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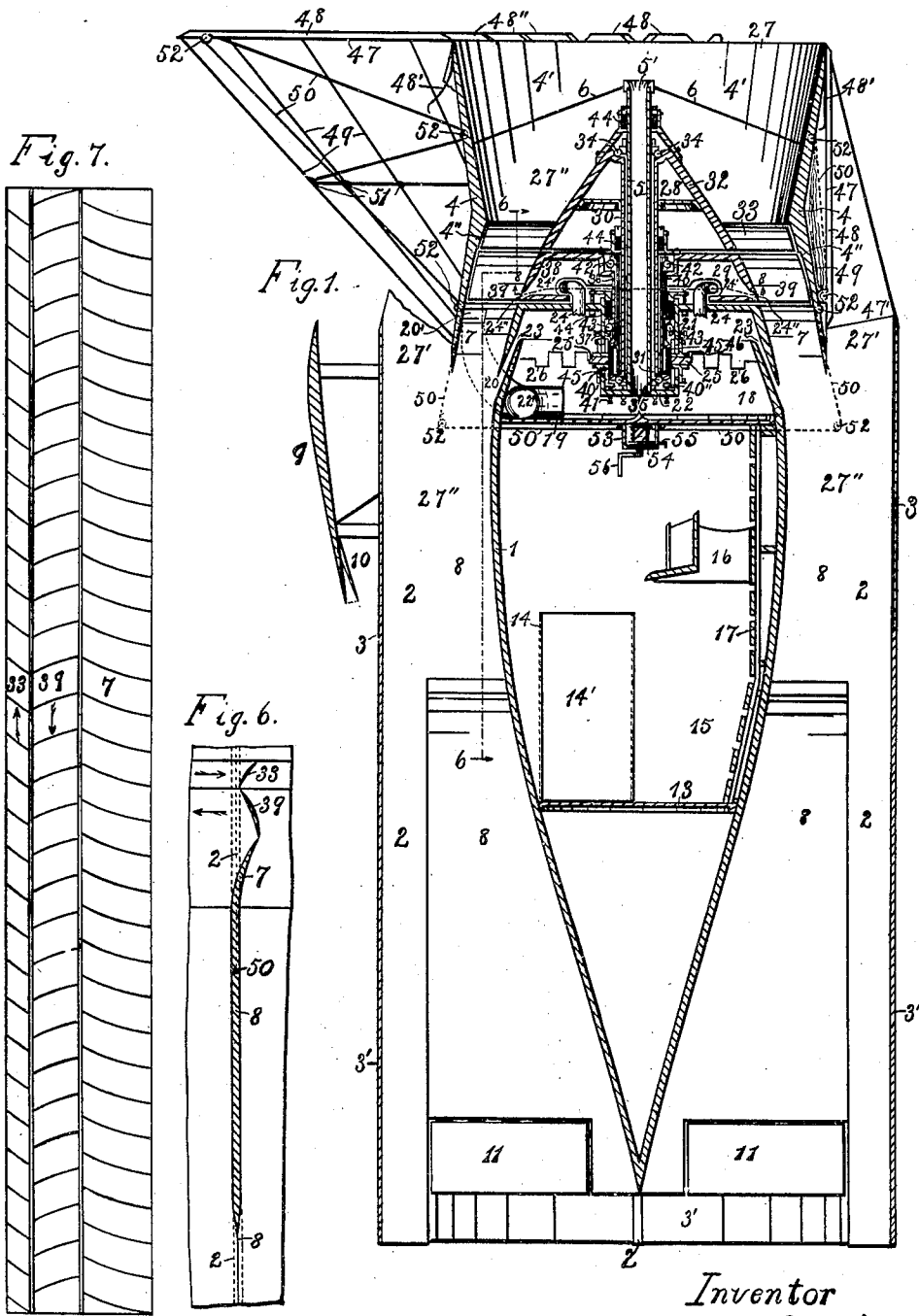
D. E. VAN VACTOR

