No. 748,372. PATENTED DEC. 29, 1903.

R. T. HEAD.

ROAD MAKING MACHINE.

APPLICATION FILED AUG. 18, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

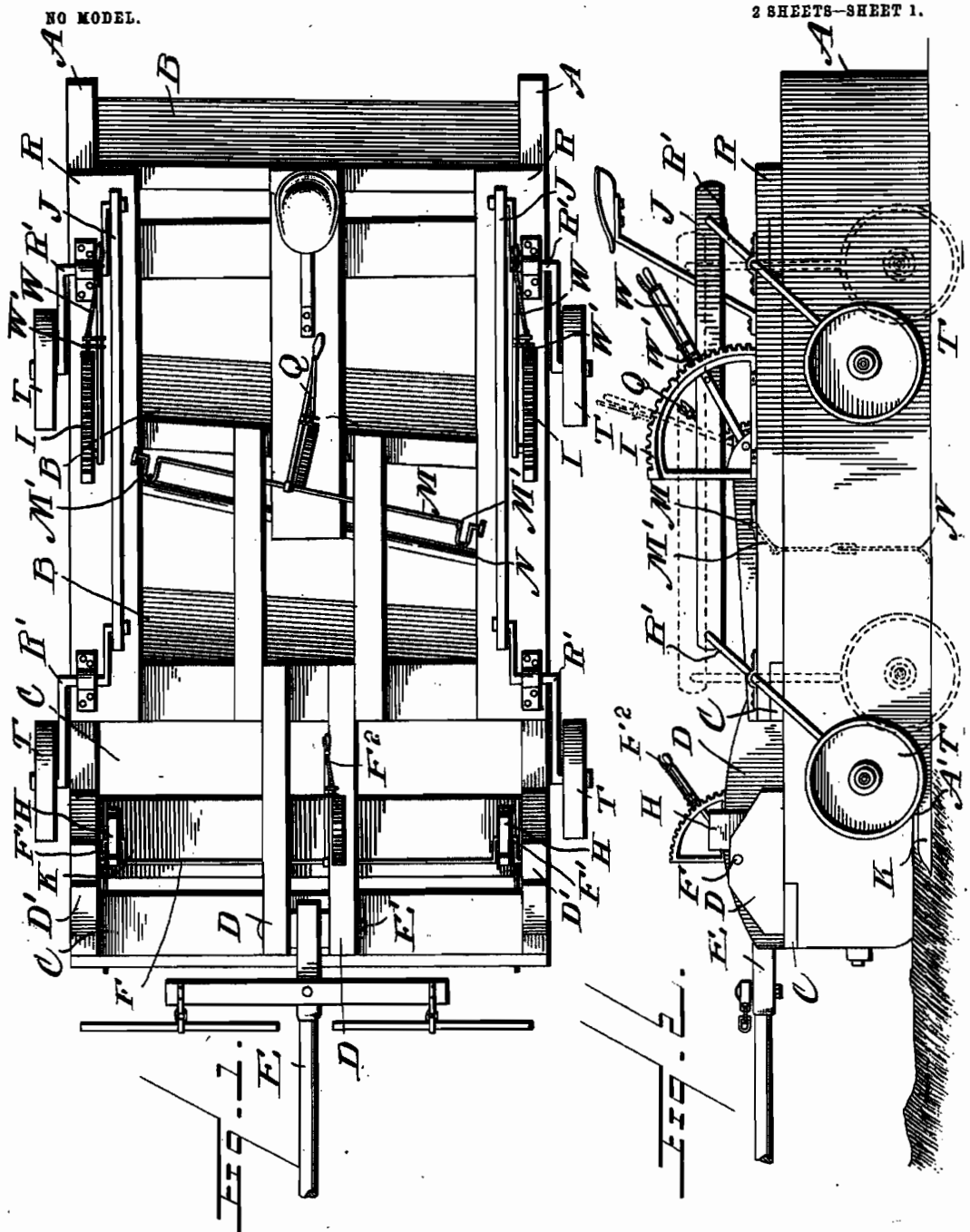


Fig. 1.

Fig. 2.

WITNESSES:

Wm. F. Doyle

A. L. Hough

INVENTOR

Robert T. Head,

BY

Franklin H. Hough

Attorney

F. Marriott,

Aerial Steam Car.

NO. 97,100. Patented Nov. 23. 1869.

Fig. 1.

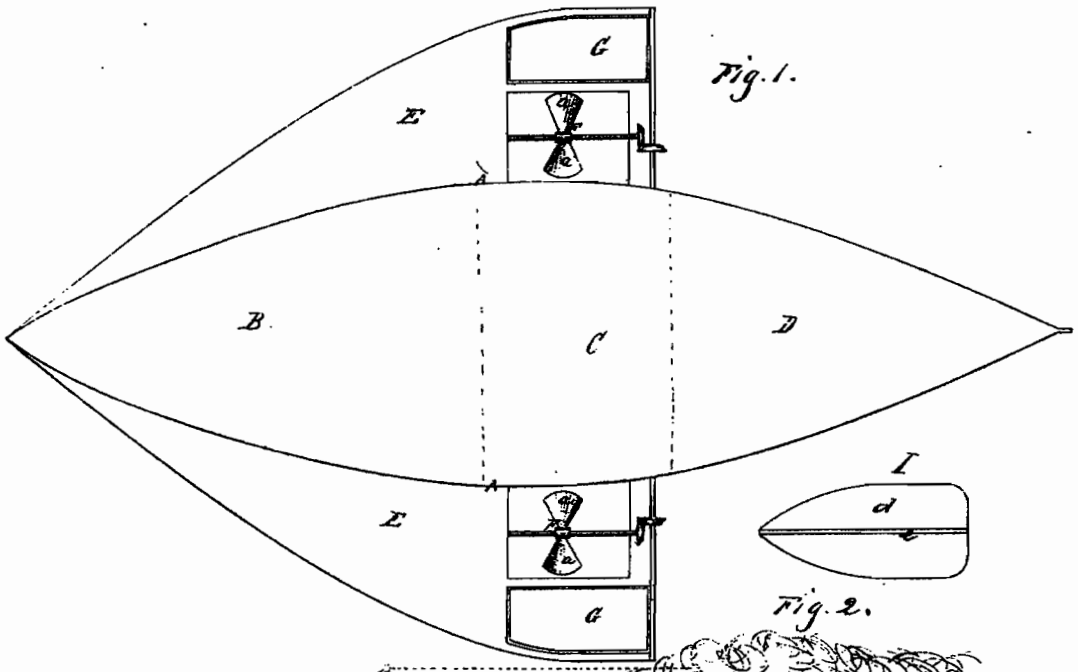


Fig. 2.

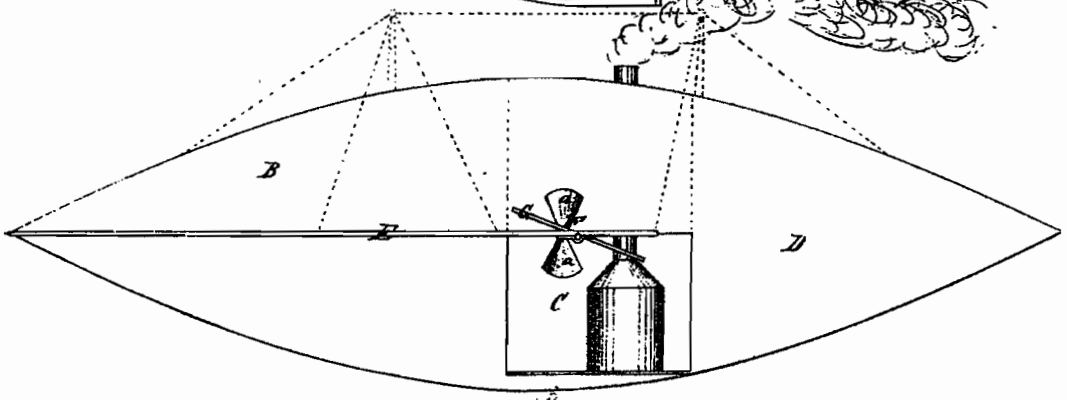
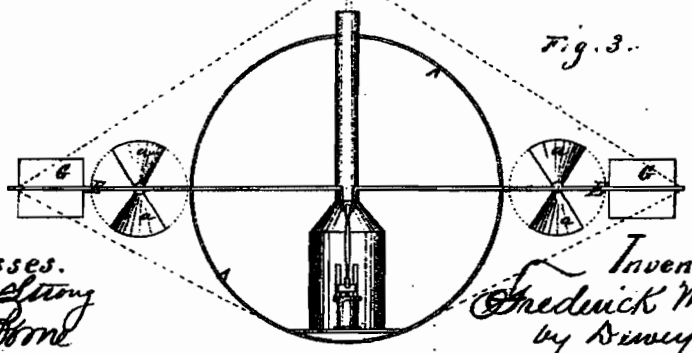


Fig. 3.



Witnesses.
Geo. H. Strong
J. L. Boone

Inventor,
Frederick Marriott
by Dewey & Co
his Attys

United States Patent Office.

FREDERICK MARRIOTT, OF SAN FRANCISCO, CALIFORNIA.

Letters Patent No. 97,100, *dated November* 23, 1869.

IMPROVEMENT IN AERIAL STEAM-CARS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, FREDERICK MARRIOTT, of the city and county of San Francisco, State of California, have invented an Aerial Steam-Carriage; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains, to make and use my said invention or improvements without further invention or experiment.

My invention relates to a steam-carriage or vessel, which is so constructed that it can be moved or propelled through the air by mechanical means, and which can be steered in its course with the same facility that a vessel floating upon the surface of a body of water obeys the movements of her rudder.

My vessel or carriage is constructed of any light and strong material, and is made pointed at both ends, or cigar-shaped, each end being inflated with hydrogen or other gas.

Extending from the forward point of the carriage to about the middle of the vessel, and on each side, is a vane or wing, which gradually widens as it extends toward the rear.

These wings serve to carry the carriage steadily through the air.

The carriage is caused to move through the air by screw or other propellers, which are driven by a steam or other power-engine of suitable size and capacity.

In the rear end of each of the vanes or wings, at the sides of the vessel, is attached a plane, which turns upon an axle, and by which any desired elevation can be given to the vessel.

A tail or rudder is also attached to the rear pointed end, by means of which any required direction can be given to the vessel when it is in motion.

In order to more fully illustrate and describe my invention, reference is had to the accompanying drawings, forming a part of this specification.

Figure 1 is a top view of my aerial carriage or machine.

Figure 2 is an elevation of one side.

Figure 3 is a transverse vertical section through the centre.

A represents a frame or structure, in the form of two cones united at their bases, and made of some light and strong material.

This structure is divided into three compartments, B, C, and D, the compartment C being in the middle of the vessel, inside of which the engine is carried.

The compartments or gasometers B and D are covered with some suitable fabric, for containing hydrogen, or other gas specifically lighter than atmospheric air, with which the compartments are to be filled, for which purpose any of the prepared fabrics capable of retaining gas, such as is employed in the manufacture of balloons, will answer.

Beginning at the point of the vessel, and extending about half way its length toward the rear, are wings or planes E E, one on each side.

These wings are rigidly fixed to the side of the car, so as to lie horizontally in a plane with its centre, and gradually increase in width toward the rear.

These wings aid in buoying up the car, and keeping it steady in its movements through the air.

Opposite the centre of the vessel, and operating in suitable openings in the rear end of the wings E E, are propellers F F.

These propellers consist of two blades, *a a*, bent to the proper curvature, and driven by an engine of the proper capacity, carried in the apartment C.

The kind of power or style of engine employed is immaterial, the only requisite being that it shall be as light as possible, and, when steam is used, that the boiler shall have a sufficient amount of fire-surface to enable the generation of steam to be carried on as fast as possible.

The propellers F, working, as they do, outside of the body of the car, and through the horizontal wings, have full grasp upon the air, to carry forward the car.

Turning upon an axle, through openings in the wings, outside of the propellers, are what I call "planes," designated by the letters G.

These planes vibrate upon axles placed transversely to the longitudinal axis of the, car, and are operated, by suitable mechanism, from the interior of the compartment C, by the engineer.

By turning these planes to the proper angles, the elevation of the car can be regulated.

This is one of the principal features of the invention, as, by their use, the vessel can, at all times, be controlled, and its elevation regulated, with the same ease that a bird gives itself an upward or downward direction with its wings.

The tail or rudder I is composed of two parts, *d* and *e*, placed at right angles to each other, their planes intersecting through the middle of each, thus forming a vertical and a horizontal rudder.

This tail or rudder is attached to the rear end of the cigar-shaped frame A, by means of a hinge or other joint, so that it can be turned to stand at any desired angle to the frame, either up or down, and thus give the engineer a more complete control over the movements of the vessel.

The entire machinery is operated from the central compartment or cabin C by suitable mechanism.

This flying boat or vessel, I call "The Avitor," its governing principle and general arrangement being similar to that of a bird moving through the air.

The Avitor, when fully inflated, does not contain sufficient gas to cause it to rise, but remains in its position until the propellers are started into operation, and begin to beat the atmosphere, when it rises with

(No Model.) 3 Sheets—Sheet 1.

S. B. BATTEY.

AERIAL MACHINE.

No. 502,168. Patented July 25, 1893.

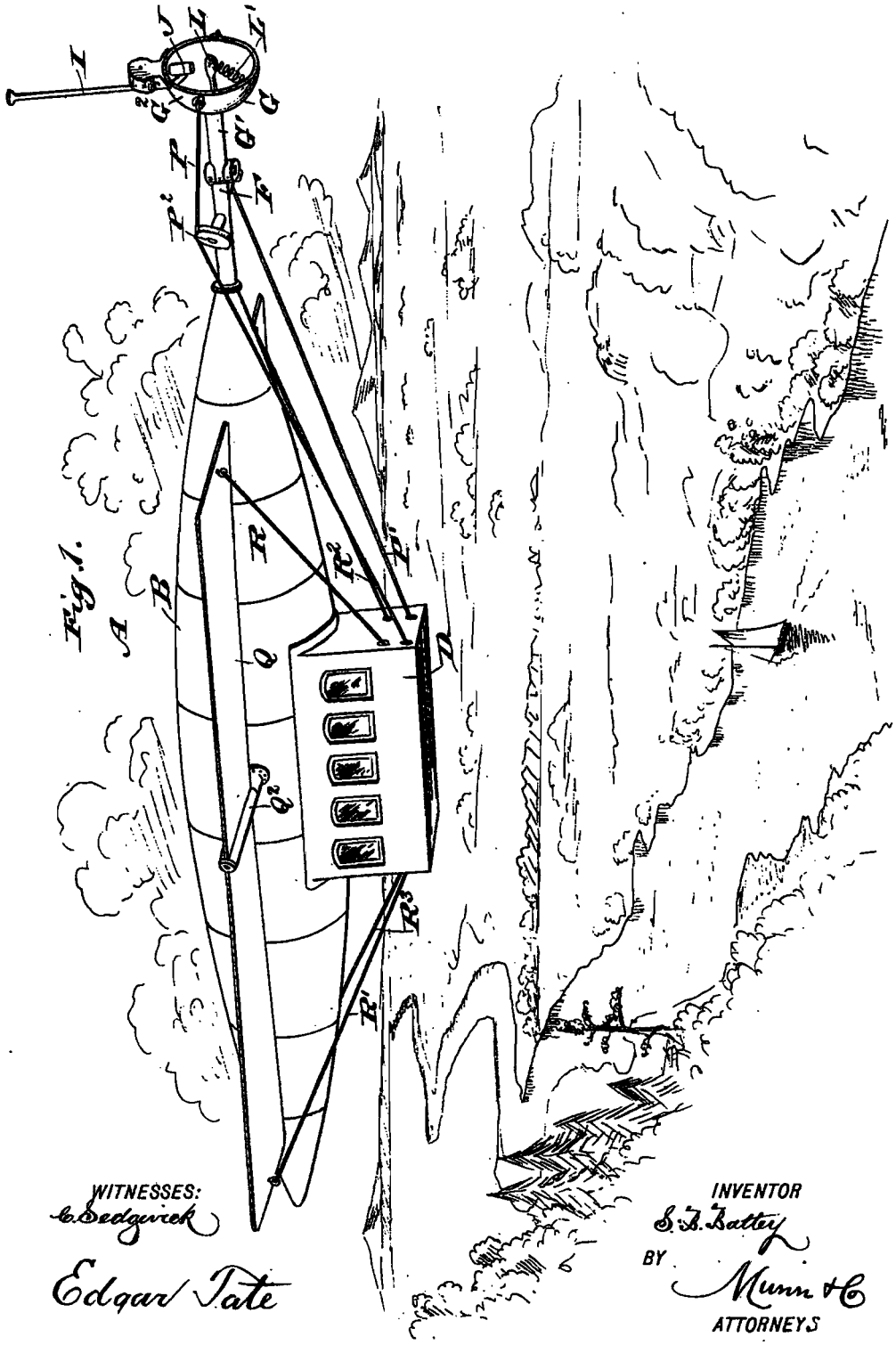


Fig. 1.

WITNESSES:
C. Sedgwick
Edgar Tate

INVENTOR
S. B. Battey
BY Munn & Co
ATTORNEYS

A. H. FRIEDEL.

FLYING MACHINE.

APPLICATION FILED OCT. 13, 1908.

984,269. Patented Feb. 14, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

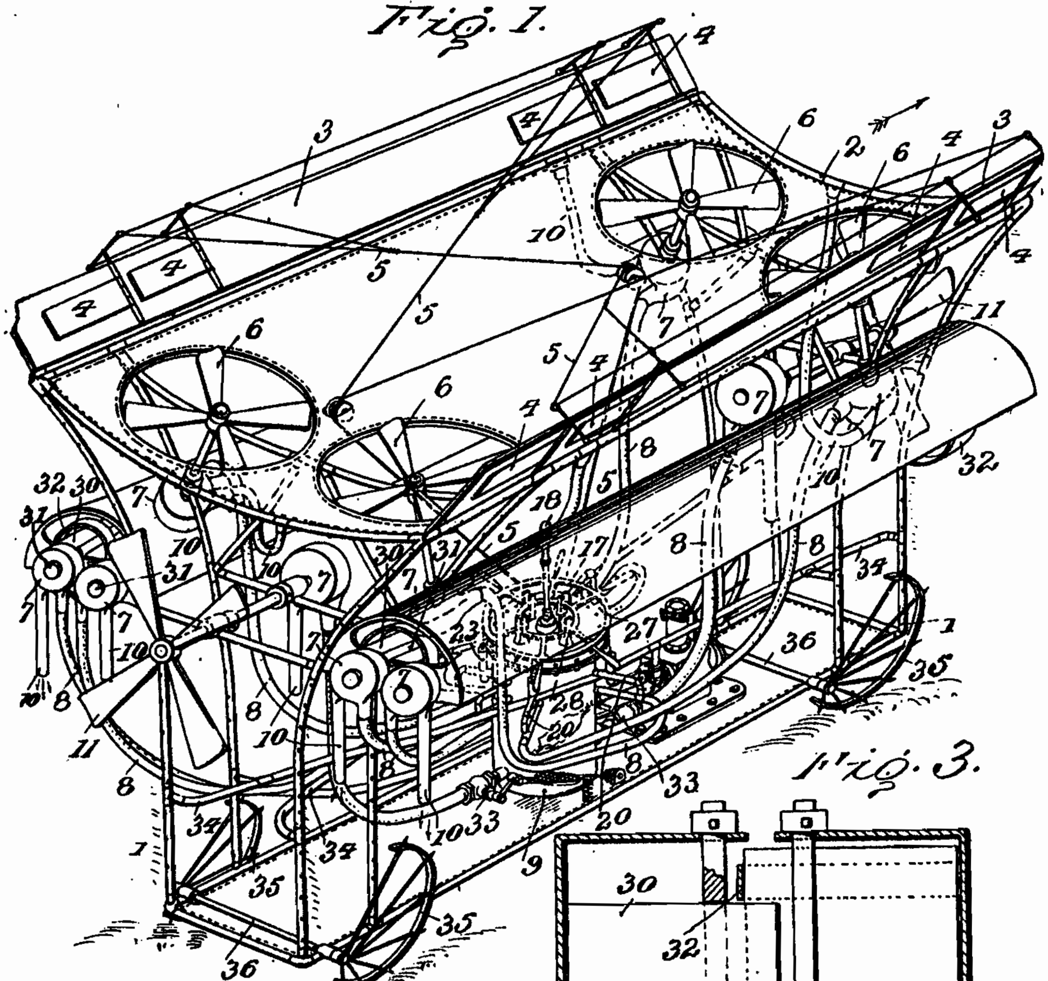


Fig. 3.

