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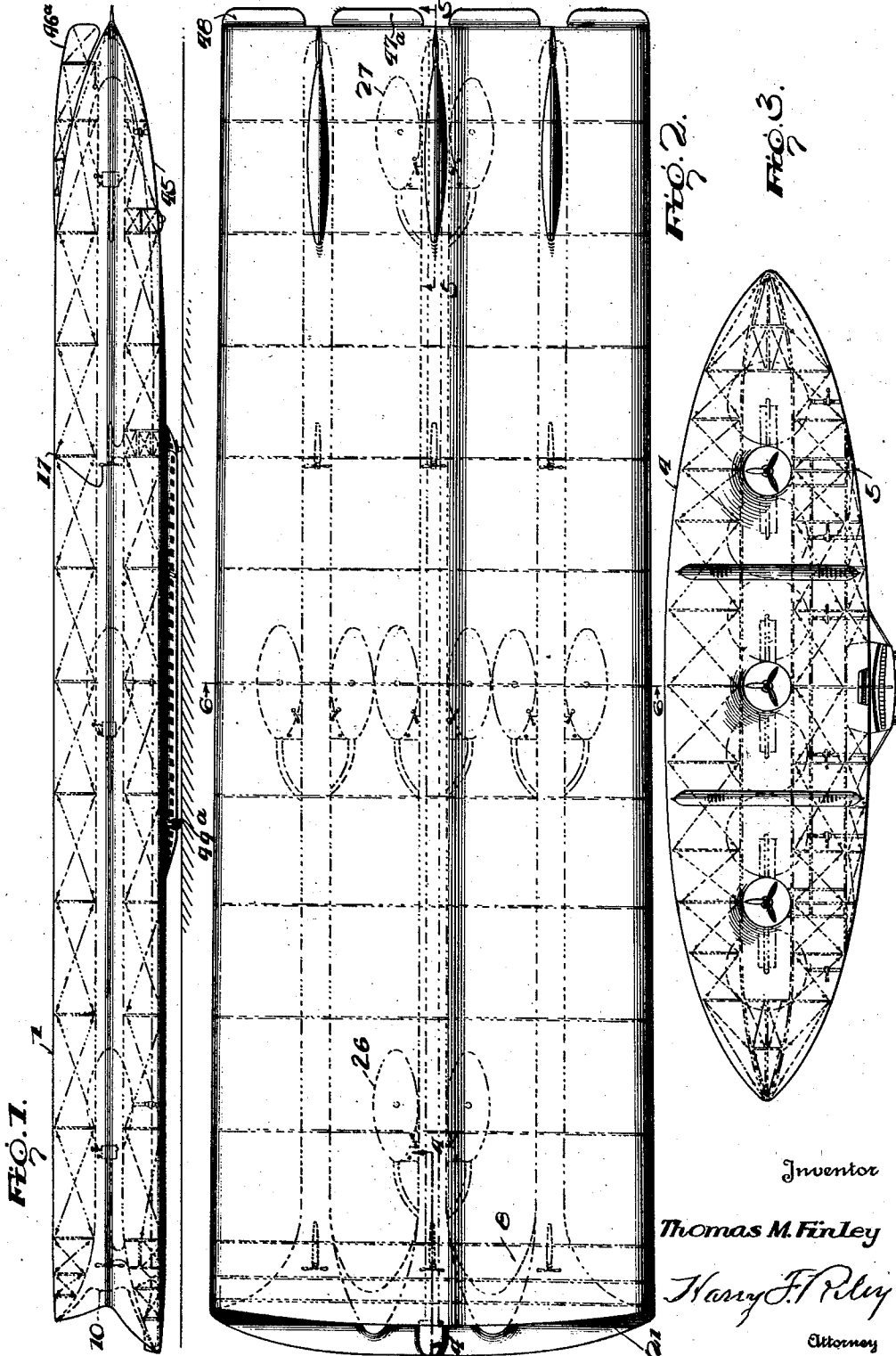
T. M. FINLEY