1,907,394

AEROPLANE

Filed Dec. 11, 1930

4 Sheets-Sheet 1



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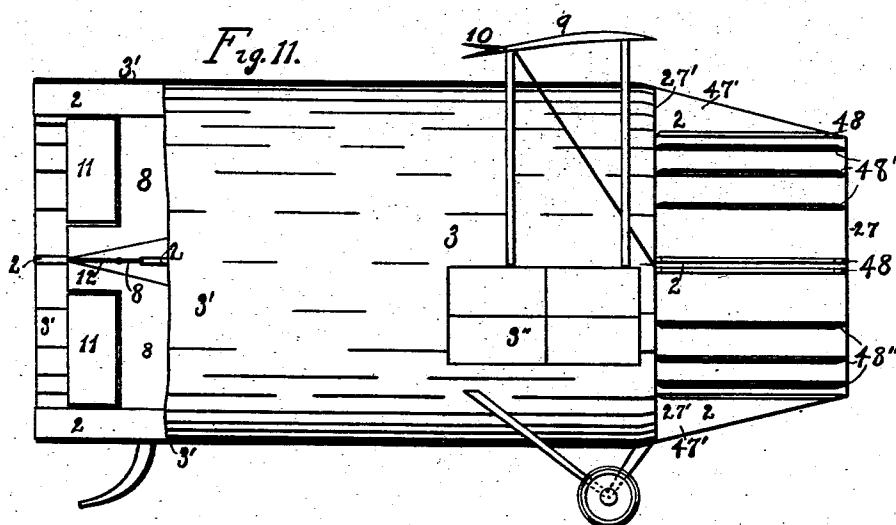
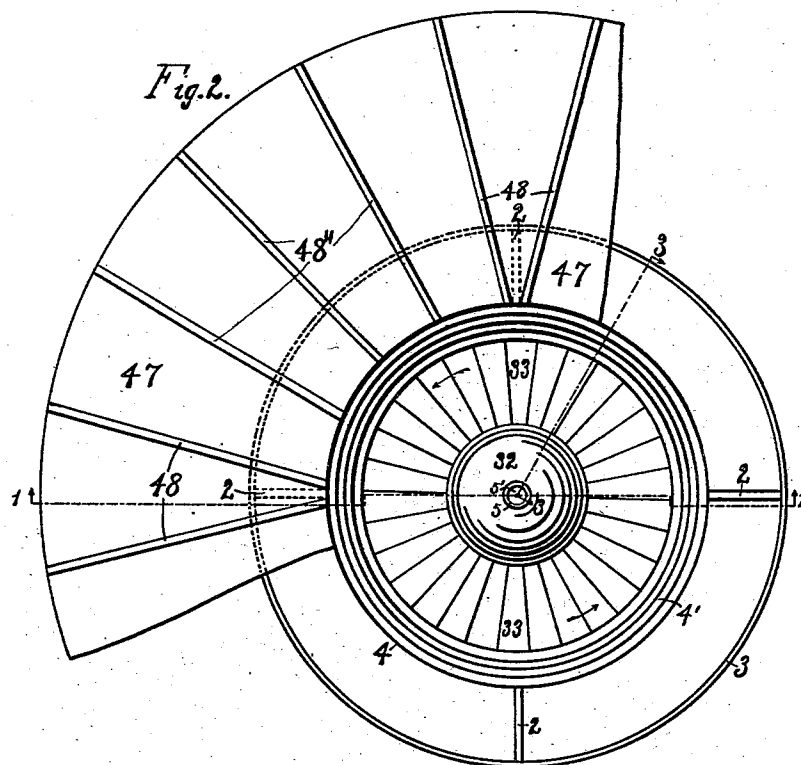
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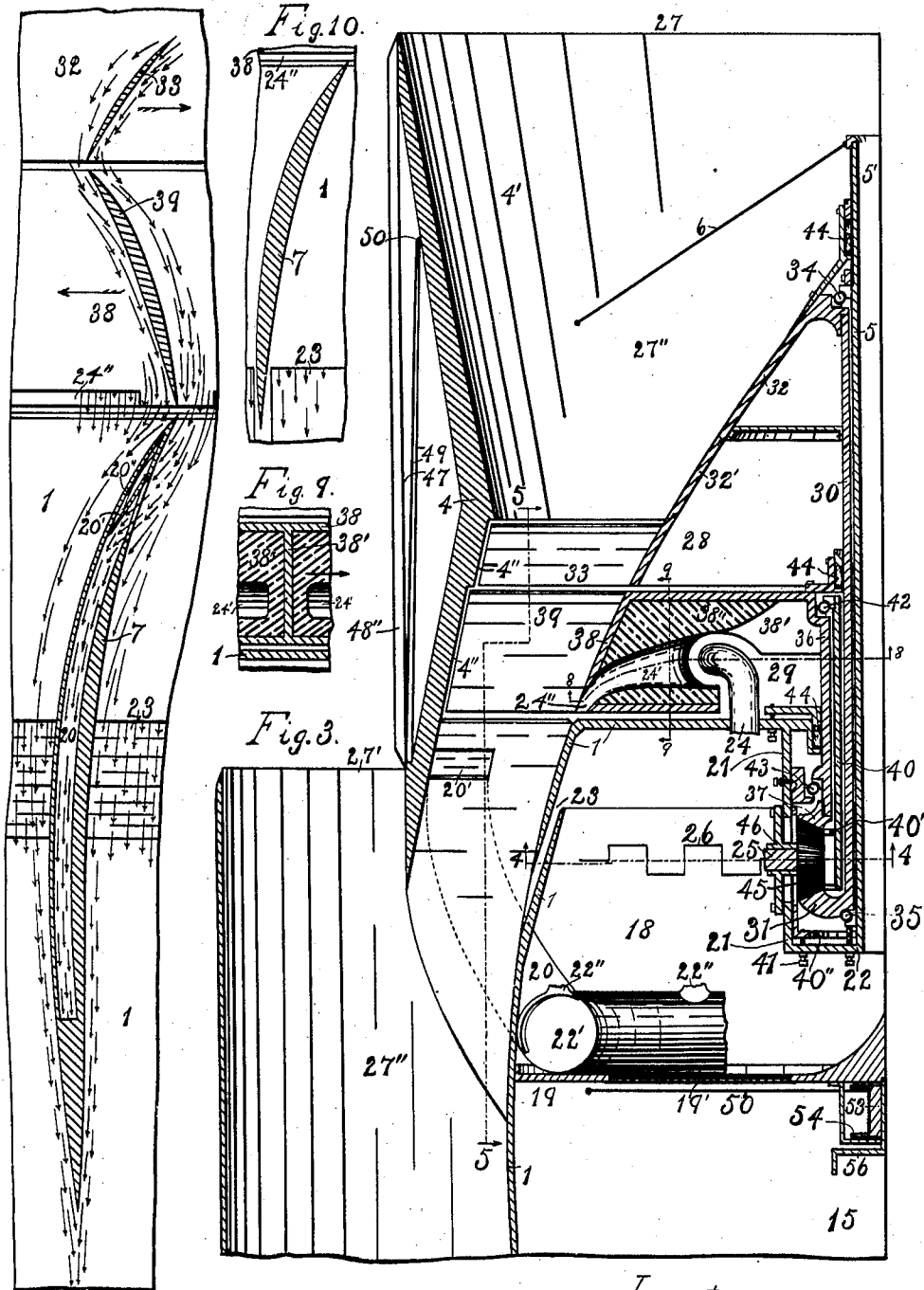