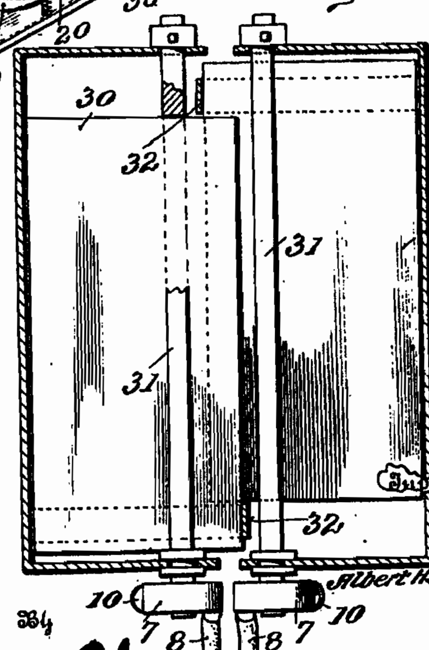
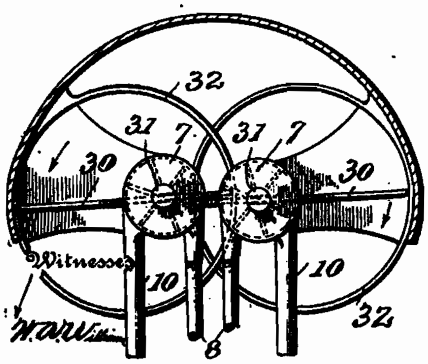


Fig. 2.



Witnesses

W. W. Williams

W. N. Woodson

Inventor

Albert H. Friedel.

By H. B. Willson & Co.

Attorneys

H. MUELLER.

AEROPLANE.

APPLICATION FILED OCT. 31, 1908.

914,969.

Patented Mar. 9, 1909.

4 SHEETS—SHEET 1.

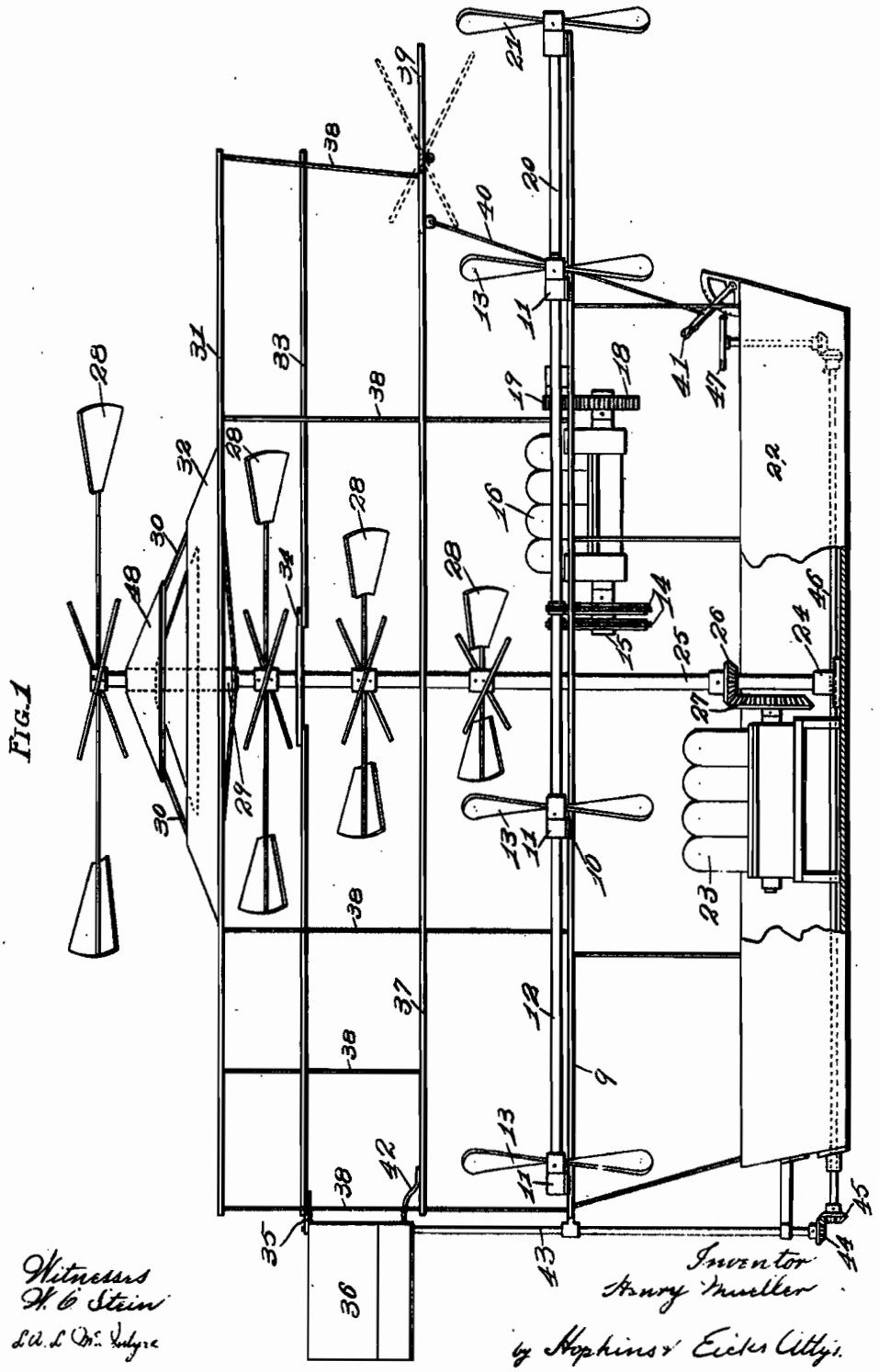


FIG. 1

Witnesses
H. C. Stein
L. A. L. Du Pont

Inventor
Henry Mueller
by Hopkins & Eickemeyer Attys.

B. L. MARENESS.

AEROPLANE.

APPLICATION FILED NOV. 21, 1910.

1,145,695.

Patented July 6, 1915.

2 SHEETS—SHEET 1.

Fig. 1

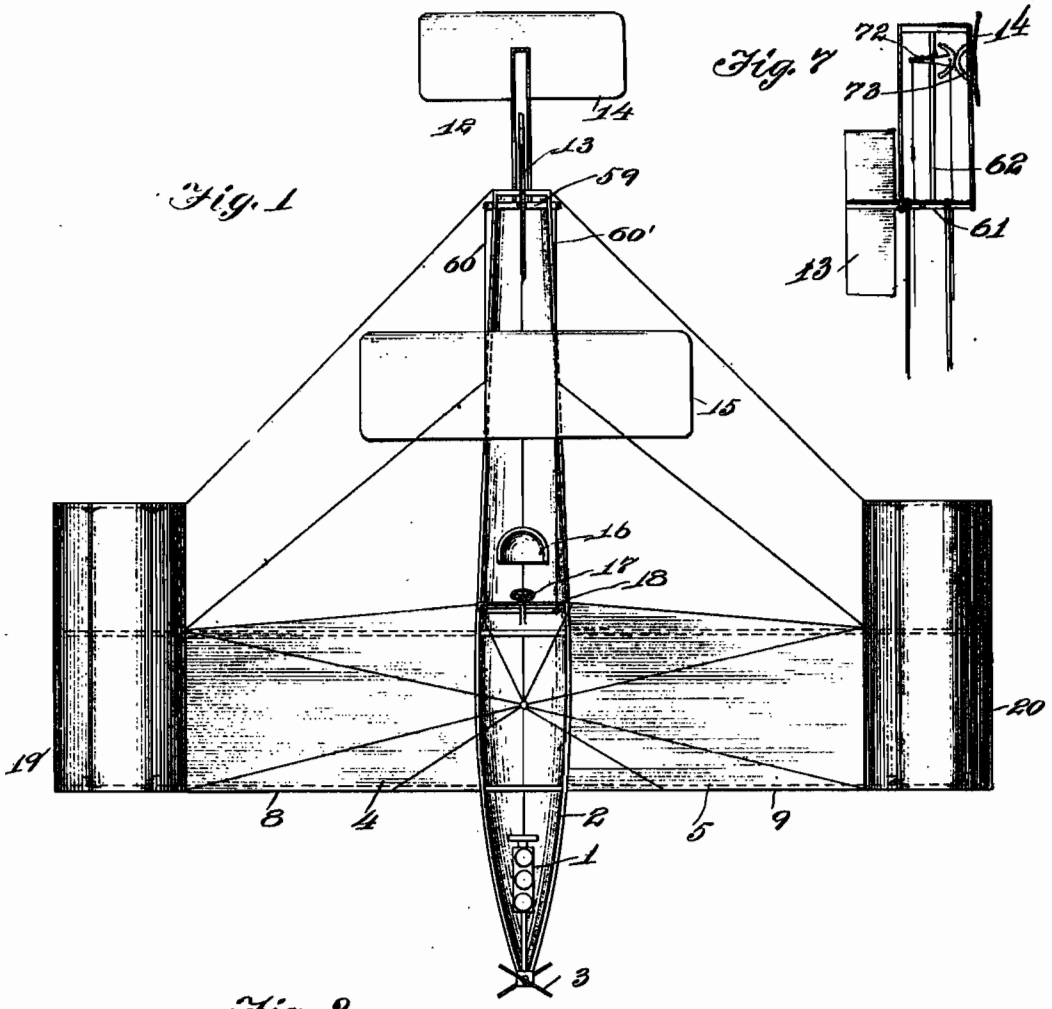
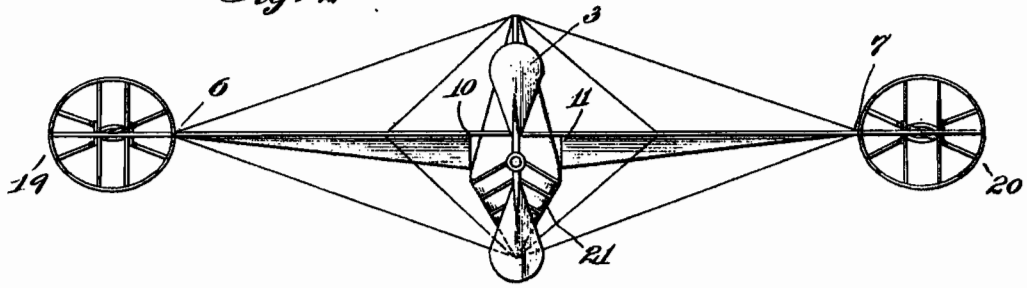


Fig. 7

Fig. 2



Witnesses

Nina J. Halsne.

L. B. Graham

Inventor

Berton L. Mareness

By Brown & Hopkins

Att'ys

G. H. CURTISS.

CONTROLLING MECHANISM FOR FLYING MACHINES AND THE LIKE.

APPLICATION FILED SEPT. 6, 1912.

1,085,575.

Patented Jan. 27, 1914.

3 SHEETS—SHEET 1.

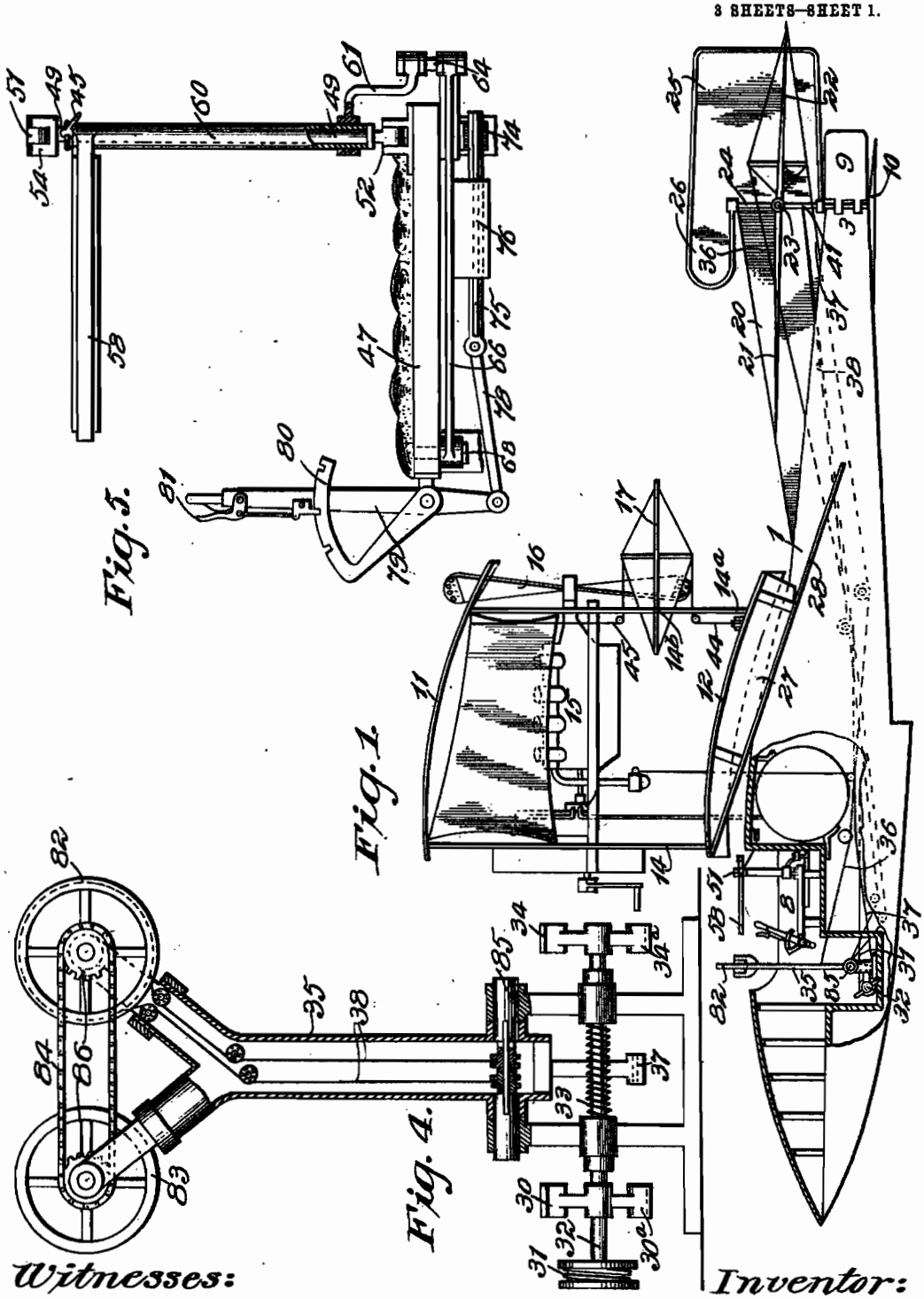


Fig. 5.

Fig. 1.

Fig. 4.

Witnesses:

F. D. Cummer

A. Bernstein

Inventor:

Glenn H. Curtiss

by Newell & Neal

his Attys.

G. H. CURTISS.

FLYING MACHINE.

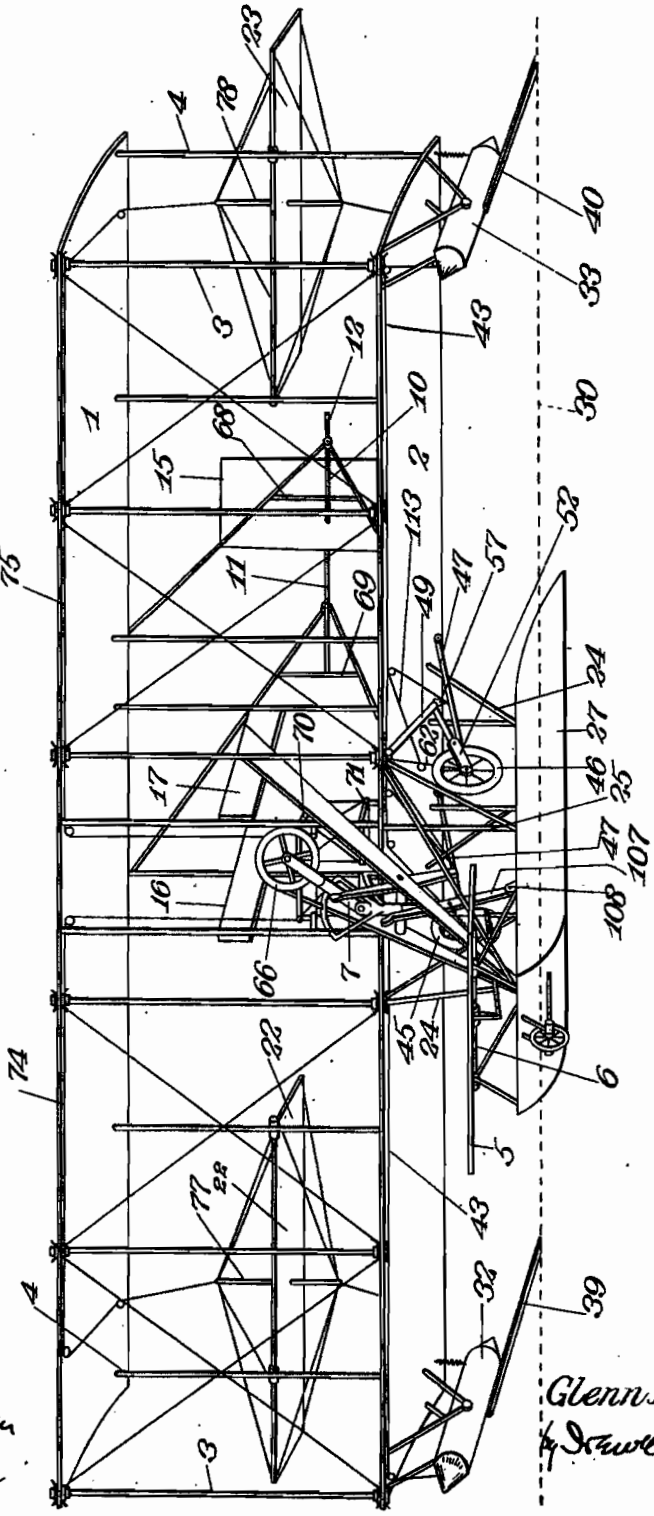
APPLICATION FILED SEPT. 14, 1912.

1,104,036.

Patented July 21, 1914.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses

F. D. Mumen

F. Jackson

Inventor

Glenn H. Curtiss

by Dewellaskual

Attorney

C. M. McMAHON.

AEROPLANE.