2,252,342

SEMIDIRIGIBLE FLYING MACHINE

Filed Aug. 5, 1938

3 Sheets-Sheet 1



Inventor

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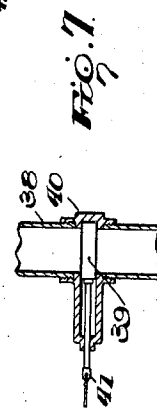
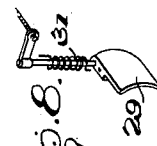
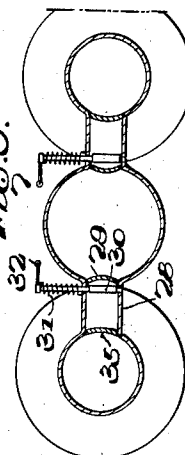
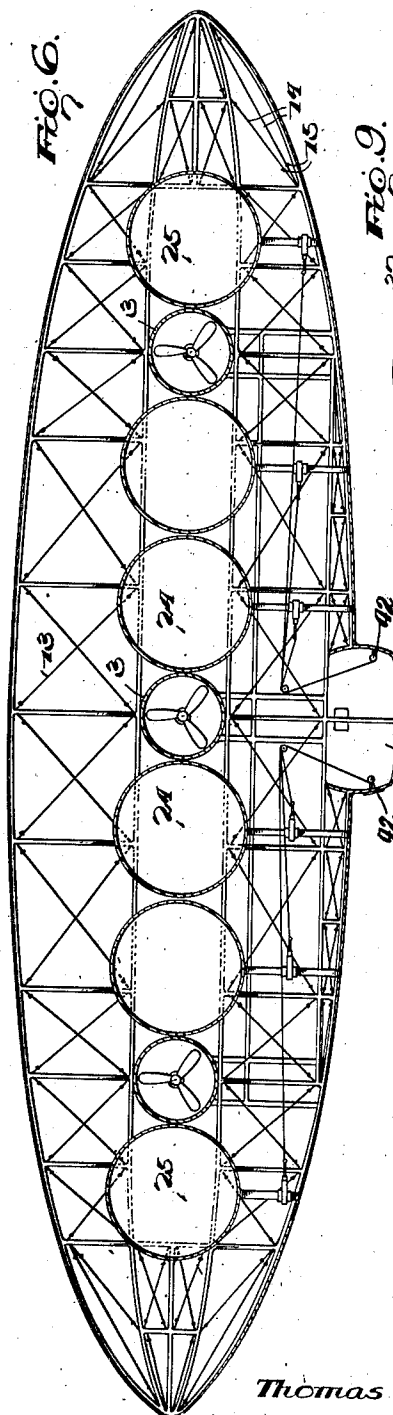
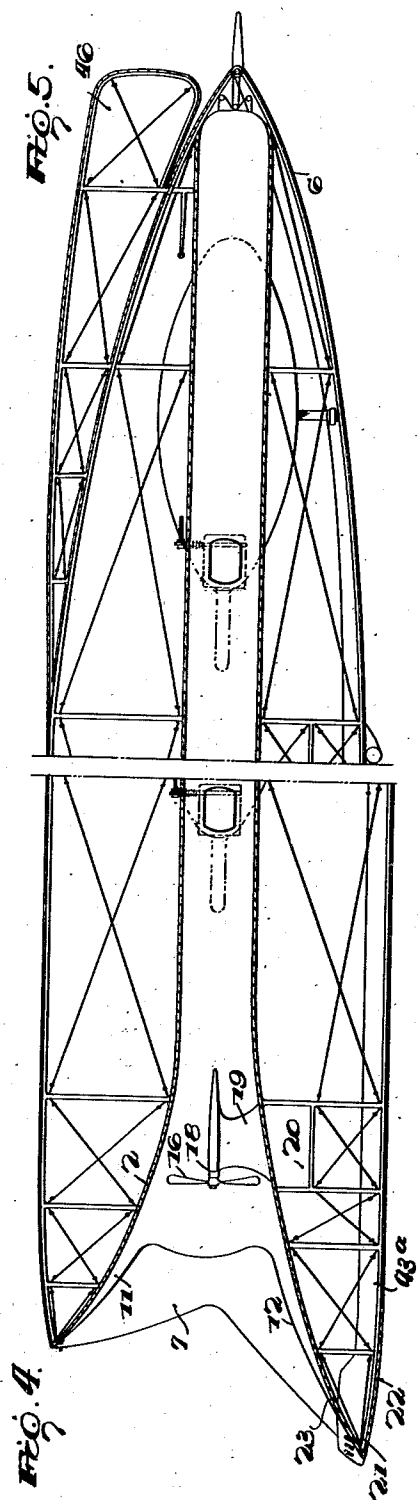
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SEMIDIRIGIBLE FLYING MACHINE

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3 Sheets-Sheet 2



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SEMIDIRIGIBLE FLYING MACHINE

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3 Sheets-Sheet 3

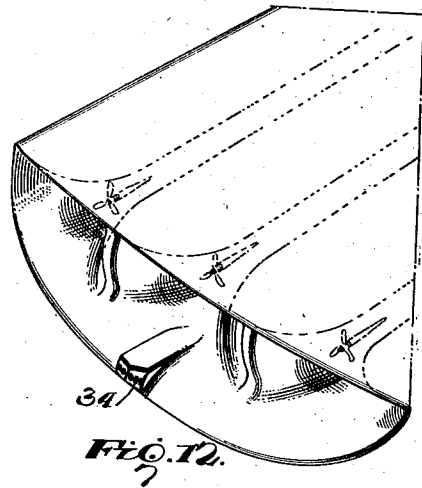
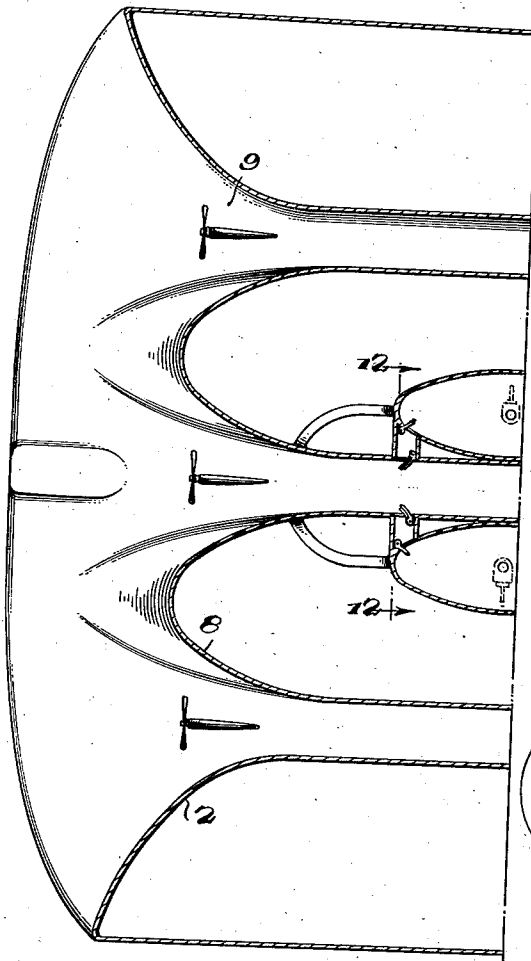


FIG. 11.