Fig. 5.

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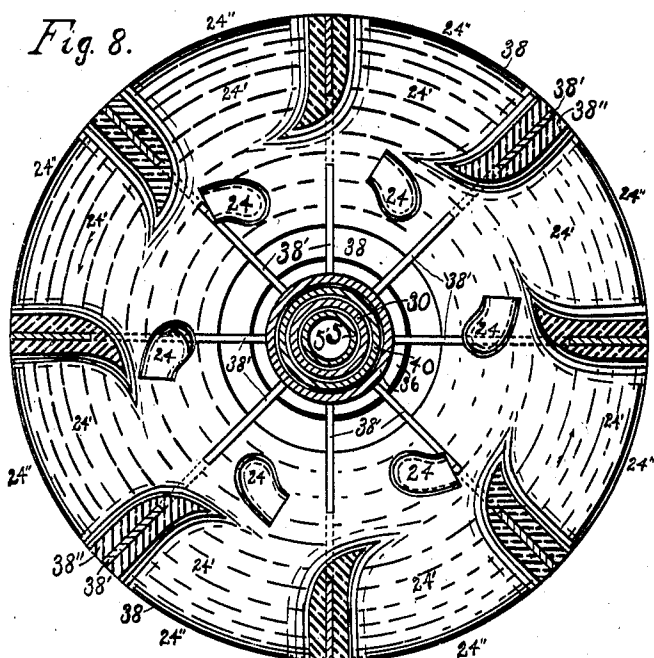
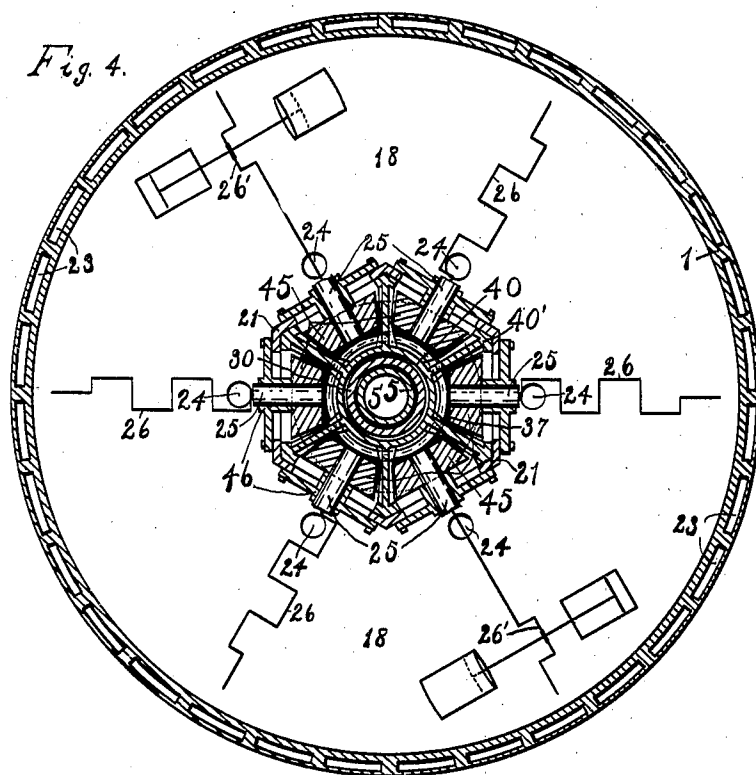
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AEROPLANE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

DAVID E. VAN VACTOR, OF EVANSTON, ILLINOIS

AEROPLANE

Application filed December 11, 1930. Serial No. 501,576.

The objects of my invention are, first, to provide means for vertical and horizontal ascension and landing; second, to provide a system of propulsion of uniform efficiency at all speeds of the craft; third, the application of the aggregate power of multiple prime movers to a single effective system of propulsion with a minimum of friction; fourth, to gain higher speed, and greater safety in aerial transportation; fifth, to provide a means for compressing air to the required density for super-charging the power plant units, and to sustain life in high altitudes; sixth, to reduce the noise of operating aeroplanes; and seventh, to provide a muffled and forced exhaust for the power plant.

These objects are attained by the preferred mechanism and means, illustrated in the drawings and described herein, and pointed out in the claims.