APPLICATION FILED APR. 13, 1912.

1,084,099.

Patented Jan. 13, 1914.

2 SHEETS—SHEET 1.

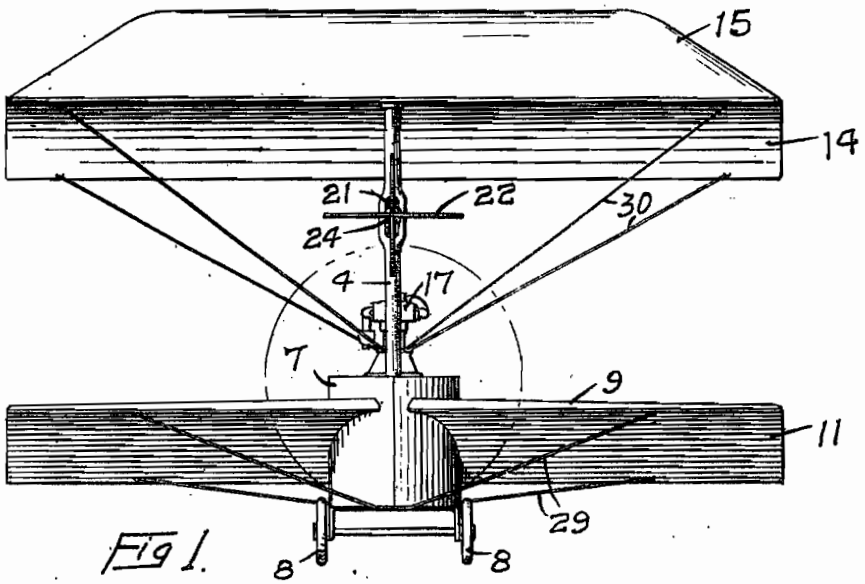


Fig 1.

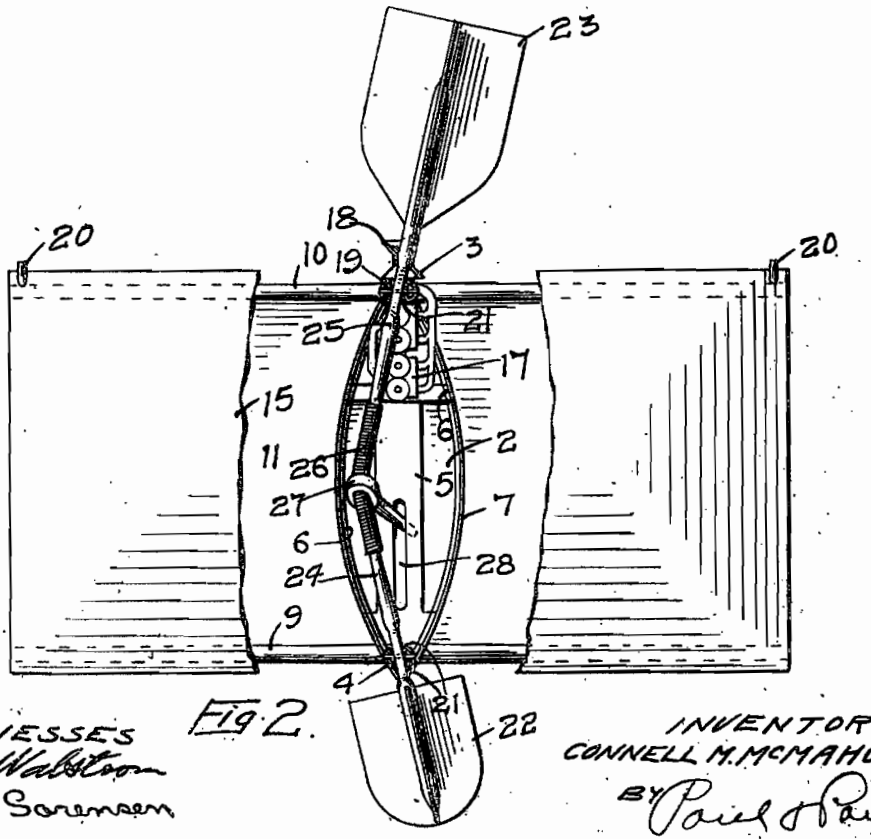


Fig 2.

WITNESSES

J. E. Sorensen

INVENTOR

CONNELL M. McMAHON

BY Paul & Paul

ATTORNEYS

G. L. MARTIN.

FLYING BOAT.

APPLICATION FILED FEB. 3, 1914.

1,239,500. **Patented Sept. 11, 1917.**

4 SHEETS—SHEET 1.

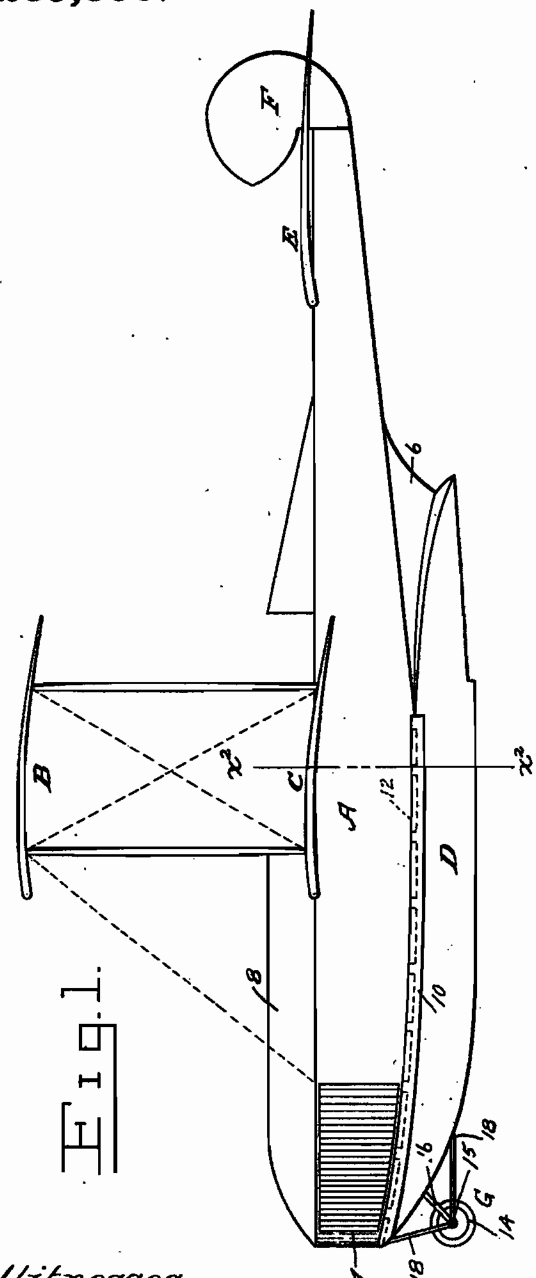


Fig. 1.

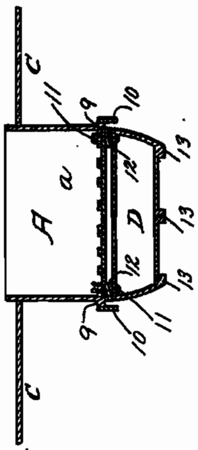


Fig. 2.

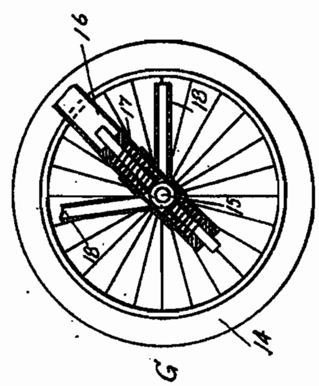


Fig. 3.

Witnesses,

H. Gearings

Alfred H. Daehler.

Inventor,

Glenn L. Martin,

By Raymond Holt Wardale

His Attorney.

G. H. CURTISS.

LUBRICATING SYSTEM FOR TRAVELING MOTORS.

APPLICATION FILED DEC. 11, 1914.

1,329,038. Patented Jan. 27, 1920.

FIG. 1

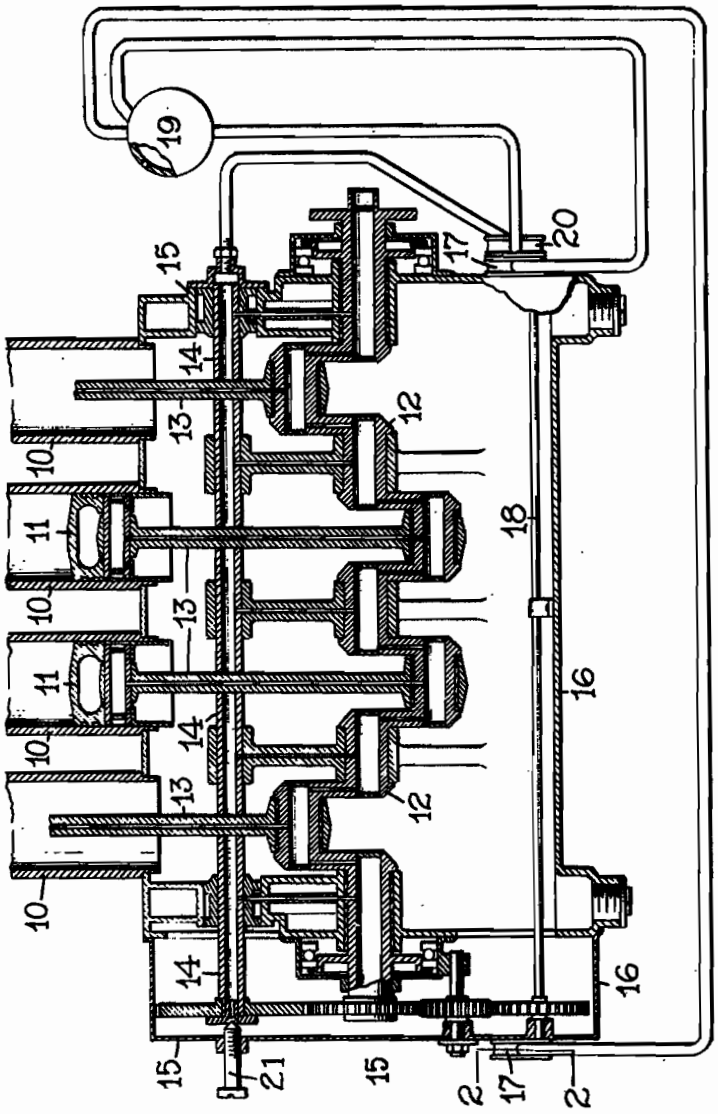
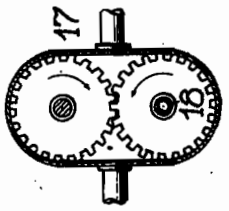


FIG. 2.



Witnesses

C. C. Cummings.

Marie Adams.

Inventor

GLENN H. CURTISS.

By John P. Barbour

Attorney

UNITED STATES PATENT OFFICE.

GLENN H. CURTISS, OF HAMMONDSPORT, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CURTISS AEROPLANE AND MOTOR CORPORATION, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

LUBRICATING SYSTEM FOR TRAVELING MOTORS.

1,329,038. Specification of Letters Patent. Patented Jan. 27, 1920.

Application filed December 11, 1914. Serial No. 876,716.

To all whom it may concern:

Be it known that I, GLENN H. CURTISS, a citizen of the United States, residing at Hammondsport, in the county of Steuben and State of New York, have invented certain new and useful Improvements in Lubricating Systems for Traveling Motors, of which the following is a specification.

My invention relates to motors and particularly to motors employed in aircraft.

Difficulties have heretofore been experienced in the lubrication and operation of aircraft motors, especially motors used on aircraft of the heavier than air type, due to the unusually severe conditions of service to which aeroplane motors are subjected. The object of my invention is to minimize these difficulties and I accomplish this by the provision of a lubricating system such that, regardless of the positions assumed by the craft in practice, and regardless of the severe conditions of service, an ample quantity of lubricant may be supplied at all times to the moving parts of the motor, and the motor is neither under-lubricated, over-lubricated or flooded at any time. The operation of the motor is thereby rendered more certain and reliable, and the craft as a whole thereby rendered more safe and secure.

In brief, in its broad aspect my invention comprises a drainage reservoir in fixed position upon the aircraft for receiving oil from different parts of the motor and the position of the oil in which shifts from one portion thereof to another as the inclination changes during the travel, and means whereby the oil is drawn or pumped from said reservoir during and regardless of said inclination changes. More specifically speaking my invention comprises a crank case drainage receptacle arranged to receive the oil draining from the lubricated bearings, and the oil in which shifts from one end to another as the inclination of the motor is changed in travel, a pair of circulating pumps, one drawing its supply from one end of said drainage receptacle and one from the other, an elevated supply reservoir fed by said circulating pumps, and an additional force feed pump passing oil from said supply reservoir to the bearings of the motor. My invention includes details of the conduit system and the regulation of the forced feed pressure as well.

In the accompanying drawings I show that form of my invention now best known to me.

Figure 1 is a diagrammatic illustration of the system, and

Fig. 2 is a sectional view of one of the pumps.

The parts may be identified by the reference numerals with which they are designated upon the drawings, and are characterized individually as now set forth.

(10, 10) The cylinders of an internal combustion motor. The motors usually installed upon aircraft are of this character, but as respects my invention, the motor may be of any other character, operated by one source of power or another, and may be of the reciprocating or the rotary type.

(11) The pistons of this motor.

(12) The crank shaft.

(13) The connecting rods.

(14) The cam shaft. Both the crank shaft and the cam shaft are hollowed out to form conduits through which oil may pass to the crank, connecting rod, and cam shaft bearings. The branches from the crank bearing conduits extend through the bearings, and through the connecting rods 12, to the piston pins which are likewise hollowed out, and deliver oil through restricted apertures to the walls of the cylinders themselves. The details of these apertures and the plugging up of the ends of the several hollow shafts and pins to properly confine the oil to the conduit system so formed, constitute no part of my present invention, the claims of this application being directed more especially to the system of lubrication set forth.

(15) The motor casing inclosing the main moving parts.

(16) The crank case drainage receptacle arranged longitudinally of the motor to receive the oil draining from the lubricated parts. This receptacle is really in continuation of the casing 15 being suitably connected thereto in any well known manner.

(17, 17) A pair of circulating pumps located one at each end of the drainage receptacle 16 and drawing its supply therefrom. These pumps are preferably of the

G. H. CURTISS.

TWIN FUSELAGE CONSTRUCTION.

APPLICATION FILED OCT. 18, 1915.

Patented Feb. 18, 1919.

2 SHEETS—SHEET 1.

1,294,412.

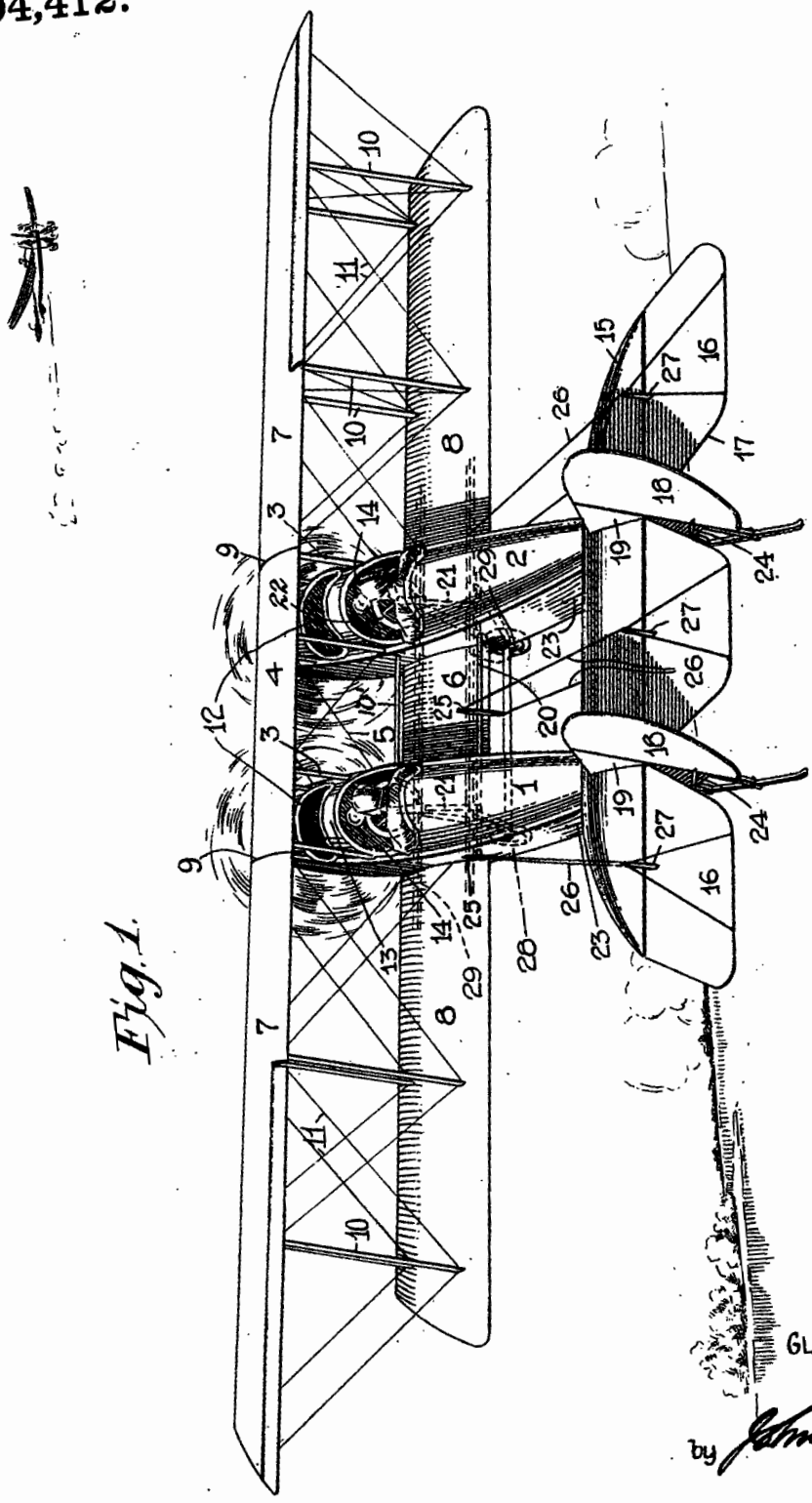


Fig. 1.

INVENTOR
GLENN H. CURTISS

by John P. Barker
ATTORNEY

G. L. WEBER.

FLYING MACHINE FRAME.

APPLICATION FILED SEPT. 30, 1916.

1,274,963.

Patented Aug. 6, 1918.