FIG. 10.

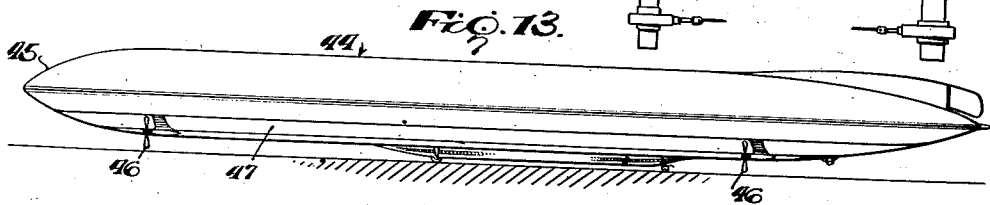
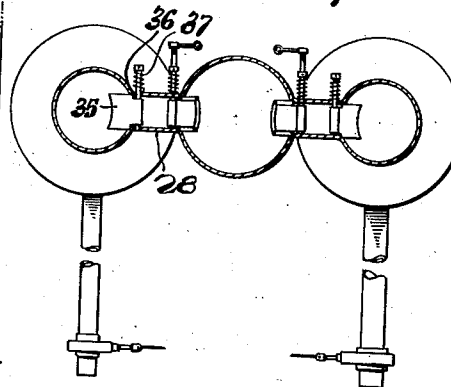


FIG. 13.

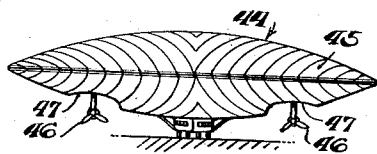


FIG. 14.

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UNITED STATES PATENT OFFICE

2,252,342

SEMIDIRIGIBLE FLYING MACHINE

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Application August 5, 1938, Serial No. 223,306.

11 Claims. (Cl. 244—5)

The invention relates to a semi-dirigible flying machine.

The primary object of the present invention is to provide a semi-dirigible flying machine having an airfoil body substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension and capable of imparting to a flying machine of this character all the advantageous characteristics of a heavier than air flying machine without any of the disadvantages of the latter.

It is also an object of the invention to provide a semi-dirigible propeller driven flying machine having a hollow gas holding airfoil body substantially oblong in plan view and approximately prolate spheroid cross sectionally and forming substantially a flying wing and adapted to travel in the direction of its greater dimensions and to be flown either heavier or lighter than air.

A further object of the invention is to provide a semi-dirigible propeller driven flying machine substantially oblong in plan view and approximately prolate spheroid cross sectionally having a gas holding body provided at the front with a flaring entrance opening and having a plurality of tubes forming air tunnels and extending longitudinally through the body from the flaring entrance to the rear end of the body and receiving propellers adapted to produce pre-slip streams at the front flaring entrance and slip streams in the tunnels with the attendant vacuums and advantages illustrated, described and claimed in Patent No. 2,115,711, granted to me May 3, 1938, whereby the air resistance usually encountered by lighter than air flying machines is removed from the front of the machine and the air expelled with rocket effect at the rear ends of the tunnels to assist or augment the propulsion of the machine as set forth in the aforesaid patent.

A further object of the invention is to provide a semi-dirigible flying machine having a hollow gas holding airfoil body forming substantially a flying wing and provided at the front at the bottom of its flaring entrance opening with an apron wing possessing the characteristics of an airplane wing in presenting a lower ground or lifting surface and having vacuum action at its upper surface produced by the propellers for driving the flying machine, said apron wing functioning to assist in lifting the front of the machine and prevent the propellers displacing supporting air from beneath the machine.

A further object of the invention is to provide a semi-dirigible flying machine having a gas holding airfoil body approximately oblong in plan view and cross sectionally and substantially prolate spheroid cross sectionally and forming a flying wing movable in the direction of its greater dimension and having a flaring entrance opening at the front end and a plurality of laterally spaced tunnels extending from the entrance opening longitudinally through the body to the rear end thereof, said body being provided with air containers located adjacent the tunnels and having means for enabling air under pressure induced by the velocity of the slip stream to be introduced into the air containers to provide ballast for the machine and also for balancing the machine to enable the same to run on an even keel and to be maintained in parallelism with the surface of the ground whether the machine is in motion or not.

It is also an object of the invention to provide means for manually controlling the introduction of air into the air containers and for releasing and exhausting it therefrom, whereby the flying machine may be instantly converted into a machine heavier than air or lighter than air.

Another object of the invention is to provide means for enabling the air released or exhausted from the air containers to be discharged at points beneath the body of the machine to assist the lifting or rise of the machine from the ground by both the rocket effect of the discharging air and also by increasing the density or volume of air directly beneath the machine.

