the same. The parachute or umbrella shape of the body portion of the airship gives the greatest possible resistance to the air in any tendency of the airship to move downward and permits only a minimum resistance of the air to the upward movement of the body portion as the umbrella shape or parachute form operates in the nature of a wedge and enables the air to divide readily and pass downwardly at each side of the body portion in the upward rising movement of the machine. Also the particular shape of the body portion of the machine affords the greatest air density in which the propellers may operate to the greatest advantage in propelling the machine. By virtue of the propellers operating entirely within the trough and the particular shape of the body portion and its tendency to compress and confine the air between the opposite sides of the body portion, the air in the trough will be moving at a very high rate of speed and as air moving with great force always has its density increased the machine will saddle a volume of relatively dense air in which the current through the trough will constitute the back bone. The parachute or umbrella shape of the machine gives to the body thereof a tendency to collect the air in and pack the same between the sides of its longitudinal trough. The collecting and packing of the air is at a point beneath the body of the airship where advantage is taken of the same by the propellers and such packing and increasing of the density of the air does not affect or retard the forward movement of the same but on the contrary enables the machine to be driven through the air with a greater speed than would otherwise be possible.

The rotating propeller planes with their exterior or lower convex surfaces sloping upward will afford a lifting power to the airship when the latter moves forwardly, and the propellers downward driving force increases the lifting effect and also provides stabilizing means and will operate to maintain the machine in a steady condition. When the front end of the body is elevated the rotary propeller planes are increased in their slope or inclination and the said rotary propeller planes are adapted to operate independently of or simultaneously with

the horizontal propeller blades. The adjustable side planes are adapted to lift the airship and balance the same while in flight and if there is any tendency when the airship is in flight for the same to roll sideways such tendency can be counteracted and the position of the machine corrected by adjusting the said side planes. The airship is adapted to easily rise and maintain its flight with a maximum load as it has the combined lifting effect of the gas drums or bags, the side planes, the rotary propellers, and the shape of the body with its elevating plane and driving propellers.

This will enable the airship to rise from the ground or descend to the ground without the necessity of an aviation field or similar landing. Also the airship is adapted to hover and maintain a firm stable position and is particularly adapted for use as a fighting machine as devices of offense and defense may be operated from above and below. All of the machinery, material and the operators are protected inside of the machine which may be operated in the most severe weather. Also by reason of the spaces or compartments formed by the gas drums or bags the temperature inside of the airship may be maintained at any desired degree. If heat is desired it can be supplied by any suitable heating device and if cool air is required it may be obtained by providing valves in the floors or walls of the machine and the necessary draft may be obtained for expelling foul air and supplying fresh air. The crest of the body portion of the airship provides advantageous places for the position of pilot houses or cabs and any desired number may of course be employed. The airship owing to the propellers operating in air of a maximum density is adapted to develop a relatively high rate of speed and owing to the many means of control the airship will afford a maximum safety to the occupants. Also the tapered front terminal portion of the body of the airship by having substantially the form of a duck bill it is adapted to divide the air and enable the airship to move forwardly with a minimum resistance and the particular shape of the front portion enables the body of the airship to respond readily to the means for changing the direction of the body. The airship possesses the advantageous features of a Zeppelin and an aeroplane without the disadvantages of either type of machine and it also combines with the said features the advantages of a parachute not only to facilitate an easy descent but also to enable the driving propellers to operate on air of maximum density. The gyratory element constituted by the rotary propeller plane contributes greatly to the safety of the airship and the perfect control of the same by maintaining the body of the

airship in a firm and steady position both while the airship is in motion and when the same is stationary.

The horizontal propellers may be arranged in any other desired position with relation to the propeller plane to enable them to be operated by the same shaft.

What is claimed is:

1. An airship of the class described including a body portion substantially crescent shape in cross section and provided at the bottom with a central longitudinal trough or space and a propeller operating in the said space, said body consisting of spaced inflated buoyant sections and an intervening compartment.
2. An airship of the class described including a body substantially crescent shape in cross section and provided at the bottom with a longitudinal trough or space and having opposite bottom portions extending downwardly from the trough or space at an inclination, said body having a compartment located above the trough and a propeller operating in the trough or space.
3. An airship of the class described including a body portion approximately crescent shape in cross section and having a central longitudinal trough, the bottom of the body being inclined downwardly at each side of the trough and rounded at the sides of the trough, said body portion having a compartment located above and at the sides of the trough.
4. An airship of the class described including a body portion substantially crescent shape in cross section and provided with a tapered terminal substantially wedge-shaped portion, said body portion also having a longitudinal trough extending throughout the length of the body and along the tapered terminal portion of the same and gradually increasing in depth from the ends of the airship to the body portion.
5. An airship of the class described including a body substantially crescent shape in cross section and having longitudinally tapered end portions, said body being also provided with a trough extending longitudinally of the bottom of the body and the ends, the ends of the body portion being inflated and buoyant and the body portion having inflated buoyant sections and an intervening compartment located above the said trough.
6. An airship of the class described including a body substantially crescent shape in cross section and having longitudinally tapered ends of approximately the width of the body and provided with a central longitudinal trough located at the bottom of the body and extending from one end to the other of the same and gradually increasing in depth from the ends of the airship to the body portion.
7. An airship of the class described including a body substantially crescent shape in cross section and having tapered terminals consisting of buoyant inflated sections, the space between the tapered terminals being provided with inflated buoyant sections and an intervening compartment, said body being also provided with a central longitudinal trough arched at the top and a plurality of propellers operating in the trough.
8. An airship of the class described including a body substantially crescent shape in cross section and having a central longitudinal trough located at the bottom of the body, said body comprising a plurality of gas bags of substantially the cross sectional shape of the body and spaced apart to form passages extending longitudinally and transversely above the trough.
9. An airship of the class described including a body and a rotary propeller plane located below the body and having a plurality of propeller blades movable into and out of engagement with the said plane to permit the plane to rotate independently of the propeller blades.
10. An airship of the class described including a body of substantially crescent shape in cross section and rotary propeller planes located below the body at opposite sides of the trough and provided with propeller blades movable into and out of engagement with the planes to permit the planes to rotate independently of the propeller blades.
11. An airship of the class described provided with a rotary plane constituting a gyratory stabilizing member consisting of a substantially saucer shaped body presenting a lower convex surface.
12. An airship of the class described provided with a propeller plane constituting a gyratory stabilizing member consisting of a substantially horizontal bottom portion and inclined outer portions, propeller blades and means for connecting the propeller blades with and disconnecting them from the said planes to permit the latter to rotate independently of the propeller blades.
13. An airship of the class described including a lower rotary propeller plane, a shaft connected with the plane, a sleeve slidable on the shaft, propeller blades connected with the sleeves and means for moving the blades into engagement with the said plane, the plane and the blades having coacting interlocking means.
14. An airship of the class described including a rotary propeller plane having a central flat portion provided with radial openings and propeller blades movable into and out of engagement with the openings and adapted to extend below the said plane.
15. An airship of the class described in-

cluding a substantially horizontal rotary propeller plane provided with radial openings, means for rotating the propeller plane, propeller blades movable into and out of the said openings and adapted to project above and below the said plane.

16. An airship of the class described including a rotary propeller plane having radial openings, a shaft connected with the propeller plane, a sleeve slidable on the shaft and having propeller blades movable into and out of the said openings, said blades being provided with lugs located at the terminals of the blades to engage the plane and anti-friction devices carried by the sleeve and located at the inner ends of the blades and arranged to run on the plane.

17. An airship of the class described including a substantially vertical shaft, a rotary plane mounted on the shaft and having radial openings, a sleeve slidable on the shaft and provided with blades movable to and from the said openings, an operating lever having a fork connected with the said sleeve, an outer sleeve and braces extending from the outer sleeve to the rotary propeller plane.

18. An airship of the class described including a body substantially crescent shape in cross section and having a central trough at the bottom, propellers operating in the trough, horizontal propeller planes located beneath the body at opposite sides of the said trough and provided with propeller blades movable into and out of action and laterally extending planes projecting from the upper portion of the body and mounted for tilting movement.

19. An airship of the class described including a body substantially crescent shape in cross section and having tapered end portions, said body being provided also with a longitudinal trough located at the bottom of the body between the sides thereof and extending the entire length of the body, the tapered terminal portions of the body having relatively sharp ridges or crests, adjustable planes extending laterally from the

top of the body and rotary propeller planes located beneath the body at opposite sides of the trough and having outer inclined portions and provided with propeller blades movable into and out of operative position to enable the propeller planes to rotate independently of the blades.

20. An airship of the class described including a buoyant body provided with a front longitudinally tapered terminal portion of approximately the width of the body and transversely curved at the upper face to form an approximately duck bill shaped front.

21. An airship of the class described including a buoyant body provided with a tapered front portion of approximately the width of the body, said front portion being provided at the extremity with a forwardly projecting laterally extending horizontal ledge and a pivotally mounted plane carried by the ledge.

22. An airship of the class described including a buoyant body provided with a tapered front portion of approximately the width of the body, said front portion being provided at the extremity with a forwardly projecting thin horizontal ledge, said ledge being provided at the front with a central opening and an elevating plane pivotally mounted in the opening of the ledge.

23. An airship of the class described including a rotary plane rotating on a substantially vertical axis and consisting of a gyratory member of substantially saucer-shape presenting a concave upper face.

24. An airship of the class described including a gyratory member arranged horizontally and consisting of horizontal portions and inclined portions extending upwardly from the horizontal portion.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS M. FINLEY.

Witnesses:

L. P. DRISKILL,
W. A. ENGLE.