In the drawings, Fig. 1 is a vertical sectional view with the machine in an upright position, showing fragments of the landing sail, extended on one side to illustrate its position for landing, and collapsed on the other side to illustrate its position for flight, on the line 1 1, Fig. 2; Fig. 2 is a plan view with the aerofoil and guys removed, with a fragment of the landing sail extended to illustrate its position for landing; Fig. 3 is an enlarged fragmental sectional view of details, showing one side of which the other is the counter part, on the line 3 3, Fig. 2; Fig. 4 is a transverse sectional view of the driving mechanism, and of the fuselage, on the line 4 4, Fig. 3; Fig. 5 is an enlarged sectional view of a front and rear propeller blade and an intermediate stationary helical blade elongated and containing an air inlet and conduit, on the line 5 5, Fig. 3; Fig. 6 is a sectional view of a front and a rear propeller blade and a helical blade which is merged at its trailing edge into a stabilizing web but not showing the air inlet and conduit, on the line 6 6, Fig. 1; Fig. 7 is a diagrammatic view of the periphery of the two series of propeller blades and of the series of helical blades, represented upon a plane surface, to illustrate means for producing a frequency of vibration in the air

above the upper limit of audibility; Fig. 8 is a sectional view showing a muffled and forced exhaust system, on the line 8 8, Figs. 1 and 3; Fig. 9 is a sectional view of a blower blade, on the line 9 9, Fig. 3; Fig. 10 is a sectional view of an intermediate helical blade unmodified; Fig. 11 is an elevation with parts cut away, showing the usual landing equipment.

The fuselage 1, and the standards 2, constitute the craft's principal parts in the framework. To them are interbuilt the inclosing shell 3, the cylindrical encasement 4, the shaft 5, the guys 6, the helical blades 7, and the stabilizing webs 8, making the general structure of the craft to which are attached the landing sail 47, and the means for operating it. To this general structure are attached the aerofoil 9, (or aerofoils in biplanes), ailerons 10, the rudder 11, the elevators 12, and the usual means for their operation, not shown, and the landing equipment in the case of horizontal rising and landing craft, all of which elements of control and sustentation may be constructed and operated in any preferred way known to the art. The fuselage 1, taken in conjunction with other parts of the machine is streamlined in outward contour, and divided and arranged for the convenience of the operator, and for the accommodation of any load the machine may be designed to carry. A bulkhead 13, is constructed across the rear portion of the fuselage 1, which serves as a floor when the machine is in a vertical position. Entrance is made to this floor or bulkhead 13, through a door 14, in the shell 3, (shown by dotted lines), and a door 14', in the fuselage 1, into the operator's room 15, see Fig. 1. The operator's seat 16, is reached by a ladder 17, which serves as a floor when the machine is in horizontal flight. Means for storing fuel, oil and other needs for operating the craft, and means for lighting and visibility such as transparent sections 3'', and periscopes, not shown, in the shell 3 and the fuselage 1, can be installed in accordance to the known principles of construction.

The standards 2, are disposed around the fuselage 1, (their number being determined

according to the purpose of any given machine, four are shown, Figs. 2 and 10), and extend rearwardly to support the machine when at rest, with the longitudinal axis of the fuselage 1, vertical. An air passageway 27'', provides for the conveyance of the air from the primary intake 27, and the air added from the auxiliary intake 27', to the rear of the machine. This passageway 27'', is bounded on the outside by the encasement 4, and the inclosing shell 3, and on the inside by the streamlined contour of the propeller centers 32, and 38, and the fuselage 1. That portion of it at the rear of the propeller, is divided into sectors by the stationary blades 7, the standards 2, and the webs 8. The rear portion 3', of the inclosing shell 3, is preferably constructed of flexible material so it will yield into a position of neutral pressure between the passageway 27'', and the outside atmosphere, to prevent suction at its rear end during flight; and it extends to the lower ends of the standards 2, shown as 3', at the bottom of Fig. 3; when at rest it confines the air stream driven therein and develops a statical air pressure under the fuselage 1, to assist in the initiatory ascent.

The front end of the fuselage 1, is partitioned off into a motor compartment 18, by a bulkhead 19, with means of access 19', Fig. 3. The compartment 18, is so formed as to provide a hollow stud 21, ending in a head 22, from which projects a shaft 5, held in alignment by the guys 6. The stud 21, and the shaft 5, are the basic means for the location and operation of driver shafts 25, the propeller members 28, and 29, and a train of elements transmitting motion thereto from a source of power. The compartment 18, has rearwardly inclined ports 23; and an inlet port 5', producing by suction and impact a rapid and diffused circulation of air to cool and ventilate it and its contents. It also, has exhaust pipes 24, leading into the intake of the supporting center 38, of the propeller, for the disposal of exhaust fluid from the engines located in it.

The propeller is composed of two members 28, and 29, designed to rotate reversely in parallel planes adjacent. The front member 28, and the elements connecting it to a source of power, consist of a hollow shaft 30, with a gear 31, rigidly attached to its rear end, and a cone 32, fixedly attached to its front end. The cone 32, has means 32', for access to its inside. To the rear outside face of the cone 32, are fixedly attached multiple propeller blades 33. Thus assembled, the unit is adjustably mounted in suitable bearings 34, and 35. The rear member 29, and the elements connecting it to a source of power, consist of the hollow shaft 36, with a gear 37, rigidly attached to its rear end, and a supporting center 38, fixedly attached to its front portion. To the supporting center

38, are fixedly attached propeller blades 39. To the inside of the stud 21, is slidingly fitted a forwardly projecting shell stud 40, having ribs 40', connected to a rim 40'', as shown in Figs. 3, and 4. It is held in adjustment by bolts 41, one of a series being shown in Fig. 3. Thus assembled the unit is adjustably mounted upon suitable bearings 42, and 43, Figs. 1, and 3.