A further object of the invention is to provide an all metal semi-dirigible flying machine having an airfoil or flying wing body having three parallel slip stream tunnels containing six propellers and six motors and possessing the advantages of the airplane in respect to speed and maneuverability and at the same time the advantages of large lighter than air machines in lift or carrying ability and safety element.

It is also an object of the invention to provide a semi-dirigible flying machine which because of its ability to maintain itself in parallelism with the earth's surface regardless of whether or not it is in forward motion, in conjunction with the great number of square feet of ground or lifting surface, creates a gigantic and effective parachute effect adapted even should the machine be flying heavier than air to prevent it from settling at a speed which would produce fatalities or material injuries to the machine.

Another object of the invention is to provide

a semi-dirigible flying machine having an airfoil or flying wing body which will have comparatively little drift and no roll and which owing to its capability of banking will be adapted for easy and quick turning either to the right or left.

It is also an object of the invention to provide a semi-dirigible flying machine having an airfoil or flying wing body adapted owing to its particular shape to enable any type of truss framework extending either longitudinally or transversely of the body to be employed, whereby the supporting framework may be made sufficiently strong to withstand all the stress and strains to which a flying machine of this type may be subjected.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and 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 side elevation of the semi-dirigible flying machine constructed in accordance with this invention.

Figure 2 is a plan view of the same.

Figure 3 is a front elevation of the flying machine.

Figure 4 is an enlarged longitudinal sectional view of the front portion of the machine.

Figure 5 is a similar view of the rear portion of the machine.

Figure 6 is an enlarged transverse sectional view taken substantially on the line 6—6 of Fig. 1.

Figure 7 is a detail view of the valve for controlling the release or discharge of the air from one of the air containers.

Figure 8 is a detail perspective view of one of the hinged scoops of the air inlet of one of the containers.

Figure 9 is an enlarged detail sectional view illustrating the arrangement of the air containers at the opposite sides of one of the tunnels and showing the air inlets with the scoops and automatic back pressure valves, the scoops being in their closed position.

Figure 10 is a similar view showing the scoops in open position.

Figure 11 is an enlarged horizontal sectional view of the front end of the machine illustrating the arrangement of the hollow extensions of the body.

Figure 12 is a perspective view of the front end of the body.

Figure 13 is a side elevation of a modification of the invention in which the air tunnels are omitted.

Figure 14 is a front elevation of the flying machine shown in Fig. 13.

Referring particularly to the form of the invention illustrated in Figs. 1 to 12, inclusive, of the accompanying drawings, the all metal semi-dirigible flying machine body comprises an outer shell 1 of welded aluminum sheet metal, central and side longitudinal tubes 3 of similar material and a front inner tapering shell 2 of aluminum sheet metal with which the tubes 3 are connected and from which the said tubes extend longitudinally through the body of the flying machine to the rear end thereof. By the term semi-dirigible

flying machine is meant a flying machine which may be flown either as a lighter than air machine or as a heavier than air machine and when flown as the former will have all the characteristics of a dirigible flying machine and when flown as a heavier than air machine will have all the characteristics of an airplane. Instead of employing aluminum sheet metal any other suitable material may, of course, be employed in the construction of the flying machine body. The flying machine body, as clearly illustrated in Fig. 2 of the drawings, is substantially oblong in plan view, and is approximately prolate spheroid cross sectionally, as clearly illustrated in Fig. 6 of the drawings, being of substantially the same shape and possessing the same characteristics as to shape as the superstructure or body of the aeromarine boat shown and described and claimed in a co-pending application filed February 2, 1938, Serial No. 188,377. The body tapers laterally outwardly at each side from the center presenting an upper convex surface 4 and a lower convex surface 5. While curved convex surfaces are most advantageous in affording maximum ground or lifting surface the shape of the body in its lateral taper from the center to the side edges may be varied. By ground or lifting surface is meant the lower surface of the body which corresponds to the lower surface of the wing of an airplane and which incident to the vacuum at the top surface of the body is acted on by the air whereby the latter is caused to exert a lifting force against the bottom of the body.

The rear end of the body is tapered vertically as clearly illustrated at 6 in Fig. 5 of the drawings, and the body is provided at its front flaring entrance 7 at points between the tunnels with forwardly tapered hollow body extensions 8 which are rounded transversely or horizontally at their front or outer portions and which with the inner shell 2 form separate tapering auxiliary mouths 9 for the tunnels formed by the longitudinal tubes 3. The central portions 10 of the body extensions 8 are slightly rounded or bowed forwardly when viewed in side elevation and the terminals 11 and 12 of the body extensions are tapered outwardly and merge into the flaring entrance opening 7 at the top and bottom thereof. Besides forming separate auxiliary mouths 9 for the tunnels the body extensions also increase the gas capacity of the body.

The tunnels formed by the tubes 3 are laterally spaced apart, as clearly illustrated in Fig. 6 of the drawings, and the tunnel forming tubes in actual practice do not add anything to the weight of the flying machine body as they constitute portions of the supporting framework 13 which is of truss formation and because of the relatively shallow depth of the prolate spheroid shaped body any desired form of truss disposed either longitudinally or transversely of the body may be employed. Also the body is reinforced and stiffened at intervals by straight cables having turnbuckles 15 and connecting curved sections of the outer shell, as clearly illustrated in Fig. 6 of the drawings. The cables are adapted to prevent any inward collapse of the connected portion of the outer shell and any tendency of the connected portion of the outer shell to be forced inwardly will place the cables 14 under tension and such tendency will be resisted by the cables, but rods or any other suitable connection may be substituted for the cables.