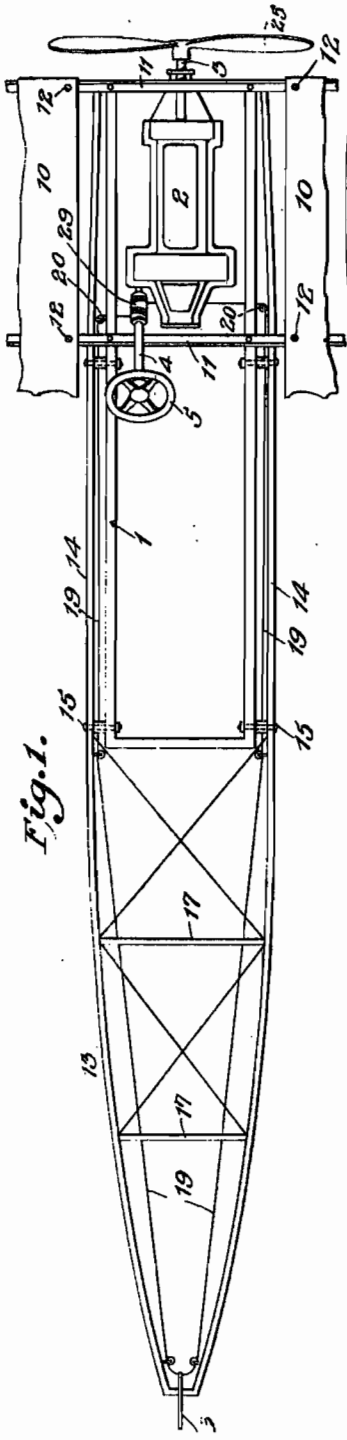


Fig. 1.

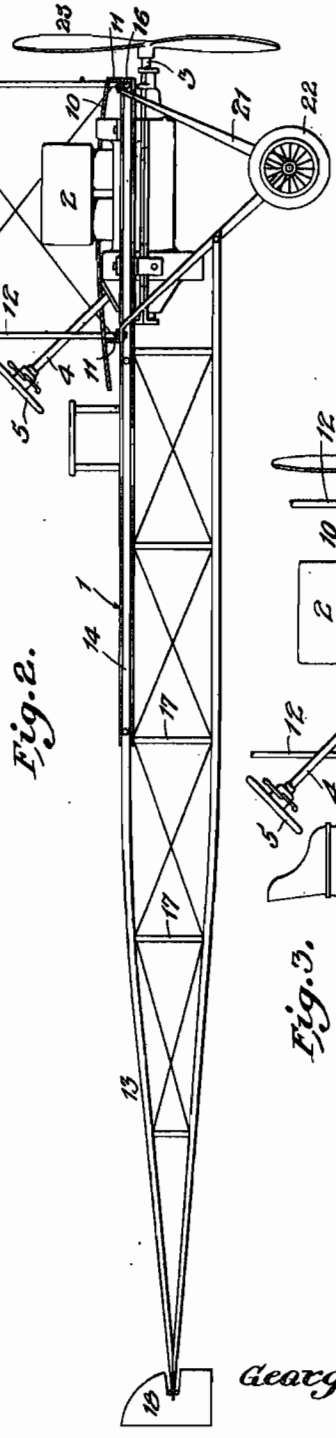


Fig. 2.

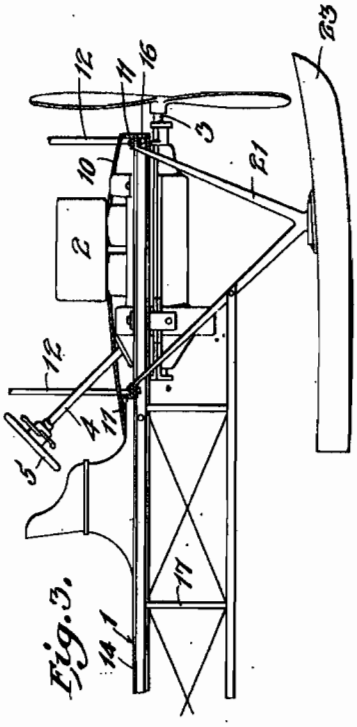


Fig. 3.

Inventor

George L. Weber

By Mason Fenwick & Lawrence,

Attorneys

G. H. CURTISS.

CONVERTIBLE RUNNING GEAR.

APPLICATION FILED NOV. 18, 1916.

1,269,570.

Patented June 11, 1918.

3 SHEETS—SHEET 1.

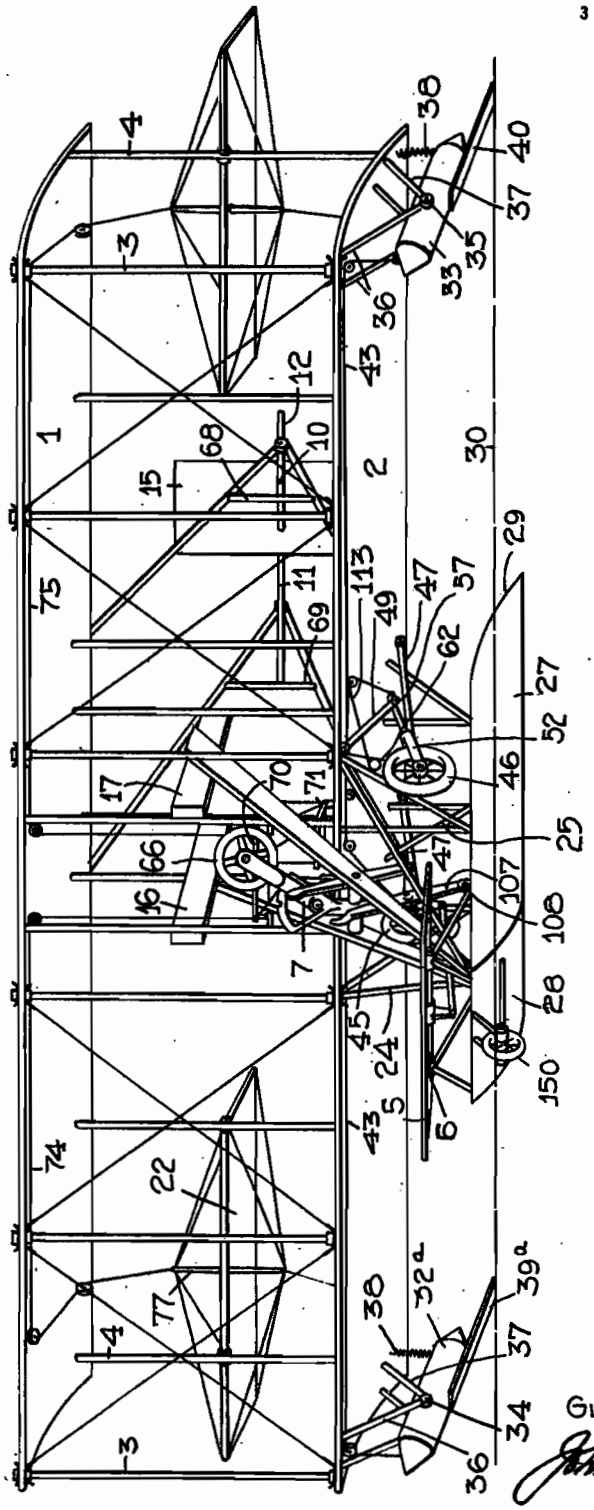


FIG. 1.

Inventor
GLENN H. CURTISS.
John P. Barker
Attorney

G. H. CURTISS.

CONVERTIBLE RUNNING GEAR.

APPLICATION FILED NOV. 18, 1916.

1,269,570.

Patented June 11, 1918.

3 SHEETS—SHEET 2.

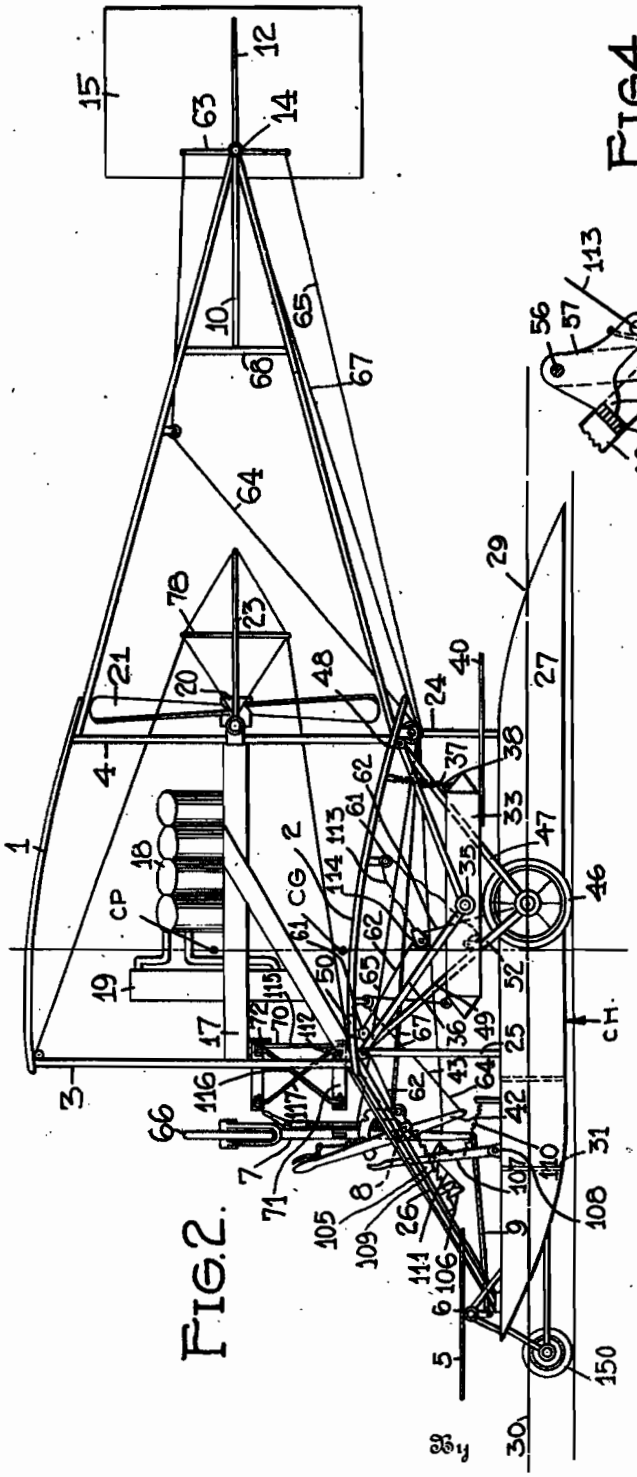


FIG. 2.

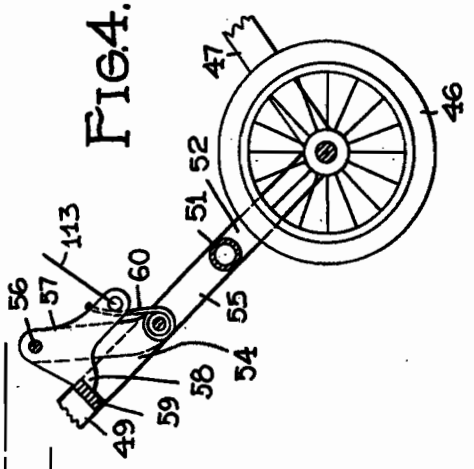


FIG. 4.

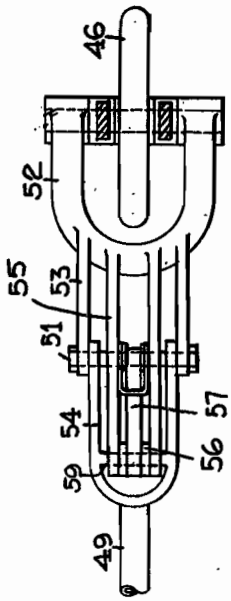


FIG. 3.

Inventor
GLENN H. CURTISS.

By

Attorney

G. H. CURTISS.

CONVERTIBLE RUNNING GEAR.

APPLICATION FILED NOV. 18, 1916.

1,269,570.

Patented June 11, 1918.

3 SHEETS—SHEET 3.

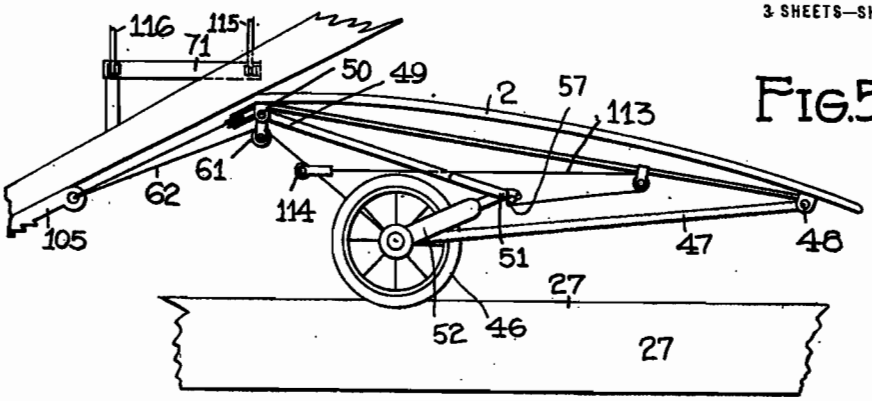


FIG. 5.

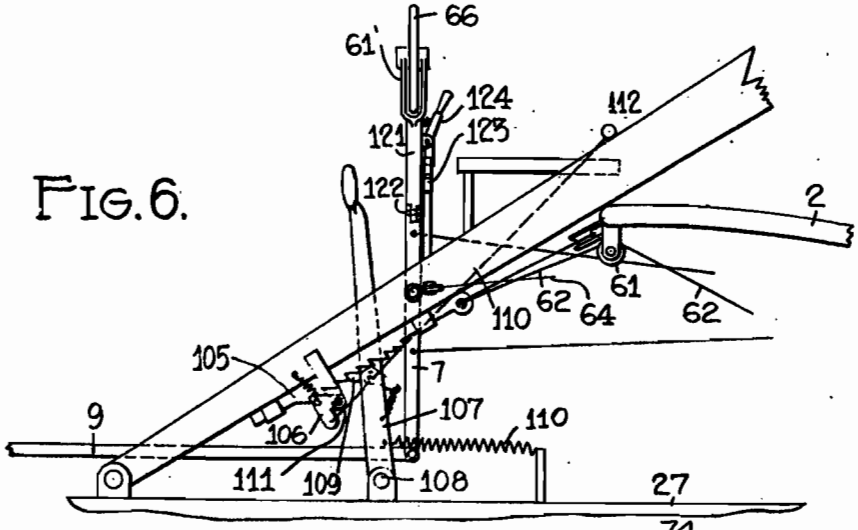


FIG. 6.

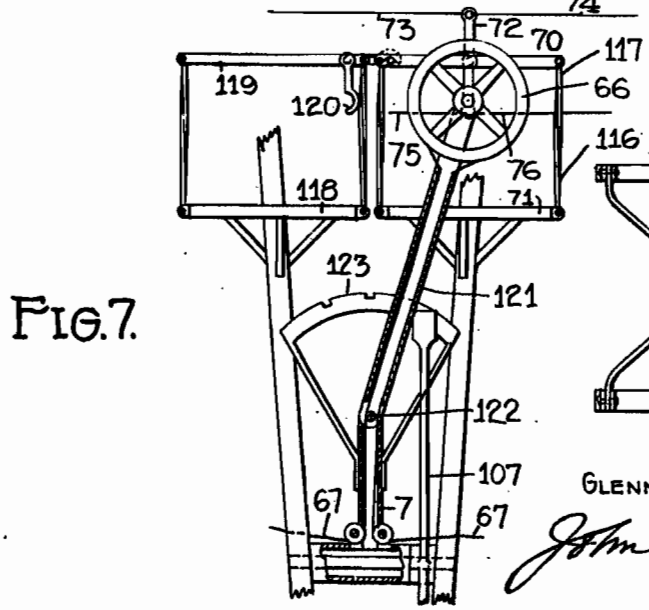


FIG. 7.

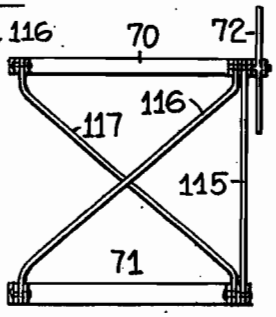


FIG. 8.

Inventor

GLENN H. CURTISS.

John P. Barker

Attorney

UNITED STATES PATENT OFFICE.

GLENN H. CURTISS, OF BUFFALO, NEW YORK, ASSIGNOR TO CURTISS AEROPLANE AND MOTOR CORPORATION, A CORPORATION OF NEW YORK.

CONVERTIBLE RUNNING-GEAR.

1,269,570. Specification of Letters Patent. Patented June 11, 1918.

Original application filed August 22, 1911, Serial No. 645,340. Divided and this application filed November 18, 1916. Serial No. 132,104.

To all whom it may concern:

Be it known that I, GLENN H. CURTISS, a citizen of the United States of America, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Convertible Running-Gear, of which the following is a specification.

Launching and landing means for an aircraft is the subject of my invention. The invention is directed particularly to a launching and landing means for that type of aircraft commonly known as a hydroaeroplane, but it will be very obvious upon an understanding of my invention that it may be applied with facility to other types of aircraft as well.

This application is a division of my application Serial No. 645,340, filed Aug. 22, 1911, in which there is disclosed a large number of mechanisms and constructions relating to aircraft of the heavier-than-air type.

The prime object of this invention is to attain efficiency in a launching and landing means of the collapsible or folding wheel type. A coördinate object is to attain sturdiness and durability of construction without detracting from the necessary high efficiency. In making efficiency an object I contemplate over-all efficiency, that is, mechanical efficiency, aerodynamic efficiency, and efficiency of manipulation. Many such devices have been proposed; in some of them one of these ends has been attained, and in some, others; but in none, so far as I am aware, have all of them been attained in the degree which is necessary for commercial exploitation.

Broadly speaking, my invention is characterized by a collapsible supporting structure for running gear wheels, constituting the ground running element of a ground landing gear, arranged to be moved from collapsed position either by gravity or by resistance of the medium through which the machine is traveling to extended position, and to be automatically locked in such extended position upon reaching it. No power is therefore required for extending the landing gear to operative position, and but a very minimum of time and attention. The release of a simple detent effects the whole operation in a most efficacious manner. A combined unlocking and retracting mechanism is utilized for effecting the collapse of the running gear. This latter includes a power multiplying device of a step by step nature whereby the running gear wheels may be easily operated at the convenience of the operator.

Such gears, as is well known, have particular application in the case of hydroaeroplanes, the wheels when extended, occupying such position with respect to the water borne base, that the machine may be operated upon land, yet when collapsed occupying a position above the bottom of the water borne base sufficiently to clear the surface of the water when the craft is operated thereover. Certain features of my invention are directed to this combination of the land running gear with the water borne base. Thus certain additional wheels are provided which give the land running gear a stability in spite of the fact that the water borne base is maintained clear of the surface of the ground.

That form of my invention illustrated was that best known to me at the date of filing the parent application above identified but it will be apprehended immediately that other embodiments have been developed by me and by others since that time, and that still others are possible.

Of the drawings,

Figure 1 is a perspective view from the front, parts having been omitted in order not to complicate the drawings,

Fig. 2 is a side elevation,

Figs. 3, 4, and 5 are details of the folding wheel construction, and

Figs. 6 to 8 are enlarged details of the control mechanism.

The features of the aeroplane shown in these drawings are described in detail in my parent application, and inasmuch as they do not enter into this invention, they will be but briefly described.

The aeroplane is of the biplane type comprising upper and lower wings 1 and 2, connected together in the usual fashion. For lateral balance the ailerons 22—23 are operated through the intermediary of a shoulder yoke 70 of the Curtiss type. For longitudinal control there is provided a horizontal stabilizing surface 10 in connection with which are mounted elevators 12. These elevators are operated from the control column

7 which is oscillatable in the longitudinal vertical plane. A vertical rudder 15, movable right and left by rotation of the control wheel 66 at the upper end of the column 7, serves for directional control. The driving thrust is furnished by a propeller 21 operated by a directly connected motor 18.