The supporting center 38, forms a drum with its heads connected by radial blades 38', and with its rear head open near the shaft 36, to provide for the entrance of the exhaust pipes 24, and is provided with fluid conductors 24', and discharge ports 24'', constituting a centrifugal blower by which the exhaust pipes 24, are evacuated and the exhaust fluid from the engines discharged into the air passageway 27'', thus muffling the nose of the exhaust, relieving back pressure against the engines and adding a propulsive valve by the rearward discharge of the exhaust fluid through the ports 24''. The walls of the center 38, and the blades 38', are protected from overheating by insulation 38''. The compartment 18, forms an annular space around the hollow stud 21, giving a location and anchorage for a power plant of any type of engines in multiple units stationed equidistant from each other, and with the driver shaft 25, of each unit radial to the driven gears 31, and 37. Driver gears 45, fixed upon the mounted engine shafts 25, are interposed between the faces of the gears 31, and 37, and engage both so the rotation of the driver gears 45, rotates the propeller members 28, and 29, reversely. With the units of a plurality of engines, stationed equidistant from each other and working in unison, the torsional moments of all gears in engagement are balanced and the friction upon the bearings 35, 43, and 46, is minimized, and the aggregate power from a plurality of engines is effectively delivered to a single system of propulsion. The diagrammatic crank lines 26, illustrate the application of engines of the in-line type, and 26', the radial type, and the driver shafts 25, and the driver gears 45, show the application of power as described, and is best seen in Figs. 1, 3, and 4. Packing boxes 44, retain lubricants for the power transmission mechanism.

The system of propulsion herein defined consists of the propeller herein described, the stationary helical blades 7, and the cylindrical encasement 4. The encasement 4, is formed with an inside contour of a bell-shaped section 4', and a rear bell-shaped section 4'', Figs. 1 and 3. It is preferable to construct the system with a multiple number in each of the three series of blades 33, 39, and 7, and set them at a high pitch. This construction produces a race rotation in the air stream. The race rotation produced by the front blades 33, is intercepted and uti-

lized by the rear blades 39, rotating in the opposite direction, and the race rotation produced by the blades 39, is intercepted and utilized by the helical blades 7, which direct the air stream into a rectilinear course. This coaction of the primary rotary members of the system with each other and with the helical blades 7, produces an axial thrust value. The race rotation set up by the blades 33, and 39, develops a centrifugal velocity pressure against the walls of the bell-shaped section 4'', and gives a propulsive value in cooperation with the axial thrust value. At rest and slow speeds of the craft the centrifugal pressure value is greatest and the axial thrust value is least. As the speed increases these values are reversed until at the maximum speed the centrifugal pressure value is least and the axial thrust value is greatest. This reversal of propulsive values as the speed increases tends toward uniform efficiency of the system at all speeds of the craft. With proper adjustment of blade pitch, flare of the section 4'', and speed of rotation of the propeller, a high and approximately uniform efficiency of propulsion is attained at all speeds of the craft.

The stationary helical blades 7, are built in between the outside of the fuselage 1, at its front end and the rear of the bell-shaped section 4'', with their pitch counter to the pitch of the blades 39. It is preferable to use a number of helical blades 7, that is a multiple of the number of standards 2, in any given case, and to so place them that some one of the series will register with each of the standards 2, thus allowing the rear edges of such registering blades to be merged into the front ends of the stabilizing webs 8, which, with the merging of the webs 8, along their outer edges with the standards 2, where they meet, lessens parasitical resistance, Figs. 1 and 6. This use of such a number of blades 7, will also allot an equal number of the intermediate blades 7, to each of the spaces between the standards 2. A number of the helical blades 7, are constructed, each with a conduit 20, leading from a controllable inlet valve 20', to a compressed air container 22', for the purpose of diverting a portion of the air stream produced by the propeller and converting its velocity energy into pressure energy. The inlet valve 20', has a spring 20'', which prevents any escape of compressed air from the conduit 20. The container 22' is tapped as at 22'', and the compressed air conveyed through suitable piping with controlling valves, not shown, to wherever needed for the operation of the craft and the sustenance of life. It is preferable to use the blades 7, that register with the standards 2, for the conduits 20, but when they are not sufficient in any given case, a number of the intermediate blades 7, may be modified to allow for the conduits 20, by

elongation rearward as shown in a sectional view of one of each of the propeller blades 33, and 39, and one of the intermediate blades 7, Fig. 5. One of the unmodified helical blades 7, is shown in Fig. 10, on the same scale as Fig. 5.