The flying machine is provided in each of the

tunnels with fore and aft propellers 16 and 17. The propellers which are arranged substantially as illustrated in the aforesaid patent, are of any desired type employed in airplanes and gas machines and are mounted on relatively short longitudinal shafts 18 which are suitably mounted in streamline gear housings 19 containing a suitable gearing (not shown) for connecting the propeller shafts with suitable motors (not shown) located in motor cabins 20 located within the body of the flying machine adjacent the tunnels, as clearly illustrated in Fig. 4 of the drawings. The body may be provided with the breather and ventilating means shown, described and claimed in the aforesaid patent, and which are omitted in the present application for convenience of illustration. The propellers 16 and 17 function, as shown, described and claimed in the aforesaid patent, to form pre-slip streams within the flaring entrance to the tunnel and the preslip stream has substantially the same velocity as the slip stream or blast of air from the propellers and create a vacuum space between the preslip stream and the walls of the flaring entrance as explained in the aforesaid patent.

The lower portion of the flaring entrance opening in the front of the body is extended forwardly in advance of the front edge of the top portion of the entrance opening to provide a lower apron wing 21 which has a lower ground or lifting surface 22. This lower surface coupled with the vacuum action induced by the propellers at the upper surface 23 of the apron wing enables the apron wing to function in the same manner as an airplane wing in producing a lifting effect at the lower face or surface while the vacuum exists at the upper surface. The apron wing at the bottom of the flaring entrance 7 assists in lifting the front of the machine both at takeoffs and during the operation of the machine while flying and prevents the propellers displacing supporting air from beneath the machine.

The flying machine body is provided between the central and side tunnels with pairs of horizontally disposed approximately egg-shaped air containers 24 constructed of suitable metal or other material and tapered longitudinally. The air containers 24 are circular in cross section and similar containers 25 are located at the outer sides of the outer tubes in transverse alignment with the air containers 24. The air containers 24 and 25 are arranged centrally of the flying machine body which is also provided with fore and aft air containers 26 and 27 arranged in pairs and disposed centrally of the front and rear portions of the flying machine body. The number and arrangement of the air containers may be varied, as will be readily understood, and each air container is provided with an air inlet 28, extending from the air container to an adjacent tunnel and provided at the tunnel with a pivoted air scoop 29 mounted on a vertical shaft or pivot 30 and curved in vertical section, as clearly illustrated in Fig. 9 of the drawings, in which the scoops are shown in closed position. The scoop 29 is adapted to be swung from the closed position illustrated in Fig. 9 of the drawings to the open position illustrated in Fig. 8, and when in open position extend into the tunnel sufficiently to divert a portion of the slip-stream into the air inlet 28 and through the same into the air container where the air will pack with tremendous pressure when the slip stream is moving at high velocity. The vertical shaft 30 is extended above the inlet and has disposed on it

a coiled spring 31 which tends to hold the scoop in closed position. The upper end of the shaft or pivot 31 is provided with a lever arm 32 and is connected by a suitable link or rod connection with any suitable operating means (not shown) designed to be located preferably within the pilot cabin 34 or other convenient place. The air inlet 28 is equipped at the inner end with an automatically closable back pressure valve 35 mounted on a suitable pivot 36 and adapted to be moved to its closed position by a spring 37 and normally maintained closed by internal pressure within the air container. The air entering the air container will open the valve 35 which will remain open as long as the scoop is in open position and air is passing through the air inlet and will close automatically as soon as the scoop is moved inwardly to closed position. The scoop when in closed position is located within the vacuum space between the wall of the tunnel and the slip-stream and will not interfere with the latter.

Each air container is also provided with an air outlet tube 38 preferably arranged vertically and extending downwardly from the air container through the lower portion of the body of the machine and discharging at the lower surface thereof, as clearly illustrated in Fig. 6 of the drawings. Each outlet or air exhaust tube 38 is provided with a valve 39 slidably mounted in a suitable casing 40 and connected by a suitable rod or link connection 41 with a lever 42 located in the pilot cabin or other convenient position. These levers are preferably distinguished from each other by distinctive coloring or other suitable means and are adapted to be operated to fill the containers with air under pressure and also to release the containers of compressed air so that the flying machine may be instantly converted from a heavier than air machine to a lighter than air machine and from a lighter than air machine to a heavier than air machine. Also the location of the air containers at the front and rear of the body and transversely across the same at an intermediate point between the ends thereof will enable the air packed in the containers not only to act as ballast but also for balancing the machine which by proper control of the compressed air within the containers may be maintained on an even keel or in parallelism with the surface of the earth.

The pilot cabin, as clearly illustrated in Fig. 12 of the drawings, is preferably located at the flaring entrance centrally of the apron wing at the upper face thereof. The body is also provided at the bottom with a cabin 43 which may be of any desired length and in addition to the usual landing gear 44a a buffer wheel 45a is provided at the rear portion of the body. The body is also provided at the rear end with air rudders 46a and with elevators 47a and ailerons 48a, all of which have the usual operating mechanism and the operation of the ailerons is employed in the banking of the machine in making turns to the right or to the left in a manner similar to the banking and control of airplanes.

The body is provided with a catwalk 43a designed in practice to be covered and extending along the body from the pilot cabin to the main cabin, but it may extend to other portions of the machine.