This aeroplane structure is supported by means of vertically extending struts 24—25 upon a water borne base 27 in the form of a hydroplaning pontoon. The characteristics of this pontoon and its relation to the aeroplane are fully described in my parent application and are at this time fully understood. Between the prow 28 of this pontoon and the elevated motor 18 there are extended a pair of braces 26. These extend respectively from the engine beds 17 at a point intermediate the leading and trailing edges of the aeroplane wings diagonally downward and forward, connecting with the structure of the lower wing at a point in the vicinity of its leading edge and substantially vertically above the vertical struts 25 by means of which the aeroplane is supported upon the pontoon 27. The members 26 are thus spaced apart. They support, in front of the driving motor, both the operator's seat 71 with which is connected the shoulder yoke 70, and the control column 7 and its wheel 66. They also support the control members of the launching and landing means as will hereinafter appear.

45 and 46 are wheels constituting the preferred form of means for supporting the machine in travel in contact with the earth. They are hung from the machine and project slightly below the lower surface of the boat, as indicated in Fig. 2. In order that they may exert less resistance when the machine is moving through the water, I have provided means under the control of the operator for raising the wheels out of the water when the machine is floating, and for depressing the same at will. In the preferred construction, 47 is a brace pivoted at 48 to the frame of the machine, and 49 is another brace pivoted at 50 to the frame, and at 51 pivoted to a short arm 52. A locking device shown in Figs. 3 and 4 in detail, operates to hold the wheels in their depressed position shown in Fig. 1. As shown in Figs. 3, 4 and 5, the wheel is pivoted to the U-shaped frame 52 having projections 53 pivoted to the U-shaped end 54 of the brace 49. Bent arms 55 fixed to the frame 52 carry pivoted to them at 56 a locking detent 57, which has a catch-nose 58 engaging a bar 59 on the U-shaped frame 54. 60 is a spring normally holding the latch in the position shown in Fig. 4. The preferred mechanism for raising the wheels comprises a slidable rack bar 105 (see Figs. 5 and 6) engaged by a spring-pressed detent 106. 62 is a wire connected to the bar and running to the axle of the wheel, being led over suitable pulleys such as 61. 107 is a foot lever pivoted to the boat at 108 and carrying a spring dog 109. 110 is a spring to draw lever 107 backward. As the foot lever is reciprocated it forces the bar 105 downwardly, being held by detent 106 at each reciprocation, drawing on wire 62 and collapsing the frame 47, 49, 52 to the raised position shown in Fig. 5. The holding detent 106 may be tripped by a wire 111 and handle 112 adjacent to the operator's seat. In order to release lock 57 a wire 113 runs therefrom to a pulley 114 loose on the wire 62. This latter is slack when the wheels are down and locked, and as the slack is taken up it draws on wire 113, unlocking latch 57 just before wire 62 becomes taut. Of course the other wheel is provided with the same construction, the wires 62 of both wheels being connected to rack bar 105. Releasing the detent 106 before the machine comes out of the water allows the weight of the parts and the resistance offered by the water to throw the wheels back to the locked position shown in Figs. 1 and 4. The machine may then travel out of the water onto the land and over the same without the resistance which would be exerted by the boat 27 if in contact with the earth. Supported by brackets beneath the fore part of pontoon 27 is still a third wheel 150 as clearly shown in Figs. 1 and 2. With wheels 45 and 46 it constitutes the third point of a triangular wheel base. This wheel as shown is non-collapsible and is preferably considerably smaller than wheels 45 and 46. It is placed at such elevation that when running upon the ground it maintains the fore part of the pontoon elevated above the surface.

The wheels 46, which constitute the main supporting wheels of the machine are so arranged relatively to the water borne base and in fact relatively to the machine in its entirety that the axial line of the wheels, when extended, lies in substantially the transverse vertical plane of the center of gravity and consequently support substantially the entire weight of the machine when at rest upon the ground. The supplemental or third wheel 150 (in effect a runner) is longitudinally separated from the main supporting wheels and so positioned relatively to the machine as to bear only a very minor portion of the total weight thereof and yet sufficient weight to prevent contact of the water borne base with the ground when the machine is operated as a land machine.

In operation, the machine may rise either from the land or water as desired and return thereto. If operating upon the surface of the water with the running gear wheels 45—46 in collapsed condition as shown in Fig. 5, it is desired to run out on to a beach, as the shore is approached the operator re-

leases detent 106 by pulling wire 111 and the wheels are thereby allowed to drop by gravity to the position shown in Fig. 2. First the rush of the air (assuming operation is at high speed) and then the rush of the water, thrusts the wheels rearwardly and downwardly as the machine progresses, thereby aiding gravity in effecting a quick extension. As they move into extended position, they are locked through the automatic action of the spring detent 57 and by virtue of the triangular arrangement of bracing formed by the structure of the lower wing 2 and the struts 47, and 49—52 in combination, and are rigidly and sturdily held in their extended position. As they project slightly below the bottom of the boat, the craft may be run out upon the shore at speed and with the bottom of the water borne base 27 free from contact with the ground. If having started from the land on the wheels as a launching base and having proceeded either into the air or into the water, it is desired to operate upon the surface of the water, the operator has simply to manipulate in oscillating motion the lever 107 as previously described, whereupon the main wheels 45—46 are step by step withdrawn into their retracted or collapsed position in which they are elevated above that level at which they would engage the water and offer material resistance to forward progress. In addition to releasing the latch 57, the cable 113 by virtue of its connection with the collapsing strut 49—52 not only unlocks but assists to break the toggle constituted by the branches 49—52 of the strut. It also takes some of the weight of the gear as it is collapsed depending upon the amount of lost motion which is provided between cable 113 and cable 62.

What I claim is:

1. A launching and landing gear for aircraft comprising a runner, a supporting strut for the runner arranged to be placed under compression and a second collapsible supporting strut for the runner arranged to be placed under tension by rearward thrust, the compression member being located aft of the tension member.

2. A launching and landing gear for aircraft comprising a V-strut frame collapsible in a longitudinal plane, and a runner supported by said frame and movable forwardly and upwardly as the landing gear is collapsed without altering the placement of the points of attachment of either strut relatively to the machine.

3. A collapsible launching and landing gear for air-craft comprising a collapsible runner rigidly braced against collapse rearwardly and arranged to collapse forwardly and upwardly only without altering the placement of the points of attachment of the runner supports relatively to the machine.

4. A launching and landing gear for aircraft comprising a runner, a collapsible triangularly arranged support for the runner, the base of which is immovable relative to the craft, one side of which is fixed longitudinally as respects the craft and the runner, and the other side of which is collapsible to effect collapse of the support.

5. A collapsible launching and landing gear for air-craft comprising a runner, a fixed part of the craft and a pair of meeting struts pivotally connected therewith at points longitudinally spaced, the pivot axes of the struts being relatively stationary, the rearmost one of said struts being longitudinally fixed in length between the runner and the body of the craft and the front strut adjustable to permit movement of the runner with the rearmost strut as a radius.

6. A launching and landing gear for aircraft comprising a collapsible runner having extended and retracted positions, a sectional strut connected with said runner, and step by step operating mechanism connected with said strut for relatively moving its sections.

7. A launching and landing gear for aircraft comprising a collapsible runner arranged for collapse forwardly and upwardly only, means for retracting said runner to collapsed position, and a latch engaging to hold the runner in extended position independently of said retracting means.

8. A launching and landing gear for aircraft comprising a runner, and a collapsible triangularly arranged support therefor, the base of which is immovable relative to the craft, one side of which is fixed longitudinally as respects both the craft and the runner, and the other side of which is longitudinally collapsible to effect the collapse, together with a latch to retain the runner in collapsed position.

9. A launching and landing gear for aircraft comprising a runner, and a collapsible triangularly arranged support therefor, the base of which is immovable relative to the craft, one side of which is fixed longitudinally as respects both the craft and the runner, and the other side of which is foldable to effect the collapse, a latch arranged in connection with said foldable side to hold the same against collapse during operation, and means for retracting the runner.

10. A launching and landing gear for aircraft comprising a collapsible runner, a release latch arranged to hold said runner in collapsed position, and foot operated means for collapsing the runner, aerial controlling means for said craft and hand operated means for said aerial control means.

11. A launching and landing gear for aircraft comprising a runner, and a collapsible framework supporting the same including a toggle, a lock for the toggle arranged to

hold the runner in extended position, and operating mechanism to move the runner from extended to retracted position connected with said lock to operate the same and break the toggle.

12. A launching and landing gear for aircraft comprising a collapsible runner which is normally locked against collapse and operating mechanism to move the runner to collapsed position, together with auxiliary operating means to initiate the collapse.

13. A launching and landing gear for aircraft comprising a collapsible runner which is normally locked against collapse, operating mechanism to unlock and move the runner to collapsed position, together with a lost motion connection between said runner and said operating means.

14. A launching and landing gear for hydroaeroplanes including a waterborne base having a downwardly and rearwardly inclined prow, runners mounted respectively at opposite sides of the waterborne base for movement into and out of position beneath the horizontal plane of the bottom of the waterborne base, a fixed runner mounted forwardly of the downwardly and rearwardly inclined prow, a collapsible support for the movable runners and mechanism for controlling the effectiveness of the support.

15. A launching and landing gear for hydroaeroplanes including a pontoon having a downwardly and rearwardly inclined prow, a land runner projected beneath said prow portion together with collapsible runners located rearwardly of said prow runner at opposite sides of the pontoon, both the forward runner and the rear runner, when extended, extending beyond the horizontal plane of the bottom of the pontoon.

16. In a hydro-aero machine, the combination with a water borne base having a construction adapted to support the machine by displacement when at rest on the water and to bring it to a hydroplaning position when traveling at hydroplaning speed thereover, of a pair of laterally spaced main supporting wheel so arranged relatively to the water borne base that they may be extended and retracted respectively below and above the normal water line thereof and so arranged relatively to the machine in its entirety that the axial line of the wheels, when extended, lies in substantially the transverse vertical plane of the center of gravity and they consequently support substantially the entire weight of the machine when at rest upon the ground, said wheels when extended being effective as a means for launching and landing the machine respectively from and upon land, and when retracted, located above the water line so as to interfere in no way with the launching and landing of the machine respectively from and upon water.

17. In a hydro-aero machine, the combination with a water borne base having a construction adapted to support the machine by displacement when the machine is at rest upon the water and to bring it to a hydroplaning position when traveling at hydroplaning speed thereover, of a pair of laterally spaced main supporting wheels so arranged relatively to the water borne base that they may be extended and retracted respectively below and above the normal water line thereof and so arranged relatively to the machine in its entirety that the axial line of the wheels, when extended, lies in substantially the transverse vertical plane of the center of gravity and they consequently support substantially the total weight of the machine when at rest upon the ground, said wheels when extended being effective as a means for launching and landing the machine respectively from and upon land, and when retracted, located above the water line so as to interfere in no way with the launching and landing of the machine respectively from and upon water, and a supplemental runner longitudinally separated from the main wheels and so positioned relatively to the machine as to bear only a very minor portion of the total weight thereof and yet sufficient weight to prevent contact of the water borne base with the ground when the machine is operated as a land machine.

In testimony whereof I affix my signature.

GLENN H. CURTISS.

G. H. CURTISS.

STREAM LINE WIRING FOR AIRPLANES.

APPLICATION FILED MAY 4, 1918.

1,392,271. Patented Sept. 27, 1921.

FIG. 1.

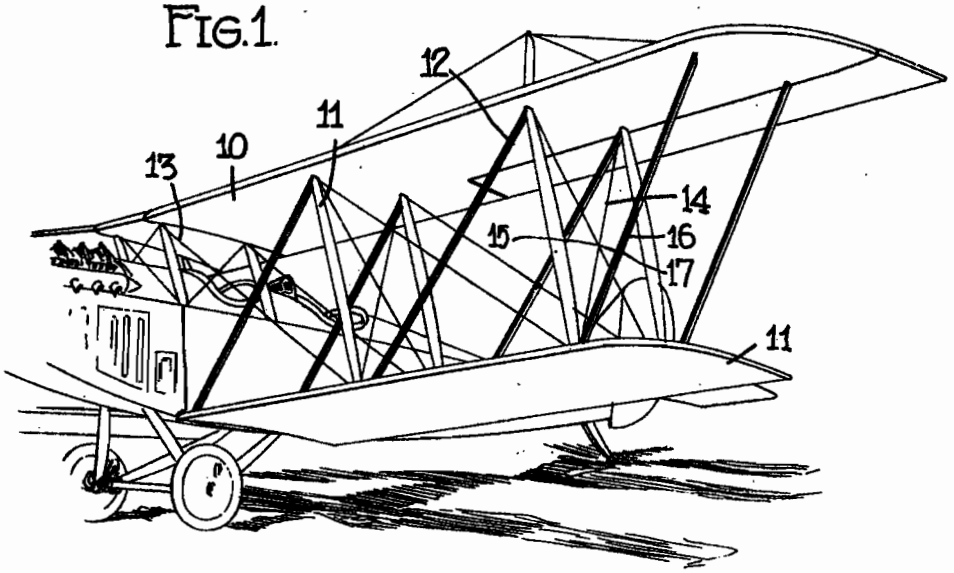


FIG. 2.

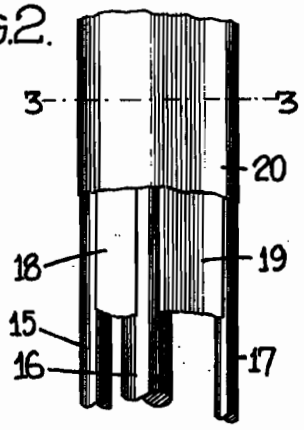


FIG. 4.

FIG. 6.

FIG. 5.

FIG. 7.

FIG. 3.

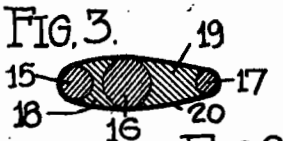


FIG. 8.

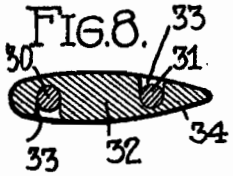


FIG. 9.

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COMBINATION LANDING GEAR FOR AEROPLANES.

APPLICATION FILED MAR. 13, 1918.

1,306,751. Patented June 17, 1919.

FIG. 1.

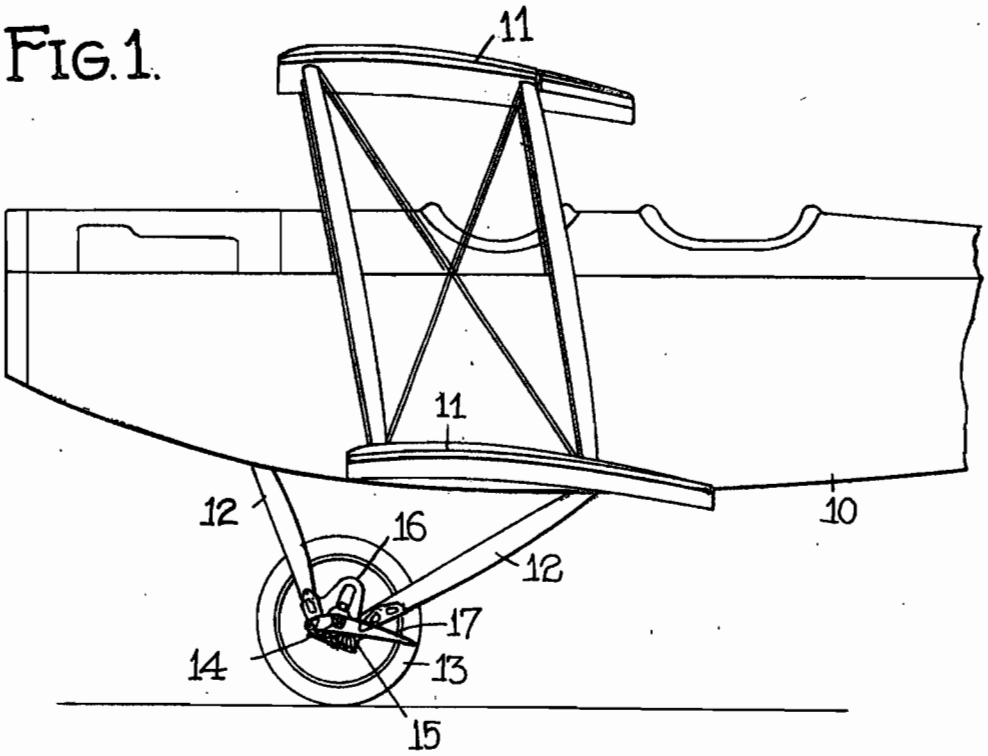
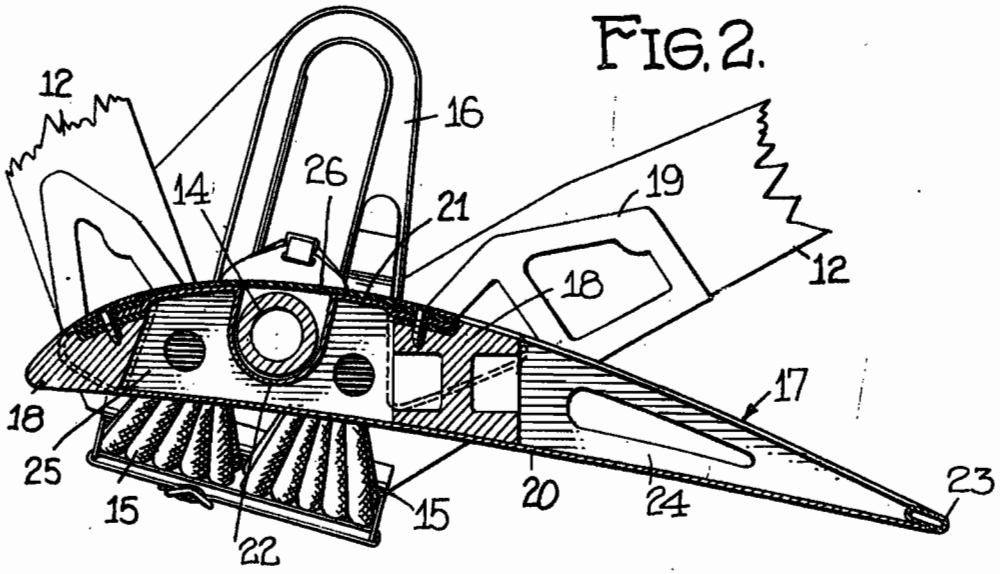


FIG. 2.



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By

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Attorney

UNITED STATES PATENT OFFICE.

GLENN H. CURTISS, OF GARDEN CITY, NEW YORK, ASSIGNOR TO CURTISS AEROPLANE AND MOTOR CORPORATION, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

COMBINATION LANDING-GEAR FOR AEROPLANES.

1,306,751. Specification of Letters Patent. Patented June 17, 1919.

Application filed March 13, 1918. Serial No. 222,214.

To all whom it may concern:

Be it known that I, GLENN H. CURTISS, a citizen of the United States, residing at Garden City, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Combination Landing-Gears for Aeroplanes, of which the following is a specification.

My invention relates to aeroplanes and is characterized by the construction of the axle fairing in true aerofoil or hydrofoil section. Under existing conditions the axle of the landing gear is at best imperfectly streamlined although fairing is used to advantage and in many machines conjointly as a strut brace. Never, however, in so far as I am aware has it been given a true aerofoil or hydrofoil section that its utility might be materially increased. Heretofore, in land machines, no provision has been made for an enforced landing on water. To so land would upset the machine, damage the landing gear, and in all probability endanger the aviator's life. Hence it is to avoid such a contingency and to construct the axle fairing in lifting rather than non-lifting form that the present invention is designed. Moreover, through an improved construction, provision is made for unrestricted yielding movement of the landing gear axle under normal landing conditions.