It is preferable to construct the three series of blades 33, 39, and 7, with a different number of blades in each of the three series, in which either a diminishing or an increasing progressive difference of one will give best results, and to use such a number in each series, that when the propeller members 28, and 29, are rotated reversely at a speed required for normal flight, the frequency of vibration in the air caused by the series 39, passing the two series 33, and 7, exceeds 41,000 per second, or the upper limit of audibility. This plan of noise reduction is illustrated diagrammatically in Fig. 7, in which the series 33, contains thirty blades, the series 39, contains thirty one blades, and the series 7, contains thirty two blades. The movement of the series 39, in one direction the distance between two blades, and the movement of the series 33, an equal distance in the opposite direction, produce a number of vibrations equal to the number of blades in the three series, or ninety three. This number multiplied by the number of blades in the series 39, produces two thousand eight hundred eighty three, the number of sound vibrations produced by one revolution of the propeller members 28, and 29. The propeller rotating at a supposed normal speed of twelve hundred revolutions per minute, would produce a frequency of vibration in the air of fifty seven thousand six hundred sixty per second, which is a large margin above the upper limit of audibility. Any combination of the number of blades in the three series and the revolutions of the moving members that will produce a frequency of vibration in the air above the upper limit of audibility will reduce the noise of operating the craft.

Arms 48, and 48'', are hinged to the outside at the front end of the encasement 4. A spring 48', is operatively placed under each of the arms 48, as is shown on the left side when the sail 47, is extended, and on the right side when the sail 47, is collapsed, in Fig. 1. An annular, collapsible landing sail 47, is securely attached along its inner edge to the outside of the forward end of the encasement 4, and to the arms 48, and 48'', extending radially across its width as seen in Fig. 2. The arms 48, are placed one on each side of each of the standards 2, and diverge from each other outward just sufficient that when the sail 47, is collapsed it will be drawn closely over the tapering ends of the standards 2, taking up that portion of the sail 47, between each pair of the arms 48, as shown in Fig. 2,

when extended, and as shown at 47', in Fig. 1, when collapsed.

Two pairs of arms 48, and the intermediate arms 48'', with a fragment of the sail 47, attached, are shown extended in Fig. 2, to illustrate the position of the sail 47, during the landing process. One of the arms 48'', is shown collapsed in Fig. 3, and one of the arms 48, is shown collapsed, on the right side in Fig. 1 to illustrate the position of the sail 47, (except that portion drawn over the tapering ends of the standards 2), when collapsed and carried as potential air resisting surfaces during flight. The encasement 4, is formed upon its circumferential outside to provide a recessed space for housing the landing sail 47, (except that portion drawn over the tapering ends of the standards 2), out of the relative air stream to avoid parasitic resistance.

A cable 49, is fixedly attached to the free end of each of the arms 48, and 48'', and to the rear end of the encasement 4, Fig. 1. These cables 49, limit the outward and upward extension of the arms 48, and 48'', and the landing sail 47, attached thereto, and support them in a predetermined angle from the main axis of the fuselage. This angle is shown in Fig. 1, to be 90 degrees, but it may be varied either above or below 90 degrees to gain stability and to vary the amount of air displaced during the landing process.

An eyelet, or small pulley 51, is fixedly attached to each of the supporting cables 49, about midway of their length. Pulleys 52, are located, one in the outer end of each of the arms 48, one in the front end of the encasement 4, one in the rear end of the encasement 4, and one in each side of each of the standards 2, making a number of trains of pulleys 52, to correspond to the number of arms 48, and in operative alignment therewith.

A reel 53, with means for manual or power operation, (manual operation is shown in Figs. 1 and 3), is mounted in a suitable frame adjacent the operator's seat 16. A cable 50, allotted to each space between the standards 2, is threaded through the eyelets 51, and one of its ends threaded through an aligning train of pulleys 52, on each side of the space served, and then attached to the reel 53. The angle of the sail 47, limited by the cables 49, may be varied to any angle below the limit by winding in the cables 50, upon the reel 53, and locking it to maintain the angle of extension at the will of the operator. The sail 47, is collapsed, also, by the operation of the reel 53, which draws in the cables 50. These acting through the eyelets 51, draw the cables 49, in and under the sail 47, to a circumferential line registering with the series of pulleys 52, located in the forward portion of the encasement 4, as shown in Figs. 1 and 3. At the same time the arms 48, are drawn down close-

ly, one on each side of each of the standards 2, stretching the sail 47, tightly over the tapering ends of the standards 2, as shown at 47' Figs. 1 and 11. The remaining portions of the sail 47, are collapsed in the spaces between the standards 2, provided in the outer circumferential surface of the encasement 4, and held there by the arms 48''. The arms 48, and 48'', the sail 47, and the cables 49, are held collapsed by any usual means to secure the reel 53, against unwinding and that can be released at will. The drawings show in Figs. 1 and 3, the reel 53, operated by a bell crank 56, and held by the ratchet 54, and the pawl 55. Other means may be used without departing from the principles of the invention.

To operate a vertically rising and landing craft, which normally stands in an upright attitude, a statical air pressure is developed within the inclosure 3, under the fuselage 1. When this pressure is sufficient with the aerodynamic lift of the propulsive system the craft ascends. Then before the initial momentum is spent, the craft is turned to an angle sustainable by the aerodynamic lift of the aerofoils and the propulsive system and flight continued and maneuvered by the usual and well known means. A landing is made by turning the longitudinal axis of the craft to a vertical attitude, halting the craft to a standstill, releasing the landing sail 47, and allowing the craft to fall. The velocity of descent is governed by regulating the angle of the sail 47, in cooperation with the speed of the propeller. The craft is maneuvered to direct its course of descent and is finally eased down to a state of rest upon a supporting surface.