The body of the machine is designed to contain a volume of helium gas sufficient to render the machine and its cargo lighter than air, so that by discharging its ballast of compressed air it

may be flown lighter than air or for any other purpose, such as take-off, landings or hovering. Any of the well-known equipment may be employed for introducing, holding or containing and removing the gas, and illustration and description thereof are deemed unnecessary.

It will be seen that the semi-dirigible flying machine having the airfoil or flying body provided with the three parallel slip-stream tunnels, the number of which may be varied, provides a new and distinct type of flying machine embodying the best principles of the two older types, the airplane and the lighter-than-air machine, and also having incorporated in it novel and effective features exclusively its own and not heretofore embodied in any flying machine.

As hereafter explained, the two weak points of the heavier-than-air machine are the two strong points of the lighter-than-air machine, and that the two weak features of the lighter-than-air machine are the two strong factors in the heavier-than-air machine; so that each of these machines constitutes a solution of only one-half a machine which is entirely satisfactory. The present invention eliminates their two bad features and combines in a single unit or machine their two good features, producing a well-rounded, entirely satisfactory machine—something that has not heretofore been produced in a single machine.

The flying machine of the present invention eliminates the two basic and inherent evils of the conventional lighter-than-air machines and the two serious evils of the present heavier-than-air machine, or airplane.

The two older types above designated have many things in common; for instance, they have very much the same kind of controls, i. e., rudders, stabilizers, elevators, etc., and the same means of locomotion, to-wit, internal combustion motors and propellers. The airplane greatly excels in speed and maneuverability, while the large lighter-than-air machine excels in lift or carrying ability and safety element.

The airplane maintains its weight and that of the cargo in flight by virtue of its wing action only; that is, by the air pressure on the ground surface of the wings and body and the vacuum action over a portion of the wings and body top surface. Both these actions depend absolutely on the maintenance of high speed, and the instant it, for any reason, begins to lose speed, its flying power is diminished—if the loss of speed is unduly extended, the present heavy transport plane unavoidably comes down. The heavier the machine, the swifter and harder its fall. If it be merely loss of power, such machine may glide a certain distance and, if there be a prepared field with long runways available, a successful landing may be accomplished; however, if such field and runways are lacking, the result is disastrous.

An airplane in flight balances on a horizontal line across its body from tip to tip of wings at a point about half way between the leading or contact and trailing edges of the wings. This balance space or line is very narrow, so that the plane balances much as a seesaw board balances on a bar or rod or a tight-rope walker balances on the rope. To maintain flying balance, a plane depends entirely on its stabilizers and elevators. If they happen to lock or a stabilizer plane goes out, or the operating controls fail (all of which at times does occur), then there is almost surely another fearful disaster to record.

The modern airplane is a most perfect stream-

line body. This is for the purpose of increasing speed; which it does, tremendously. When one of these beautiful stream-line bodies, for any of numerous reasons, loses its directional balance, it shoots downward at frightful speed, almost like a bullet fired from a gun. During the last three or four years there have been many such crashes, where no one has lived to tell the story.

The narrow balance line of the airplane makes it very supple, with great maneuverability. For that reason it is a splendid war machine; however, the same thing constitutes it a very poor commercial unit.

The airplane's two strong points are its speed and maneuverability. Its two weaknesses are its low and costly carrying capacity and its extremely low safety element.

The airplane is used in commerce not because it is well adapted to such service, but because there has been no flying machine of superior principles yet developed for that purpose.

The lighter-than-air machine is the oldest flying machine in the world and yet there is not one in commercial use. Many millions of dollars have been expended and thousands of lives have been lost, but never yet has one been produced which was able to render constant service for any great length of time. There is the striking picture of them going into their hangars in September and coming out again the following May, fair-weather machines.

The unbroken line of failures in the conventional lighter-than-air machines is due to their faulty basic principles.

The first evil of the lighter-than-air machines is the fact that they are lighter than air. This, in conjunction with the fact that they are very slow machines, causes them to become the victims of the vagaries of air action—bouncing, rolling and dropping, causing great discomfort to passengers and crew.

Next, such a machine has no momentum in flight. Two forces are required to create momentum—weight and velocity. The lighter-than-air machine has neither. The application of greater power will not cure said evil, as the application of too much power has caused the destruction of many machines of this type.

The buoyant principle requires a very bulky body, as gas has a buoyance of only about one ounce to the cubic foot. When this great bulk is combined with the lighter-than-air principle, the result is a very slow response to the controls. If the wind is blowing adversely, it sometimes takes ten miles in which to turn one of these machines. On the larger of these machines the controls are nearly 800 feet from the front end, at which point the machine pivots. The operator will pull a control lever or wheel and some time will elapse before it will become evident that the machine is slowly responding to the control action.

This excessive bulk requires that the air be displaced a tremendous distance—for instance, some of the larger machines were 134 feet thick through their maximum diameter, which meant from the contact end of the body the air had to be displaced a distance of 67 feet in every direction. Consider how fast such displaced air would have to travel to get out from a body that is moving, say 70 miles an hour, when this air has to travel at an angle to the machine's body 67 feet in addition to the 70 miles of the machine's forward motion. Some of the effects are: very heavy head resistance and high pressures

upon the walls of the machine, and the greater the distance involved in the necessary air displacement, the greater the degree of pressure on the body of the machine. When the air is forced beyond the shoulders or extreme diameter of the machine's body, it is in what might be termed "cyclonic conditions"—it hammers, lashes and rolls, and at times even destroys the stabilizers located many hundreds of feet behind where the air is released.