Of the drawings, wherein like characters of reference designate like or corresponding parts:

Figure 1 is a side elevation of a tractor V-strut aeroplane equipped with the improved combined aeroplane and hydroplane surface of this invention, and

Fig. 2 is a detail transverse sectional view of said surface.

For purposes of practical illustration the combined aeroplane and hydroplane surface is shown as constituting an element of a standard tractor aeroplane equipped with the conventional V-strut type landing gear. Said surface preferably incloses the landing gear axle and the customary strut braces which ordinarily streamline the axle for decreased head resistance in flight. No limitation, however, in this connection is intended. The combined aeroplane and hydroplane surface may be, if desired, separately supported by and between the landing gear struts either above or below the axle without departing in any way from the generic spirit of the invention as claimed.

The aeroplane illustrated comprises the usual fuselage body 10, principal supporting surfaces 11—11, V-type landing gear struts 12, landing gear wheels 13 and landing gear axle 14. Said axle 14 is normally held against vertical displacement by shock absorber elastics 15 trained beneath the V-struts 12, and at opposite sides of the struts, over the adjacent portions of the axle. Guides 16 for the axle 14 are provided.

The improved auxiliary supporting surface 17 is of true aerofoil and hydrofoil section. As shown, it is arranged to completely inclose the axle 14 of the landing gear. Its construction is such that the usual axle fairing may be dispensed with, or, from a different point of view, the axle fairing may be described as constructed in aerofoil or hydrofoil form. Considered from either angle, under the conditions stated, the result is exactly the same.

Strut braces 18, in the form of lightened beams support the surface 17. Said beams 18 are terminally shaped to engage in sockets formed as an integral part of the V-strut fittings characteristic of a standard Curtiss machine. The beams are located respectively fore and aft of the axle with the beam in advance of the axle constituting a leading edge strip for said surface 17 by reason of its cross sectional form.

That a true aerofoil section may be given the surface 17 the beams 18 are interconnected in planes above and below the axle by sheet metal strips or sheathing. These metal strips, designated respectively 20 and 21, marginally overlap the beams 18 to provide a securing surface and with said beam afford a water tight compartment. The upper or top strip 21 is pocketed or offset longitudinally intermediate its longitudinal edges as at 22. Within the pocket thus formed the axle 14 is normally inclosed and hidden. Aft of the rear beam 18 the surface framework comprises a metallic trailing edge strip 23 and lightened ribs 24 interconnecting said strip 23 and said beam. Fabric covering, except in the vicinity of the pocket 22, may or may not be used. Also, if desired, the beams 18 may be interbraced by lightened transversely extending ribs 25.

Under normal conditions the elastics 15

are in repose, that is, unstretched. Being unstretched, the axle 14 normally lies hidden within the pocket 22 of the aerofoil 17. Vertical displacement of the axle, however, occurs when landing and preliminary to aerial flight. For this reason the guides 16 are provided. Accordingly that side of the surface beyond which the axle moves when displaced is left uncovered except for an elastic strip 26 stretched over said pocket. This strip maintains the true aerofoil section between beams so long as the axle remains unmoved. In addition the strip also prevents the entrance of water into the pocket 22.

By giving to the surface 17 an angle of incidence somewhat greater than the angle of incidence of the principal supporting surfaces 11 a hydroplane surface of considerable effective area is produced. A surface of this type situated at the base of the landing gear renders landing upon the surface of the water of a land machine practicable and entirely feasible without endangering either the pilot or the machine. The area of the surface is such that upon an enforced landing upon water the hydroplaning action is sufficient to support the weight of the machine by reason of its moving speed. As the speed of the craft gradually lessens the hydroplane surface settles deeper until finally the body of the machine comes into engagement with the water surface. This gradual diminution of the moving speed is conducive to safe landing and eliminates completely the nosing under tendency which would otherwise exist. In aerial flight the increased angle of incidence given the surface 17 is such that slight aerodynamic lift is obtained, *i. e.*, lift at least sufficient to sustain the weight of the surface and, depending upon the distance between struts and the depth of the chord, a portion of the weight of the entire machine. The beams 18 effectually interbrace the landing gear struts and consequently replace the axle fairing heretofore used. If desired, the lightened surface 17 disclosed, may be in the nature of fairing construction in aerofoil or hydrofoil section. The location of the auxiliary surface in the plane of the axle 14 is deemed best by reason of the decreased head resistance obtained. Furthermore, it is believed to be essentially novel to mount a supporting surface, especially one serving a twofold purpose by and between the landing gear struts of a land machine.

What is claimed is:

1. In an airplane, the combination of a landing gear including ground runners adapting the machine to arise from and alight upon the ground, a cross connection between the runners, a principal aerial supporting surface adapting the machine to aerial flight, and a cambered auxiliary supporting surface carried by the landing gear and streamlining the cross connection between the ground runners, the cross sectional form of said aerial auxiliary supporting surface being such that the machine is adapted to alight upon the water should occasion demand.

2. In an airplane, the combination of a wheeled landing gear adapting the machine to arise from and alight upon the ground, a cross connection between the wheels of the landing gear, and a hydroplaning surface adapting the machine to alight upon the water, the cross sectional form of the hydroplaning surface being such that the cross connection is inclosed for the major part within its confines.

3. In an airplane, the combination of a landing gear including ground runners adapting the machine to arise from and alight upon the ground, a principal supporting surface for sustaining the machine in flight through the air, a cross-connection between the runners of the landing gear, and a hydroplaning surface adapting the machine to alight upon the water, the cross sectional form of the hydroplaning surface being such that it constitutes an auxiliary supporting surface and at the same time offers a streamline inclosure within which the cross connection between the runners of the landing gear is confined.

4. In an airplane, the combination of a wheeled landing gear adapting the machine to arise from and alight upon the ground, an axle upon which the wheels of the landing gear are mounted, means yieldingly resisting vertical displacement of the axle, and a hydroplaning surface inclosing the axle and adapting the machine to alight upon the water, the cross sectional form of the hydroplaning surface being such that it constitutes an auxiliary supporting surface while the machine is supported wholly by the reaction of air upon its wings or supporting surfaces.

In testimony whereof I hereunto affix my signature.

GLENN H. CURTISS.

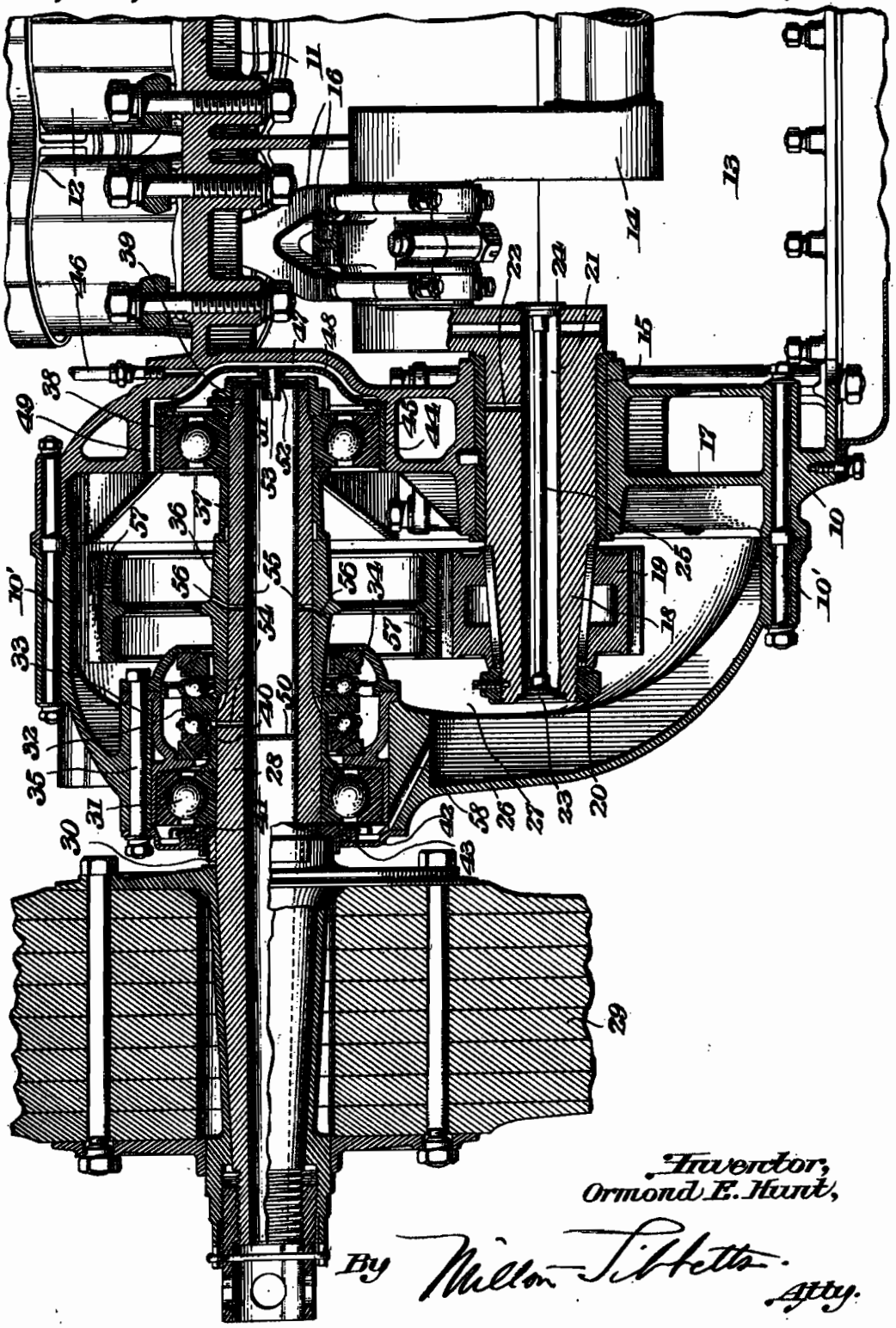
Dup

O. E. HUNT.

PROPELLER DRIVE FOR HYDROCARBON MOTORS.

APPLICATION FILED APR. 27, 1918.

1,415,092. Patented May 9, 1922.



Inventor,
Ormond E. Hunt,
By Milton Tibbetts.
Atty.

UNITED STATES PATENT OFFICE.

ORMOND E. HUNT, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PROPELLER DRIVE FOR HYDROCARBON MOTORS.

1,415,092. Specification of Letters Patent. Patented May 9, 1922.

Application filed April 27, 1918. Serial No. 231,236.

To all whom it may concern:

Be it known that I, ORMOND E. HUNT, a citizen of the United States, and resident of Detroit, Wayne County, State of Michigan, have invented certain new and useful Improvements in Propeller Drives for Hydrocarbon Motors, of which the following is a specification.

This invention relates to hydrocarbon motors and particularly to the reduction gearing between the crank shaft thereof and a propeller shaft, and the mounting of the parts.

One of the objects of the invention is to provide a construction that will permit of unit assembly to thereby facilitate manufacture.

Another object of the invention is to provide lubrication means for the driving mechanism of a hydrocarbon motor.

Another object of the invention is to provide a separate compartment for the reduction gearing and the bearings thereof, to prevent the moisture of the crank case from rusting the bearings or other parts.

Other objects of the invention will appear from the following description taken in connection with the drawing which forms a part of this specification, and in which the figure is a vertical longitudinal sectional view through one end of a hydrocarbon motor embodying the invention.

Referring to the drawing, 10 represents the forward part of a hydrocarbon motor crank case or base. As shown, this crank case or base 10 is formed in two halves, the upper half 11 supporting the cylinders 12, and the lower half 13 forming an oil well. The crank shaft 14 of the motor is mounted in bearings between the upper and lower halves of the crank case, and the forward bearing 15 is shown in section in the drawing. The drawing also shows two of the connecting rods 16 mounted on one of the cranks of the crank shaft 14, it being understood that the motor shown is of the V-type.

The bearing 15 above referred to is supported directly in the forward end wall 17 of the crank case or base 10 and the crank shaft 14 extends through and beyond this bearing, the extended end being indicated at 18. Upon this extended end is mounted a spur gear 19, keyed thereto and secured thereon by a nut 20.

It will be seen that this end of the crank shaft 14 is drilled out as at 21 and a branch passage 22 is provided for carrying oil to the bearing 15. Oil may be fed under pressure to the interior of the crank shaft by any suitable means (not shown) and the ends of the drilled-out part 21 of the crank shaft may be closed as by disks 23 and 24, and a tie rod 25.

Detachably secured to the front wall of the base or crank case 10 as by bolts 10′, is a cover 26 which is shown as of bulged-out construction and formed so that together with the front wall of the crank case it forms a compartment or housing 27 forwardly of the crank case and into which the end 18 of the crank shaft extends. By reason of the separation of this compartment from the crank case by the front wall of the latter, any moisture that may be in the crank case is prevented from circulating in the compartment 27 where it might injure the bearings and other parts therein as by rusting them.

The cover 26 is arranged to rotatably support a propeller shaft 28, which shaft extends through the cover and has an airplane propeller 29 securely keyed to its front end. The rearward part of the propeller shaft 28 is shown as housed within the compartment 27.

The propeller shaft 28 has a flange 30, which is shown as an integral part of the shaft, and upon a cylindrical part of the shaft adjacent said flange are bearings 31 and 32. These bearings may be broadly termed "roller bearings," which is intended to include bearings having either balls or cylindrical or conical or similar rollers, and the bearing 31 is an annular bearing while the bearing 32 is a double thrust bearing. These two bearings are supported in the cover 26 by means of collars 33 and 34, both of which are secured to the cover 26 as by a series of bolts 35.

Just rearwardly of the bearing 32 is a large spur gear 36, the hub of which is keyed to the shaft 28. Then there is a spacing collar 37 and then another annular roller bearing 38. A nut 39 threaded on the rear end of the shaft 28 bears against the inner race of the bearing 38 and thereby retains the various bearings and the gear 36 in place on the shaft. A spacing collar 40 between the inner race of the bearing 31 and the intermediate race of the bearing 32, and a flanged

ring 41 between the flange 30 and the inner race of the bearing 31, complete the various parts mounted on the shaft 28. A plate 42 fits on the cover 26 over the opening through which the shaft 28 passes and has a packing 43 which makes a joint with the periphery of the ring 41 to prevent the escape of lubricant around the shaft. This plate 42 is secured to the cover by the bolts 35 above referred to.

From the above description it will be seen that the shaft 28 and all of its bearings and its gear and propeller may be assembled with the cover 26 independently of the motor crank case 10 and afterwards secured in place on the end of said crank case. This considerably facilitates manufacture of these parts.

The front wall of the upper half 11 of the crank case 10 is formed with a bearing receiving part 44 into which is placed a lining shell 45 adapted to receive the bearing 38 of the shaft 28. It will be understood that when the cover 26 is placed in position at the front end of the crank case the bearing 38 is slipped into the shell 45 and said bearing is to be supported by the crank case or base. As this cover is placed in position the gears 36 and 19 are brought into mesh so that the shaft 28 is driven at a reduced speed by the crank shaft 14.

Means are provided for feeding oil to the various moving parts in the compartment 27 and as shown one of the oil leads from the motor brings the oil to the compartment as by a pipe 46. This pipe carries the oil to a space 47 formed by the wall of the crank case and a plate 48 arranged just at the rear of the shaft 28 and held in place by the shell 45. An overflow conduit 49 may be provided if desired at the top of the space 47. The shaft 28 is of hollow construction and oil which may be fed to the rear part of the shaft is prevented from reaching the forward part by a partition in the form of a disk 50 which is pressed into the shaft as shown in the drawing. The rear end of the shaft has a disk 51 secured thereto and a central opening 52 permits the passage of a tube 53 which provides communication between the space 47 and the interior of the shaft 28. Thus the oil fed by the pipe 46 to the space 47 passes through the tube 53 into the rear part of the shaft 28. Any overflow from the passage 49 drains down to the bottom of the compartment 27 where it may be withdrawn with suitable pump connections, not shown. Some of this overflow lubricates the bearing 38.

The shaft 28 is also formed with branch oil conduits 54 and 55, the former leading to the bearings 32 and 31 and the latter communicating with conduits 56 formed in the hub of the gear 36. These latter conduits throw the oil by centrifugal force onto the inner periphery of the gear 36 from which it passes to the gear teeth through openings 57.

Some of the oil that passes to the bearings 31 and 32 drains to the bottom of the compartment 27 through a drain conduit 58 and the remainder overflows at the end of the collar 34.

From the above description it will be seen that there is a constant circulation of oil through the various bearings and over the gears so that all moving parts within the compartment 27 are amply lubricated.

Other forms and modifications of the mechanism shown and described herein may be made without departing from the spirit or scope of the invention.

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

1. The combination with the base and crank shaft of a hydrocarbon motor, of a cover detachably secured to said base and with the base forming a compartment, a propeller shaft extending through the cover, radial and thrust bearings for the propeller shaft in said cover, a radial bearing in said base for the inner end of said propeller shaft, and gearing between said shafts.

2. The combination with a hydrocarbon motor having a crank shaft, of a propeller shaft geared to said crank shaft and having a flange between its ends, a supporting casing for said shafts, a propeller mounted on the propeller shaft at one side of said flange, and separated bearings mounted on the propeller shaft at the other side of said flange.

3. The combination with a hydrocarbon motor having a crank shaft, of a propeller shaft geared to said crank shaft and having a flange between its ends, a supporting casing for said shafts, a propeller mounted on the propeller shaft at one side of said flange, and radial and thrust bearings mounted on the propeller shaft at the other side of said flange.

4. The combination with a hydrocarbon motor having a base, of a hollow propeller shaft mounted in bearings therein, a gear on said shaft, means for feeding oil to the interior of said shaft, and means for feeding oil from said shaft to said bearings and to the teeth of said gear.

5. The combination with a hydrocarbon motor having a crank case including an end closing wall and a cover spaced from said wall, of a propeller shaft, a pair of separated radial bearings for said shaft in said cover and in said wall, a double thrust bearing between the radial bearings and a driving gear for the propeller shaft mounted thereon in the compartment formed by said cover and wall and between said thrust bearing and one of said radial bearings.

In testimony whereof I affix my signature.

ORMOND E. HUNT.

G. C. LOENING.

AIRPLANE.

APPLICATION FILED MAY 13, 1919.

1,394,630.

Patented Oct. 25, 1921.