Having described my invention, I claim:

1. An aeroplane having a load carrying body designed to have its longitudinal axis vertical when at rest and horizontal when in translatory flight, in combination, a streamlined load carrying body, supporting standards rigidly attached by intervening webs to the body, and an inclosing shell around the body attached to the standards and with a primary and an auxiliary intake at its top end and extending to the lower or rear ends of the standards.

2. An aeroplane having, in combination, a general framework which consists of a fuselage, a series of standards disposed around the fuselage so as to support it with its longitudinal axis vertical when at rest, a cylindrical encasement attached to the standards, a series of stationary helical blades attached at their inner ends to the fuselage and at their outer ends to the encasement, a series of stabilizing webs connecting the fuselage and the standards, a shaft forwardly projecting from the fuselage, guys supporting the shaft, and an inclosure around the fuselage; which framework is adapted for the location and

operation of a screw propeller composed of two members, and for the installation of a power plant composed of a plurality of units of power with means for transmitting motion from the power plant to the propeller so as to rotate its members reversely in planes adjacent and in coaction with the encasement and the helical blades for the purpose of propelling and operating the aeroplane in any direction; which framework provides for the attachment of aerofoils, rudders, elevators, landing equipment, and a landing sail, and means for controlling these attachments for the sustentation and control of the aeroplane in its flight and landing.

3. In an aeroplane having a general framework, in combination, an air passageway annular in cross section, and having a primary intake and an auxiliary intake; which passageway is bounded on its outside diameter by a cylindrical encasement and an inclosing shell, and on its inside diameter by streamlined surfaces of propeller centers and the fuselage, of the aeroplane.

4. In an aeroplane having a fuselage, a series of standards disposed around the fuselage, and a cylindrical encasement attached to the standards, in combination, an inclosing shell adjustable in its diametric area within limits at its trailing end, and extending over a portion of the length of the standards to which it is attached; which shell has a diameter greater than the encasement to admit an auxiliary intake of undisturbed air at its front end, and which controls and guides the resultant air stream formed from a primary intake of the aeroplane and the auxiliary intake in its passage rearward during ascension, flight and landing of the craft; and which shell in cooperation with a system of propulsion, confines the resultant air stream to develop a pressure under and around the fuselage while the aeroplane is at rest, to lift it and give it an initial momentum for ascension.

5. An aeroplane having, in combination, a fuselage, a propeller, a series of stationary helical blades at the rear of the propeller, webs extending from a selected number of the blades to the rear of the craft, and control rudders operatively connected to the webs.

6. An aeroplane having a motor compartment composed of boundary walls so disposed as to form a hollow stud projecting into the compartment, and to inclose an annular space around the stud.

7. An aeroplane having, in combination, a hollow stud, a shell stud with ribs slidably fitted to the hollow stud, a rim connecting the ribs, adjusting bolts engaging the rim, a bearing on the shell stud, and means for lubrication.

8. In an aeroplane having a motive compartment with a hollow stud therein and a shaft projecting therefrom, in combination,

rearwardly inclined ventilating ports in the walls of the compartment and an inlet port formed in the shaft.

9. An aeroplane having, in combination, a hollow stud, a closure at the end of the stud, a shaft projecting from the closure through the stud, mounted driven propeller shafts, gears on the driven shafts, engine driver shafts radial to the stud, and gears on the driver shafts and in mesh with the gears on the driven shafts.

10. In an aeroplane having a power plant and a propeller member with a supporting drum center, in combination, a centrifugal blower which consists of the drum center with the central area of one head open as an intake, radial blades between the drum heads, insulated radial conductors open to the intake and ending in a plurality of discharge ports in or near the periphery of the drum; and exhaust pipes leading from the power plant into the intake of the blower.

11. An aeroplane having, in combination, a fuselage, a motor compartment in the fuselage, a hollow stud in the compartment, an annular space around the stud, a propeller, a power plant in the annular space and connected to the propeller, an operating compartment in the fuselage, a bulkhead between the two compartments, means of access in the bulkhead, an operator's seat in the operating compartment, means of access to the seat, an operable winch for regulating the lateral angle of a landing sail and for collapsing, holding and releasing it, a bulkhead in the rear of the fuselage, a door in the fuselage, a registering door in an encircling shell, and means in the walls of the fuselage and the encircling shell for lighting and visibility.

12. An aeroplane having, in combination, a screw propeller composed of two members designed to rotate reversely in planes adjacent, a series of stationary helical blades located at the rear of the propeller, and a bell-shaped encasement surrounding the periphery of the propeller and the helical blades.

13. An aeroplane having, in combination, a screw propeller composed of two members mounted to rotate reversely in planes adjacent with the blades in each member affixed to supporting centers, a series of stationary helical blades affixed to a supporting center in peripheral alignment with the propeller centers, and a bell-shaped encasement flared rearward with recessed steps for each propeller member and surrounding the periphery of the propeller and rigidly attached to the outer ends of the helical blades.

14. An aeroplane having, in combination, a fuselage, a propeller, a series of stationary helical blades at the rear of the propeller, a power plant, inlet valves in a selected number of the stationary blades, conduits in the selected blades and connected to the inlet

valves, storage for compressed air and connected to the conduits, pipes connecting the storage to the power plant, pipes leading to other parts of the craft, and valves controlling the flow of air in the pipes.

15. In an aeroplane having stationary helical blades and in cooperation therewith a screw propeller, in combination, in each of a selected number of the helical blades, a controllable air inlet, a conduit connected to the inlet, a compression container connected to the conduit, controllable outlet from the container, and controllable conveyance from the outlet.