The excessive thickness of these bodies, together with the fact that they are lighter than air, also causes excessive drift. It has been known that such machines sometimes drift farther than they are driven forward during the same interval of time. It is of record that a Zeppelin drifted far into the North Sea, with consequent discomfort to the passengers, who suffered from the extreme cold.

On such a cylindrical cigar-shaped body there is no place for the location of power units, or for the application of power. The Germans place their power units underneath the body and at or near the rear end of the machine. They have found that to be the best location they could find for power units, with the result that power is applied many feet below the center of the body's resistance, thus creating a side-draft, tending to raise the nose of the machine. They use two means to overcome that evil; first, the shift of the gravity center (in other words, they load the front end heavier than the back, so as to hold it down against the under-drag of the motors and propellers); second, the use of huge stabilizers. Both of such means absorb the power of the motors, thereby lowering the speed of the machine while at the same time throwing a tremendous strain on its framework. In the machine of the present invention, the application of the power is at the center of the mass or at the center of body resistance; and in the second place, the power is applied as in the case of the airplane, since the motors are pulling the machine forward instead of driving it.

The cylindrical, cigar-shaped, lighter-than-air machine pivots at the front end of the body in a sort of ball-and-socket manner, the dense air at the front end acting as the socket and the front end of the machine as the ball. The controls are at the extreme rear end; therefore, to change its directional course, the machine must move the rear end of its body before effecting any appreciable results at the front. This is not true of the machine of the present invention, because there is no air-pack at the front end of the body, and the machine will pivot at a point about half way between the front and rear ends of its body, more like the action of the airplane, without the disadvantages, such as tailspin, etc.

The cylindrical, cigar-shaped, lighter-than-air machine is not adapted to internal body truss work. Such a body is so deep that truss work cannot very well be installed; yet the need of it has been so tragically proved through the cracking up of numbers of these huge bodies.

The machine of the present invention remedies each and all of the above-mentioned evils—yet is constructed to use many millions of cubic feet of buoyant gas.

The two weak points of the lighter-than-air design are its lack of speed and lack of controllability, both on the surface and in flight. Its two strong points are great lifting or load-carrying power and superiority as to safety.

The flying machine of the present invention replaces the cylindrical so-called cigar shape by the highly efficient prolate spheroid wing body, an aerofoil or flying wing, which may or may not be inflated with buoyant gas. Such an aerofoil body or wing eliminates the plunging evil, so deadly in the airplane.

It is adapted to be launched from a landing field, to be landed on a field, and to be flown, heavier-than-air, and may be changed almost instantly, at the will of the operator, from heavier-than-air to lighter-than-air, or vice versa; and it may be flown at any desired weight, heavier-than-air within the capacity of the machine by virtue of the manipulation of the air ballast.

Because of the features of the present invention, the machine may be held parallel with the earth's surface regardless of whether or not the body is in forward motion. This, in conjunction with the great number of square feet of ground or lifting surface, creates a gigantic and effective parachute and means that, though the machine should be flying heavier-than-air, it can be prevented from settling at a speed which would produce fatalities, or from plunging with either end down.

Because of its relative thinness and its edged sides, the body will have comparatively small amount of drift and minimum roll and will, for the same reason, be adapted to easy and relatively quick turning to right or to left. The comparative thin wing-shape of the huge body adapts it to aileron action and control; and the machine under such action will bank on a turn as does an airplane, thus facilitating speed and safety in directional turns.

The comparative thinness of this huge flying wing formation admirably adapts it to internal truss construction. Such trusses may extend from the floor to top walls of the body, either through its length or width. There may, of course, be as many of these truss structures as desired. This feature is all-important as insurance against the machine's breaking up under the influences or effects of air rigors in flight or in landing.

The narrow balancing line of the airplane does not occur in the machine of the present invention for the reason that the balancing surface extends over a long area of the ground surface of the machine body of the present invention, preventing it from nose-diving or going into tailspins. The extended area of balance plus the buoyancy element of the machine effectually prevent nose-dives or tailspins, or sudden changes up or down.

In Figs. 13 and 14 is illustrated another form of the invention in which the body 44 has a closed tapered front end 45 and from which body the tunnels heretofore described are omitted. The propellers 46 are located exteriorly of the body, preferably in channels 47, which forms a flying wing and possessing all the advantages of the airfoil flying wing body heretofore described, and in addition thereto causes the air displaced by the body to travel in its displacement less than one third the distance traveled by air displaced by a cylindrical machine of the same displacement capacity.

What is claimed is:

1. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body approximately prolate spheroid cross sectionally and substantially oblong in plan view and forming a

5 flying wing having the characteristics of an airplane wing and arranged to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance opening and having a plurality of laterally spaced tubes forming air tunnels and extending longitudinally through the body from the flaring entrance to the rear end of the body, hollow body extensions arranged vertically in the flaring entrance at the spaces between the tubes and terminating short of the front end of the body and dividing the space within the flaring entrance and forming separate auxiliary mouths for the tunnels and increasing the gas capacity of the body, propellers operating in the tunnels, and means carried by the body for varying the weight of the body sufficiently for causing the machine to fly either as a lighter-than-air machine or as a heavier-than-air machine.

2. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in flying in the direction of its greater dimension, said body having a flaring entrance at the front end and provided with a plurality of tubes extending longitudinally through the body from the flaring entrance to the rear end of the body and forming air tunnels, the bottom of the flaring entrance of the body being extended in advance of the top portion of the entrance and forming an apron wing presenting a lower ground or lifting surface, and propellers operating in the tunnels and adapted to create a pre-slip stream in the entrance and a vacuum at the upper face of the apron wing.

3. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body having a flaring entrance at the front end and provided with a plurality of tubes extending longitudinally through the body from the flaring entrance to the rear end of the body and forming air tunnels, the bottom of the flaring entrance of the body being extended in advance of the top portion of the entrance and forming an apron wing presenting a lower ground or lifting surface, and propellers operating in the tunnels and adapted to create a pre-slip stream in the entrance and a vacuum at the upper face of the apron wing, and a pilot cabin located at and extending above the upper surface of the apron wing.

4. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having a plurality of longitudinal tubes spaced apart and extending from the flaring entrance to the rear end of the body, containers located in the spaces between the tunnels, means for introducing air under pressure from the slip streams of propellers into the containers and for confining the air therein and for

releasing the air therefrom to take on and remove ballast and to balance the machine.

5. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having a plurality of longitudinal tubes spaced apart and extending from the flaring entrance to the rear end of the body, propellers operating in the tunnels, containers located in the space between the air tunnels and having means for introducing air from the slip streams of the propellers into the containers for taking on ballast and for balancing the machine, and means for releasing and exhausting air from the containers and for discharging the released or exhausted air at the bottom of the body.

6. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having a plurality of tubes extending from the front entrance longitudinally of the body to the rear end thereof, propellers operating in the tunnels, air ballast and balancing containers arranged in pairs fore and aft and amidship, means for introducing air under pressure into the containers and for confining the air therein and for releasing and exhausting the air therefrom to take on and remove ballast and to balance the machine.

7. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having laterally spaced central and side tubes extending from the flaring entrance longitudinally of the body to the rear end thereof, propellers operating in the tunnels, air ballast and balancing containers located within the body and arranged in pairs between each of the tubes and also located at the outer sides of the outer tubes, means for introducing air under pressure into the containers and for confining the air therein and for releasing and exhausting the air therefrom to take on and remove ballast and to balance the machine.

8. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having a plurality of tubes extending from the front entrance longitudinally of the body to the rear end thereof, propellers operating in the tunnels, air ballast and balancing containers located within the body and having air inlets provided with scoops located at the tunnels and movable into the same for directing air from the slip streams of the propellers into the

containers, and automatically operable back pressure valves located at the inlets for retaining the air in the containers.

9. A combined lighter-than-air and heavier-than-air flying machine having a hollow gas holding initially lighter-than-air airfoil body and substantially oblong in plan view and cross sectionally tapered from the center to the side edges and forming substantially a flying wing adapted to travel in the direction of its greater dimension, said body being provided at the front with a flaring entrance and having a plurality of tubes extending from the front entrance longitudinally of the body to the rear end thereof, propellers operating in the tunnels, air ballast and balancing containers located within the body and having air inlets provided with scoops located at the tunnels and movable into the same for directing air from the slip streams of the propellers into the containers, automatically operable back pressure valves located at the inlets for retaining the air in the containers, discharge pipes extending from the containers and having controlling valves for releasing the air within the containers, and manually operable means connected with the scoops and with the valves of the discharge pipes for introducing air into the containers and for exhausting the air therefrom to take on and remove ballast and to balance the machine.

10. A combined lighter than air and heavier than air flying machine comprising a hollow gas holding airfoil body substantially oblong in plan view and cross sectionally tapered from the center to the side edges and materially greater in width than in height and forming a single flying wing and having the characteristics of an airplane wing and arranged to travel in the direction of its greater dimension and presenting at opposite sides of the center of its bottom portion lifting surfaces extending upwardly and outwardly to the side edges of the body to enable the latter to fly heavier than air as an airplane, said

body being provided at its front with a flaring entrance opening and having a plurality of tubes forming air tunnels and spaced from each other and from the side edges of the body and extending longitudinally through the body from the flaring entrance opening to the rear end of the body, propellers operating in the tunnels, and air ballast and balancing containers located within the body and means extending into said tunnels for introducing air under pressure into the containers and for confining the air therein and for releasing and exhausting the air therefrom to take on and remove ballast and to balance the machine.

11. A combined lighter than air and heavier than air flying machine comprising a hollow gas holding airfoil body substantially oblong in plan view and cross sectionally tapered from the center to the side edges and materially greater in width than in height and forming a single flying wing and having the characteristics of an airplane wing and arranged to travel in the direction of its greater dimension and presenting at opposite sides of the center of its bottom portion lifting surfaces extending upwardly and outwardly to the side edges of the body to enable the latter to fly heavier than air as an airplane, said body being provided at its front with a flaring entrance opening and having a plurality of tubes forming air tunnels and spaced from each other and from the side edges of the body and extending longitudinally through the body from the flaring entrance opening to the rear end of the body, propellers operating in the tunnels, air ballast and balancing containers located within the body, means extending into said tunnels for introducing air under pressure from the slip streams of the propellers into the containers and for confining the air therein and for releasing and exhausting the air therefrom to take on and remove ballast and to balance the machine.

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