4 SHEETS—SHEET 1.

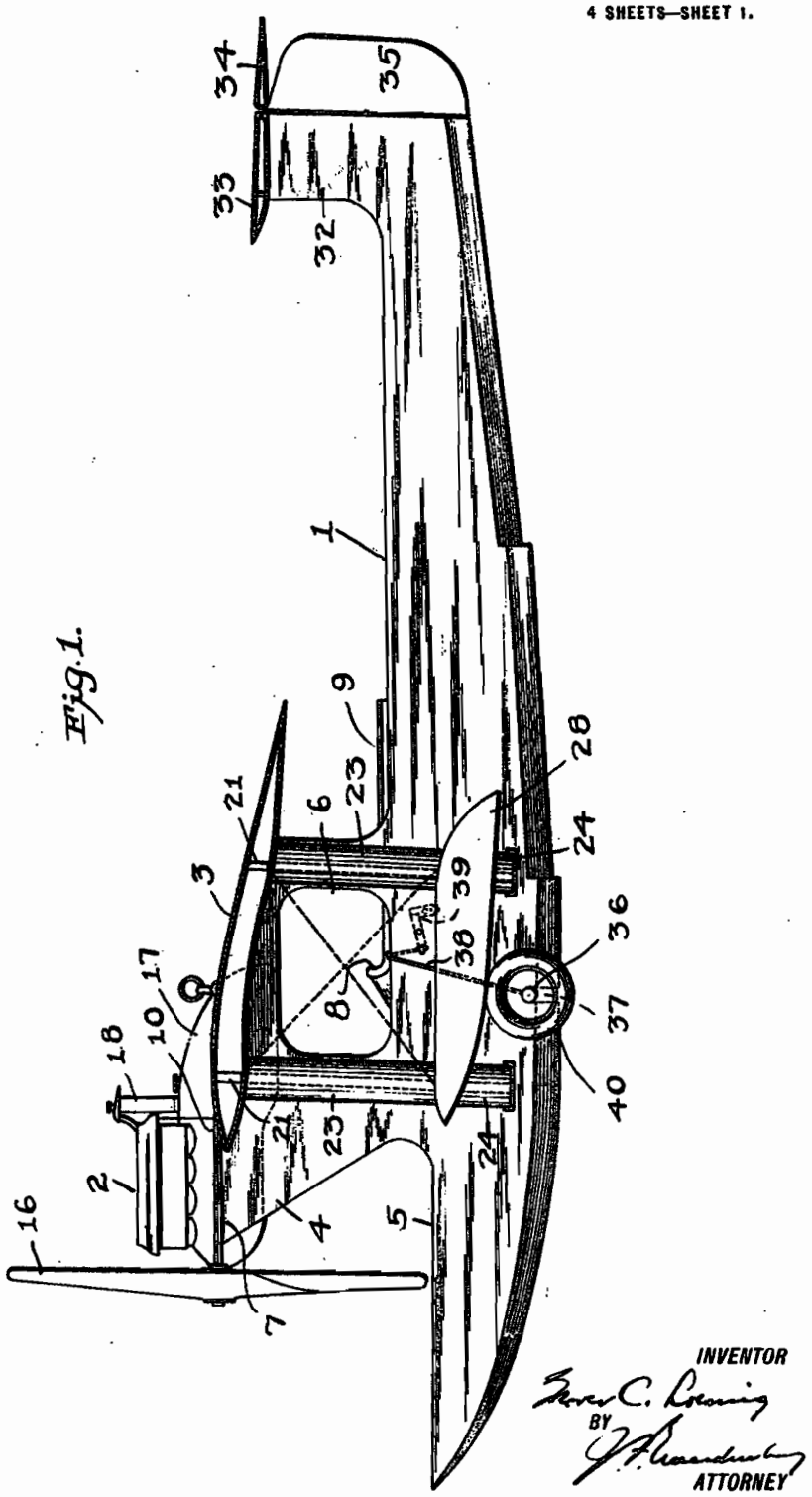


Fig. 1.

INVENTOR

Grover C. Loening

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

CLAUDIUS DORNIER, OF FRIEDRICHSHAFEN, GERMANY.

TUBULAR HOLLOW BODY.

1,419,828. Specification of Letters Patent. Patented June 13, 1922.

Application filed June 28, 1920. Serial No. 392,564.

To all whom it may concern:

Be it known that I, CLAUDIUS DORNIER, a German citizen, residing at Friedrichshafen, a/B., Germany, (for which I have filed an application in Germany Nov. 22, 1917), have invented certain new and useful Improvements in Tubular Hollow Bodies, of which the following is a specification.

My invention refers to tubular hollow bodies suited for employment in light construction, and more especially to stays for flying machines. It is the endeavor of the invention to create satisfactory possibilities for connecting the ends of the tubes, without having to continue the middle parts of the tubes with their comparatively large cross-sections right to the ends or being forced to join them to special connecting pieces of a smaller length of development. The desired purpose is achieved by shaping them in a particular manner.

This alternation of shape can be performed by aid of suitable presses or by drawing and stamping respectively. As the length of development of the tube ends is considerably smaller than that of the middle part, the eyes customary for bolt connections can be obtained in the size suitable for each case, by simply pressing the tube ends flat. A special strength is given to these eyes in accordance with the invention by the fact that, owing to the peculiar dislocation of the material, they show a considerably larger thickness of material corresponding to the reduced length of development. The middle part of the tubular body, if it is to offer a small air-resistance, for instance as a flying machine tie, can be provided with the well known guttiform shape without detriment to the tapering off at the ends which has taken place.

The invention is of special value for such constructional materials used in light construction, which, like aluminium alloys, for instance, can only be welded with difficulty or not at all, for, according to the invention, the connections of the stays can be adapted with ease to the purposes in question in each case without having to employ a welded or riveted seam.

The drawings attached to this specification and forming part thereof, illustrate a modification by way of example, a view each being represented by Fig. 1 of a still unworked tube,

Fig. 2 of the same tube with the ends tapered off,

Fig. 3 of a finished stay of a flying machine, and

Figs. 4–6 representing cross-sections of the flying-machine stays for the lines 4—4, 5—5, 6—6 of Fig. 3.

In the tube tapered off according to Fig. 2 the uttermost ends are pronouncedly cylindrical. In the stay for a flying-machine according to Fig. 3 such an end shape was given up for the purpose of further simplifying the reshaping.

I claim:

1. In a flying machine strut in combination, a seamless tubular main portion of stream line section and a seamless gradually tapering end portion of greater wall thickness than said main portion.

2. In a flying machine strut in combination, a seamless tubular main portion of stream line section and a flat seamless gradually tapering end portion of greater wall thickness than said main portion.

3. In a flying machine strut in combination, a seamless tubular main portion of stream line section, a seamless gradually tapering intermediate portion and a seamless end portion of substantially equal diameter and greater wall thickness than said main portion.

In testimony whereof I affix my signature.

CLAUDE DORNIER.

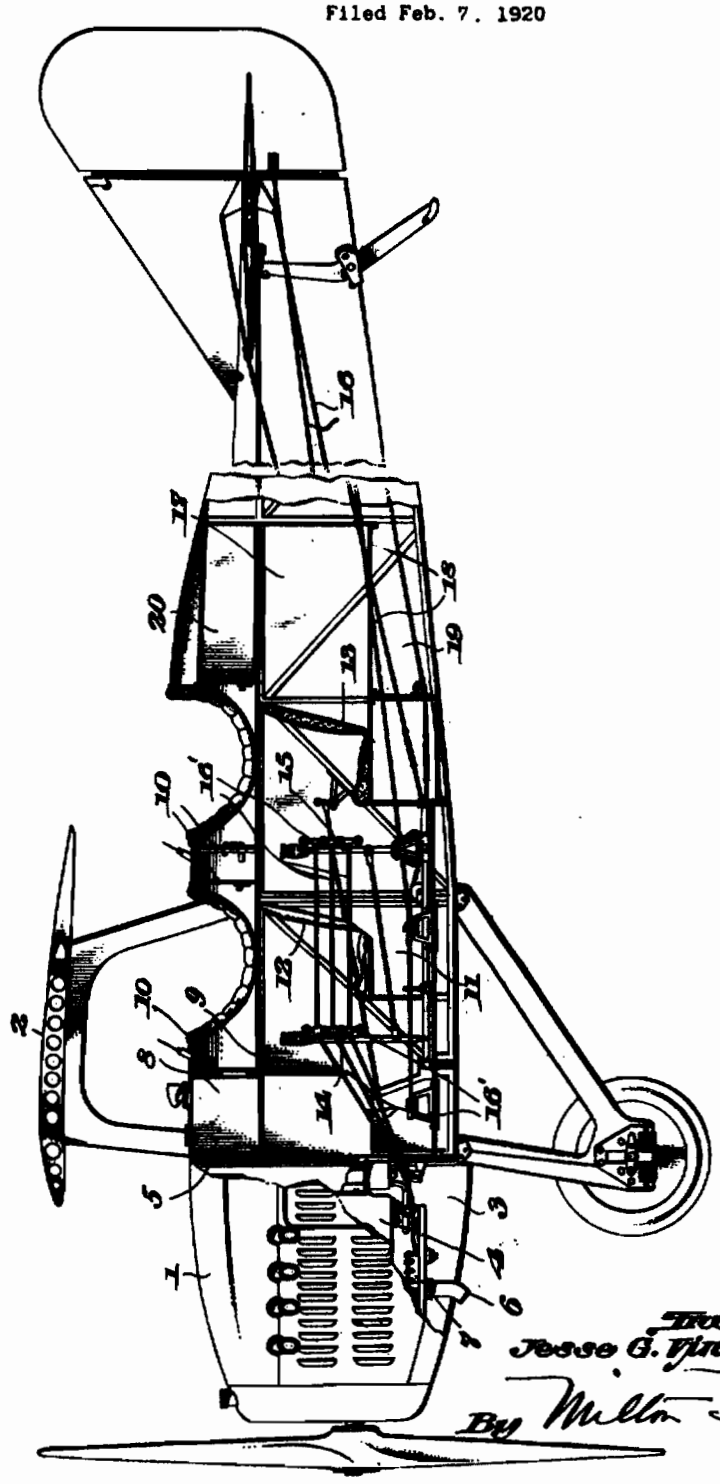
Dup

June 3, 1924. 1,496,397

J. G. VINCENT

HYDROCARBON MOTOR

Filed Feb. 7, 1920



Patented June 3, 1924. 1,496,397

UNITED STATES PATENT OFFICE.

JESSE G. VINCENT, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

HYDROCARBON MOTOR.

Application filed February 7, 1920. Serial No. 357,021.

To all whom it may concern:

Be it known that I, JESSE G. VINCENT, a citizen of the United States, and resident of Detroit, Wayne County, State of Michigan, have invented certain new and useful Improvements in Hydrocarbon Motors, of which the following is a specification.

This invention relates to aircraft and particularly to the construction of the nacelles thereof.

The objects of the invention are to provide a convenient arrangement of a nacellé for the accommodation of passengers, a motor, equipment and baggage within the body of the nacellé, and to protect the fuselage against fire.

With these objects in view, the invention is embodied in preferable form in the construction hereinafter described and illustrated in the accompanying drawing, in which:

The view shown is a vertical section, partly in side elevation, of an airplane containing my improvements.

Referring to the drawing, the nacellé comprises a continuous closed body, the exterior shell 1 of which is supported on the planes of the aircraft of which the upper plane 2 is indicated. The nacellé is divided interiorly into compartments arranged longitudinally thereof.

The front compartment 3 is adapted to contain the motor 4 and its accessory parts. The engine is thus housed in and separated from the other compartments of the nacellé and the passengers protected from grease and gases blowing therefrom, by means of a partition 5 and the exterior shell 1. The air intake 6 of the carburetor 7 of the motor projects through the bottom of the shell or fuselage, and damage from fire is thus prevented.

Immediately to the rear of the partition 5 is located a fuel tank 8 which is supported on said partition and on longitudinal bracing members 9 which in turn are connected to uprights 10 extending to the shell of the nacellé. The fuel tank is located in a large central compartment 11 within which is also mounted a forward seat 12 and a rear seat 13. In this compartment and in front of each of the said seats are located respectively control members 14 and 15 permitting dual operation of the aileron and elevator connecting elements such as 16 which also extend into and through said compartment 11. Other controls 16′ for the throttle, spark and altitude are provided.

The back of the seat 13 forms a partition which constitutes one wall of a compartment 17, the bottom 18 of which constitutes the upper wall for a lower compartment 19. The upper wall or ceiling of the compartment 17 also constitutes the bottom of a compartment 20 vertically disposed with respect to chambers 17 and 19. The two compartments 17 and 20 may serve for the carrying of equipment and baggage.

Having thus described my invention what I claim is:

In an aircraft, the combination of a nacellé comprising a front closed compartment, a seat compartment, and a plurality of vertically arranged compartments rearwardly of said seat compartment, a motor in said front compartment having its carburetor intake extending through a wall of said closed compartment, and a fuel supply reservoir mounted on said aircraft rearwardly of said closed compartment.

In testimony whereof I affix my signature.

JESSE G. VINCENT.

Dup

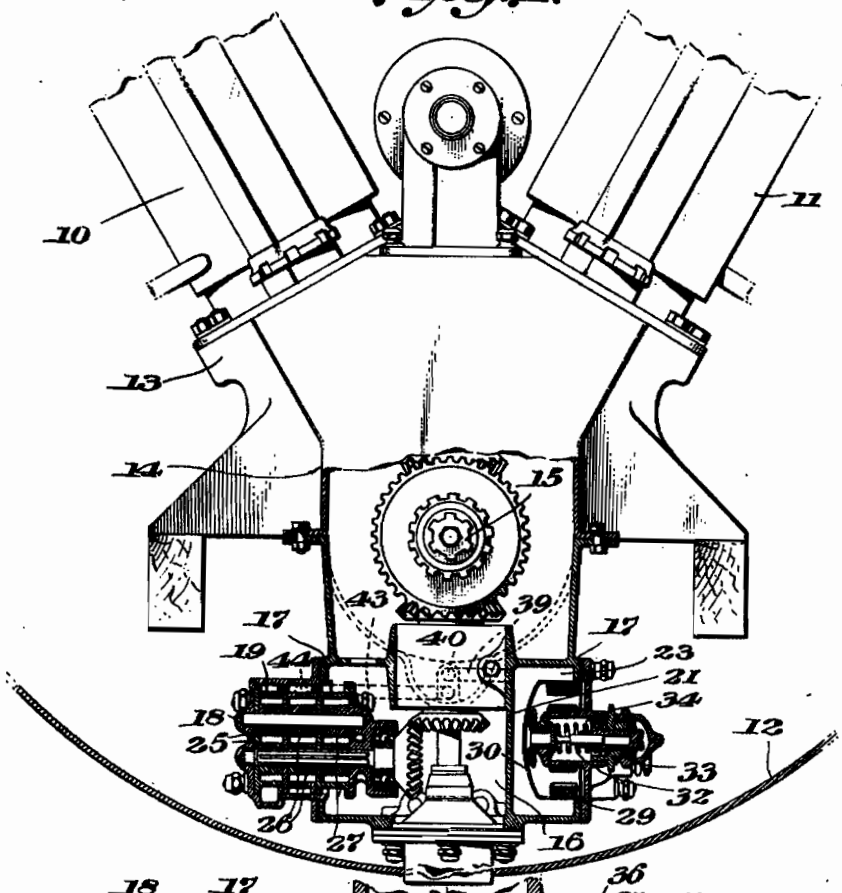
Aug. 10, 1926. 1,595,432

J. G. VINCENT

HYDROCARBON MOTOR

Filed March 20, 1920

Fig. 1.



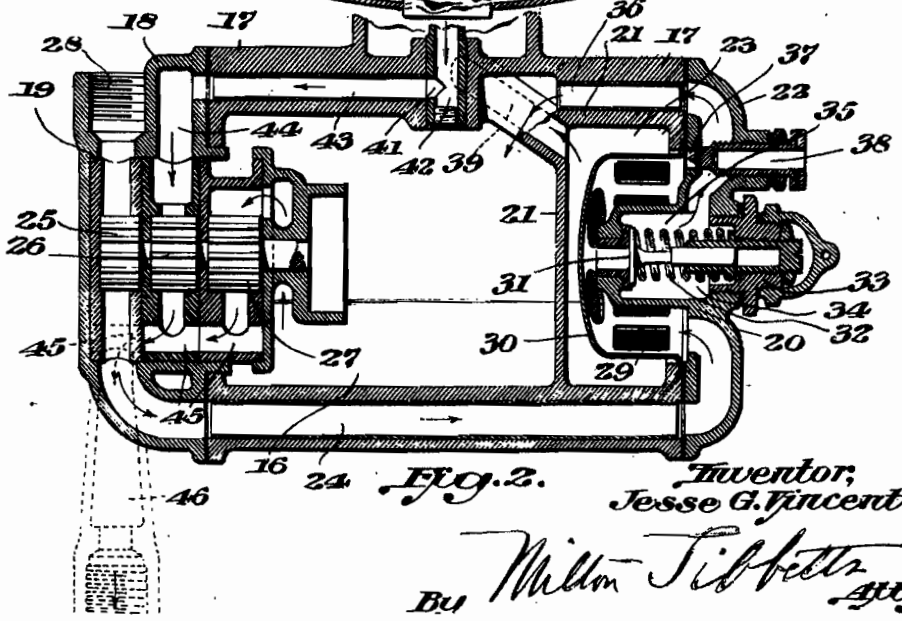


Fig. 2.

Inventor,
Jesse G. Vincent,
By Milton Tibbetts, Atty.

Patented Aug. 10, 1926. 1,595,432

UNITED STATES PATENT OFFICE.

JESSE G. VINCENT, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

HYDROCARBON MOTOR.

Application filed March 20, 1920. Serial No. 367,444.

This invention relates to hydrocarbon motors and particularly to the oiling systems of such motors.

The invention is of particularly advantageous use in connection with motors used in airplanes, although it is also applicable to motors employed in other vehicles.

The objects of the invention are to provide a construction whereby the oil pump and the principal parts associated therewith in the oil circulating system are readily accessible for removal and particularly to enable convenient access to be obtained to a motor mounted in an airplane fuselage, to provide means for regulating the oil pressure in the system, and otherwise to improve the construction of the parts of an oil circulating system.

With these objects in view, my invention is embodied in preferable form in the arrangement and construction hereinafter described and illustrated in the accompanying drawings.

Figure 1 is a vertical sectional view of a hydrocarbon motor showing my improvements applied thereto and taken from one end of the motor, and

Figure 2 is a partly sectional and partly diagrammatic view on a somewhat enlarged scale and indicating the course of travel of the oil.

Referring to the drawings, 10 and 11 indicate the cylinders in the two rows of cylinders of a V-type motor, although the invention herein disclosed may be applied to motors of other types. This motor is shown as mounted within a cowling 12, a portion only of which is shown in the drawing. This cowling forms that part of the fuselage of an airplane which constitutes the closed body at the front of the airplane adapted to receive the motor and its associated parts. The lower ends of the cylinders are connected to crank case heads 13 which are integral with the upper half 14 of the crank case within which is mounted the crank shaft 15 of the engine, the bearings of the crank shaft, driving members for the oil pump and other driven elements, and to which is secured the lower half of the crank case having at the lower part thereof a sump body 16. The wall of the crank case inclosing this sump is bulged out on each side of the longitudinal central line of the motor to provide bosses 17 which are open at their outer ends and one of which is adapted to receive a removable casing 18 in which is operatively mounted a three-part oil pump 19. In the other hollow boss, which is directly opposite the boss receiving the pump casing, is adapted to be mounted a removable casing 20. These two casings constitute covers for the open bosses so as to thereby complete the closed body of the crank case. The casing 20 is adapted to carry pressure relief and pressure regulating means for the oil supply, details of which will be hereinafter described.

It will be seen that each casing is disposed at the side of the motor above the bottom line thereof and below and within the vertical outer plane of the cylinders, so that access to the casings may be readily obtained and they may be easily removed through openings in the side of the cowling.