16. In an aeroplane having a screw propeller composed of two members designed to rotate reversely in parallel planes adjacent, in combination, a rotatably mounted train of elements connected to each member, a gear affixed to each train of elements with an annular space between the gears, and a plurality of driver gears affixed to rotatably mounted engine shafts, and located approximately equidistant from each other in the annular space and each in engagement with the gear connected to the front member of the propeller and upon its diametrically opposite side in engagement with the gear connected with the rear member of the propeller.

17. In an aeroplane having a propeller of two multibladed members designed to rotate reversely in planes adjacent and a series of stationary helical blades in a parallel plane adjacent at the rear of the rotating members, in combination, such a number of blades in each of the three series, two rotary and one stationary, that the frequency of vibration produced in the air by the passing edges of the blades, in normal flight, exceeds the upper limit of audibility.

18. An aeroplane having, in combination, in a system of propulsion, three series of helical blades, two rotary in reverse directions and one stationary, in which the blade pitch is greater in each successive series.

19. An aeroplane having, in combination, a propeller composed of two members designed to rotate reversely, an encasement flared rearwardly around the periphery of the propeller, a collapsible landing sail with a continuous annular surface when extended and with it mounted upon rigid arms hinged to the encasement, and an air intake through the sail into the encasement to the propeller.

20. An aeroplane having, in combination, a propeller, an encasement surrounding the periphery of the propeller, housing space in the outside of the encasement, a series of arms hinged to the encasement, springs compressible by a selected number of the arms, a collapsible annular landing sail attached to the encasement and to the arms, an air intake through the sail into the encasement to the propeller, supporting cables attached to

the free ends of the arms and to the encasement, eyelets fixedly attached to the supporting cables, cable passageways leading to an operating compartment, collapsing cables threaded through the eyelets and the passageways, and an operable winch connected to the collapsing cables.

21. An aeroplane designed to land vertically having, in combination, a propeller, an encasement surrounding the periphery of the propeller, a series of arms hinged to the encasement, a collapsible annular landing sail attached to the encasement and to the arms, a housing recess in the encasement, means to collapse and to extend the arms and the sail, an air intake through the sail into the encasement to the propeller, and means for varying the lateral angle of the sail while landing the craft.

22. An aeroplane designed to land vertically in an upright attitude having, in combination, a propeller, an encasement surrounding the periphery of the propeller, a circumferential recess in the outside of the encasement, a series of standards supporting the craft in an upright attitude when at rest and attached to the encasement, a series of arms hinged to the outside of the encasement, a collapsible annular landing sail attached along its inner edge to the encasement and across its width to the arms, an air intake through the landing sail and the encasement to the propeller, a series of springs compressible in collapsing the arms, means for holding the arms and the sail at a predetermined angle of extension, means for varying the angle at will, means for collapsing the arms and sail, means for housing the sail, means for holding the arms and sail collapsed, means for releasing the arms and sail at will, and means for extending the arms and sail when released.

23. An aeroplane having, in combination, a propeller composed of two members designed to rotate reversely in parallel planes adjacent, a series of stationary helical blades cooperating with the propeller, an encasement surrounding the propeller and the stationary blades, a fuselage, a power plant to actuate the propeller, and an equipment for ascent and landing with the fuselage approximately horizontal.

24. An aeroplane having, in combination, a general framework which consists of a fuselage, a series of standards disposed around the fuselage so as to support it in a vertical position when at rest, a cylindrical encasement rigidly attached to the forward portion of the standards, a series of stationary helical blades rigidly attached to the fuselage and to the encasement, a series of stabilizing webs extending longitudinally from the rear end of the encasement to the rear end of the aeroplane and radially from the fuselage to the standards, a shaft projecting for-

wardly from the fuselage, a series of guys binding the shaft to the encasement, and an inclosing shell flexible in its rear portion affixed to the standards and extending over
5 the greater portion of their length to the rear end thereof; a propeller composed of two members designed to rotate reversely in planes adjacent, and coacting with the encasement and the helical blades; an air pas-
10 sageway in the general framework with a primary intake and an auxiliary intake, annular in cross section and extending from the front end to the rear end of the machine; a motor compartment having an inwardly
15 projecting hollow stud and inclosing space and providing means for the installation of a plurality of engines stationed equidistant apart with their driver shafts radial to the stud and operatively connected to the shaft-
20 ing actuating the propeller; a system for compressing, retaining and dispensing compressed air which consists in diverting a portion of the air stream produced by the propeller, conducting it through a selected num-
25 ber of the helical blades by a conduit with a controllable inlet to a compression container, converting its kinetic velocity energy into energy of pressure, releasing the compressed air through controllable outlets, and convey-
30 ing it to where and as needed; a system for evacuating and muffing exhaust which consists in leading the exhaust fluid from the engines through pipes into the intake of a centrifugal blower constructed in the sup-
35 porting center of the rear member of the propeller and discharging it into the air pas-
sageway; a collapsible landingsail with means for housing and operating the same; and, in combination, aerofoils, ailerons, rudders,
40 elevators, and other means of control and navigation, with means for operating the same, for the control, sustentation and land-
ing of the aeroplane.

In testimony whereof, I have signed this
45 specification, this 8th day of December, 1930.

DAVID E. VAN VACTOR.

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