Webs 21 are formed integral with the body of the crank case adjacent the opening in which the casing 20 is mounted and these webs together with the cap or head 22 of the casing 20 constitute a chamber 23 for the pressure relief construction. A conduit 24 leads from the pump to this chamber 23. The pump is of triple construction and has three sets of pump elements 25, 26 and 27 disposed in a line extending transversely of the crank case. As shown in Figure 2, the elements 25 communicate with an inlet 28 adapted to lead from an oil tank not herein shown. The outlet side of the elements 25 communicates with the conduit 24 which leads to the chamber in which the pressure relief devices are mounted. A strainer 29 is mounted in the chamber 23 within a perforate dome 30 which is secured by the clamping of a flange thereof between the casing 20 and the outer face of the crank case. The oil is adapted to traverse this dome and enter the chamber 23 past a pressure relief valve 31 against which bears with a predetermined degree of pressure a spring 32 having also a bearing against a nut 33 threaded into an aperture in the head of the casing 20. The spring is of such strength that when the oil pressure exceeds a certain amount the valve 31 will be opened, permitting a portion of the oil to escape past the valve and into a by-pass chamber 34 formed in the casing 20. From this chamber a passageway 35 leads to a passageway 36 which communicates with the oil sump 16. Com-

municating with the chamber 23 inside of the dome 30 is a port 37 leading into the passageway 35. The pasageway 37 is controlled by a fixed pressure relief valve 38 in the form of a needle valve which is threaded into a threaded opening in the cap 22, and is thereby adjustable. This needle valve is adapted to permit the constant escape of a small quantity of oil past the same back into the sump, the amount of oil thus escaping being determined by the adjustment of the valve. This needle valve relief device is intended to prevent excessively high oil pressure when the motor is idling in which condition the pressure will not be sufficient to open the yieldable pressure relief valve 31.

The main body of the oil, that is that part of the stream which is not relieved by either of the valves, passes through the strainer into the chamber 23 and thence by a passageway 39 to a suitable pipe adapted to communicate with an oil manifold 40, whence the oil passes to the bearings.

The oil is drawn out of the crank case through the opening 41, and thence passes to the passageway 42 which communicates with a conduit 43 leading to a chamber 44 formed in the pump casing 18. This chamber contains the pump elements 26 which thus serve to draw the oil from the front end of the crank case and which then forces the oil from that chamber through passageway 45 into outlet pipe 46 adapted to lead to the oil supply tank.

The third pump element 27 draws the oil from the oil pump 16 and pumps it through passageway 45 into pipe 46 which leads to the oil supply tank as before described.

It will be seen that by this arrangement a fixed but adjustable pressure relief valve is provided, which is adapted to relieve the pressure when the motor is idling. It will also be seen that such a construction and arrangement of the pump and pressure relief devices with reference to the crank case are provided that both these mechanisms are readily accessible and may be readily removed for repair or replacement.

Having thus described my invention, what I claim is:

1. A hydrocarbon motor having a crank case provided with opposite openings in the sides thereof, an oil pump removably mounted in one opening, and an oil relief mechanism removably mounted in the other opening operatively connected to said oil pump.

2. A hydrocarbon motor provided with a crank case having an opening in one side thereof, an oil pump, the pump casing being adapted to close said opening, said crank case having an opening opposite the first opening, an oil pressure relief device mounted in said second opening, and carrying a part adapted to close the latter and means for establishing communication between said pump and said relief device.

3. A hydrocarbon motor having a crank case provided with opposed openings through opposite side walls thereof, a laterally removable oil pump mounted in one opening and adapted to close the same, a laterally removable pressure relief device mounted in and adapted to close the second opening, and a conduit establishing communication between the pump and relief device.

4. A hydrocarbon motor having a crank case provided with opposite openings in its side walls, a removable oil pump and its casing in one opening, a removable member mounted in the other opening and adapted to close the same, a yielding pressure relief device, a fixed pressure relief device carried by said member and operative connections between said pump and said relief device.

5. A hydrocarbon motor having a crankcase provided with an oil sump, an oil pump unit mounted in and extending laterally from said case, said unit comprising three sets of pumping elements, one of said sets receiving oil from the sump and delivering the oil to a source of supply, another of said sets receiving oil from the crankcase and delivering the oil to the source of supply, and the third set receiving oil from the source of supply and delivering oil to the lubrication system.

6. A hydrocarbon motor having a crankcase provided with an oil sump, an oil pump unit disposed horizontally in said crankcase and extending laterally therefrom, said unit comprising three sets of pumping elements, one of said sets receiving oil from the sump and delivering the oil to a said source of supply, another said set receiving oil from the crankcase and delivering the oil to a said source of supply, and the third set receiving oil from the source of supply and delivering the oil to the lubrication system.

7. A hydrocarbon motor having a crankcase, a horizontally disposed oil pump unit mounted in said crankcase and comprising three sets of pumping elements, and a source of supply and connections, two of said sets being adapted to pump oil from the various parts of the crankcase and the third set receiving oil from said source of supply and delivering the oil to the lubrication system.

8. A hydrocarbon motor having a crankcase provided with an oil sump, a pump unit mounted in said crankcase and extending into said sump, said unit including a plurality of sets of pumping elements and a source of supply and connections, said unit being adapted respectively to pump oil from the crankcase and from the oil sump to said

source of supply and to pump oil from said source of supply to the lubrication system.

9. A hydrocarbon motor having a crankcase provided with an oil sump, a pump unit mounted in said crankcase and extending into said sump, said unit including a plurality of horizontally disposed sets of pumping elements and connections whereby the pumping elements are adapted respectively to pump oil from the crankcase and from the oil sump to a source of supply and to pump oil from said source of supply to the lubrication system.

10. A hydrocarbon motor having a crankcase, an oil pump unit mounted in and extending laterally into said case and having a plurality of sets of pumping elements, oil pressure relief mechanism extending laterally into said crankcase at the side opposite said oil pump, one of said sets of pumping elements receiving oil from a source of supply and delivering oil to said relief mechanism, and the others of said sets receiving oil from said crankcase and delivering oil to said source of supply.

11. In a hydorcarbon motor having a crankcase having a sump, a pump unit mounted in the sump of said crankcase, said unit comprising means for emptying said oil sump and means for pumping oil through the lubrication system, and oil pressure relief mechanism independently mounted in said crankcase opposite said pump, said pressure relief mechanism being connected in the lubrication system.

12. In a hydrocarbon motor, a crankcase having a pair of oppositely disposed openings therein, a pump unit mounted in one of said openings, and oil pressure relief mechanism mounted in the other opening, a conduit in said crankcase communicating with said relief mechanism and means connecting said pump unit with said conduit.

13. In a hydrocarbon motor, a crankcase having an oil sump and a horizontally disposed pump unit mounted in said crankcase and comprising three sets of pumping elements, the inner set receiving oil from the oil sump and pumping said oil to a source of supply, the central set receiving oil from the crankcase and pumping oil to said source of supply, and the outer set receiving oil from the source of supply and pumping oil to the lubrication system.

14. In a hydrocarbon motor, the crankcase, a pump unit mounted at one side of the lower portion of said crankcase and extending into said case, oil pressure relief mechanism mounted at the other side of the lower portion of the other side and extending thereinto, a conduit leading to the lower portion of one end of said crankcase, said pump unit comprising a plurality of sets of pumping elements, means connecting one of said sets of pumping elements to said conduit and means connecting another of said sets with said oil pressure relief mechanism.

15. In a hydrocarbon motor, the combination with the crank case, the lubrication system, and the oil pump adapted to supply oil to said system, of a by-pass device in said system comprising a yielding relief valve to control the higher pressures in the system and a non-yielding relief means to control the lower pressures as when the motor is idling.

16. In a hydrocarbon motor, the combination with the crank case, the lubrication system, and the oil pump adapted to supply oil to said system, of a by-pass device in said system comprising a yielding relief valve to control the higher pressures in the system and an adjustable non-yielding relief valve to control the lower pressures as when the motor is idling.

In testimony whereof I affix my signature.

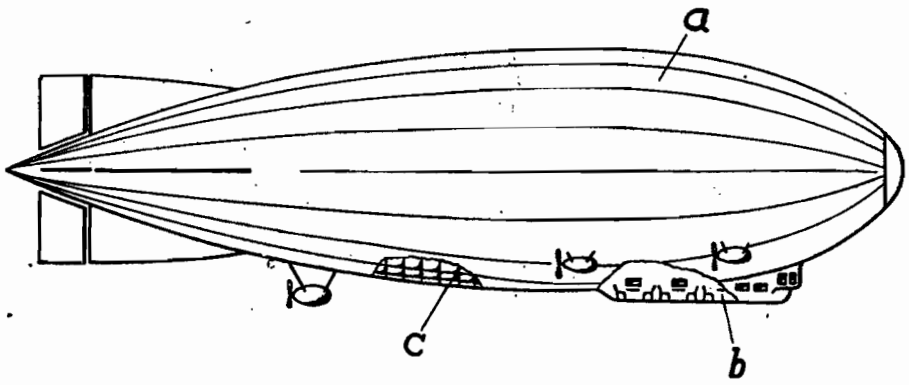
JESSE G. VINCENT.

July 13, 1926. 1,592,301

P. JARAY

AIRSHIP

Filed June 28, 1920



INVENTOR

Paul Jaray

Patented July 13, 1926. 1,592,301

UNITED STATES PATENT OFFICE.

PAUL JARAY, OF FRIEDRICHSHAFEN, GERMANY, ASSIGNOR TO LUFTSCHIFFBAU ZEPPELIN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, OF FRIEDRICHSHAFEN, GERMANY, A GERMAN CORPORATION.

AIRSHIP.

Application filed June 28, 1920, Serial No. 392,571, and in Germany April 8, 1920.

My invention refers to airships and more especially to passenger airships designed for long distance travelling and its particular object is to simplify the steering of such airships.

As is well known, owing to the radiation from the sun at day-time and the heating of the gas caused thereby, the airship has a greater buoyancy and therefore tends to rise. In consequence thereof it becomes necessary to drive the airship down by the head in order to keep it at the same height. By doing so a dynamic downwards pressure is obtained and unnecessary losses of gases are obviated. The conditions arising at night are contrary to those explained above.

In order now, to do away as far as possible with the disagreeable differences between the trim of the airship at day and at night, a novel distribution of the cabins designed to take up the passengers is resorted to. To this end the passengers' sleeping-rooms are disposed, according to the present invention, relatively to the passenger rooms to be used at day-time in such a manner that during day-time the bow and during the night the stern is down.

In the drawings affixed to this specification and forming part thereof, an airship embodying my invention is illustrated by way of example.

The gas cell *a* carries a passenger car directly fixed to it, said car comprising a room *b* to be used during day-time and a sleeping-room or rooms *c* disposed further astern.

I claim:—

1. In an airship in combination a passenger room for day sojourn and a passenger room for night's rest, said rooms being so arranged in relation to each other that a passenger going to bed at night will by this dislocation of his weight cause an upward weight moment in the ship's trim, thereby working towards compensation for the difference of buoyancy between day and night conditions.

2. Passenger accommodations in an airship comprising a space for day time sojourn of a passenger and another space for his night's rest, said second space being situated astern from said first space, thereby providing for automatic shifting of the passenger's weight at nightfall and at daybreak and counteracting the influence of day and night conditions on the airship's buoyancy.

In testimony whereof I affix my signature.

PAUL JARAY.

July 28, 1925. 1,547,585

H. JUNKERS

AUXILIARY ROLLING DEVICE FOR NAVAL FLYING MACHINES

Filed March 17, 1924

Fig1

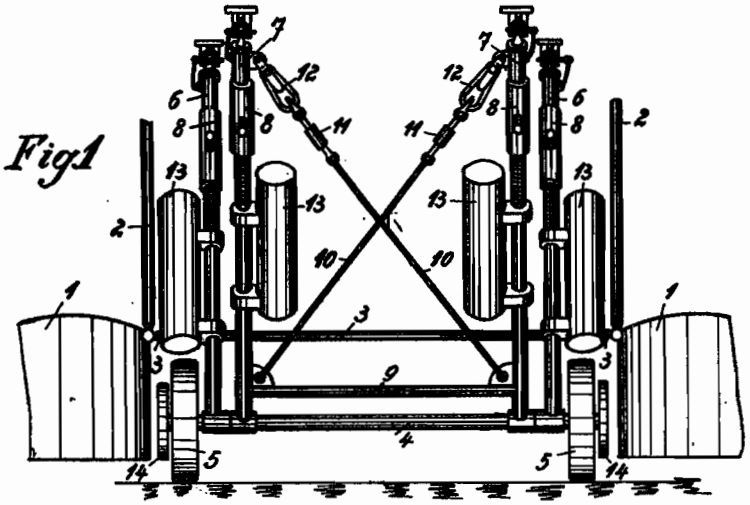


Fig.2

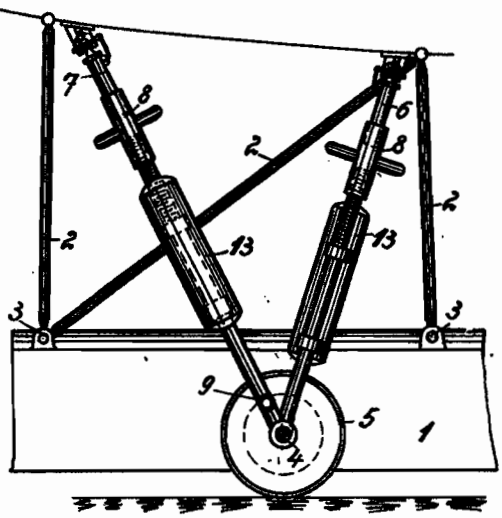
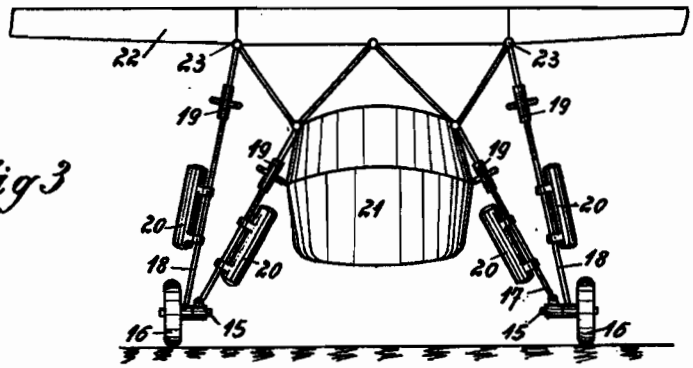


Fig3



Hugo Junkers

Patented July 28, 1925. 1,547,585

UNITED STATES PATENT OFFICE.

HUGO JUNKERS, OF DESSAU, GERMANY.

AUXILIARY ROLLING DEVICE FOR NAVAL FLYING MACHINES.

Application filed March 17, 1924. Serial No. 699,951.

To all whom it may concern:

Be it known that I, HUGO JUNKERS, professor, a citizen of Germany, residing at Dessau, Anhalt, Germany, Coethenerstr. 27, have invented certain new and useful Improvements in Auxiliary Rolling Devices for Naval Flying Machines, for which I have made an application in Germany February 2, 1923, and of which the following is a specification.

For drawing naval flying machines out of the water, boat carriages are used, which have a plate form or a frame fitting to the boat and are put in submerged state below the floats or the boat for being drawn on land entire with the machine. For this purpose below the floats or the boat the water must be so deep as to allow the carriage to be submerged below them. If the strand is very flat, the flying machine must for the said purpose remain far from the land and is in danger of being swept away by wind or stream, the motor being at rest. In flying machines having two floats, a further difficulty arises, viz, the two carriages, needed for the two floats, can not easily be fastened to the floats in precisely the same positions. Finally for lifting the flying machine from the carriage, if the same is to be available for further use, a crane or hoists must be provided on land.

For flying machines with floats it has been proposed to put on the floats wheeled frames, which are floating and may rigidly be fastened at the floats. In this case at least two such wheeled frames are needed for every float. In the water the fastening device needs a certain depth of water below the floats or the boat of the swimming machine, whilst also on land special devices must be provided for attaching or removing the wheel frames.

The invention consists in an auxiliary rolling device for naval flying machines, which can easily be applied to the floating machine in a short time, in shallow or deep water and gives the possibility of rolling the machine out of the water and also on land, and which not only spares every hoist but in turn is able to serve as a hoist for fixing or removing the floats or for transforming the machine into a land flying machine.

This is attained by constructing the auxiliary rolling device as a strut work with wheels, adapted to be fastened to the main structure of the flying machine, the struts preferably being pivoted on the one or more wheel axles of the device, and adjustable in length. For being able to be used in deep water without danger of being submerged the device is preferably constructed so as to be floating or provided with floats of such arrangement, that it may easily be handled from the flying machine floats or the flying boat.

In the drawing two constructional forms of the invention are shown.

Fig. 1 is a front view of the auxiliary rolling device in service position,

Fig. 2 is a side view of the same device, seen from the middle between the floats,

Fig. 3 is a front view of an auxiliary rolling device for a flying boat.

According to Figs. 1 and 2 the flying machine has two floats 1, which are fastened to the body or wing by struts 2 and stiffened between each other by horizontal struts 3. The auxiliary rolling device comprises an axle 4 with two wheels 5, and at the said axle two pairs of main struts 6, 7 are pivoted so as to be swingable around this axle. These struts 6, 6, 7, 7 are fastened in the shown example to four points of the flying machine body by connections which can easily be loosened and fastened. These connections may be used simultaneously for fastening a landing wheel frame in case the flying machine shall be alternatively used for land or water service, but separate connections may be provided for attaching the auxiliary rolling device in order to enable this latter to serve as erection frame for a specially easy transformation for land or water service. The main struts are adjustable in length by aid of screw spindles and sleeves 8. The struts 7 are stiffened against each other at the lower ends by a horizontal strut 9, and diagonal cross cables 10 are interposed and fastened by tension devices 11 and connecting pieces 12, which can easily be loosened; these cables are fastened in or near the points, in which the main struts 7 are connected to the body and secure the lateral rigidity of the whole device. For making the device unsinkable every main strut 6 or 7 is fitted with a float 13. Cushions 14 are provided on the ends of the axle 4 for protecting the floats against being damaged by the device.

The new device is applied in the following manner: On a flat strand the flying ma-

chine goes by own force so near to the shore, that its floats catch the ground. The rolling device, folded to a flat shape by virtue of the pivots of the main struts 6, 7, is then brought into the water and between the floats; this may easily be performed from the floats, the motor being kept running. The main struts 6, 7 and diagonal cables 10 are passed below the horizontal struts 3 of the floats and fastened at the connecting points of the body. By rotating the screw sleeve 8 the struts are then lengthened until the floats are lifted from the ground, and the machine rests on the wheels. The diagonal cables 10 are set under tension for securing the laterial rigidity of the device; this may be reached exclusively by aid of the screw sleeves 8, the tension devices 11 being previously adjusted to such a constant length, which corresponds to that length of the main struts 6, 7, which effects the lifting of the floats from the ground. Hereafter the machine may be rolled onto the strand, eventually by its own motor force, and may move on land as a land flying machine, if its tail is supported by a spur or other adapted device. In deep water the whole process is the same, as the whole device is adapted to float; by rotating the screw sleeves 8 the cables 10 are set under tension and the wheels 5 are then in right rolling position.

On the shore the flying machine may be set down on the floats by simply loosening the screw sleeves 8, and the device becomes then free for further use.

The device may in like manner be used as a hoist, for attaching or taking away or exchanging the floats or a carriage, without the use of any additional hoisting apparatus.

Fig. 3 shows in connection with a flying boat the new device consisting of two parts, each of which comprises a short axle 15 with a wheel 16 and with pivotally attached struts 17, 18. These struts are fitted with screw sleeves 19 for being lengthened and with floats 20 similarly as in the first described device. The struts 17, 18 are to be attached to adapted points of the boat body 21 or the wings 22, in the shown example to the upper board girder of the boat and to the wing connections 23 of the struts uniting the wing and boat. The lateral forces are in this case sustained by the struts 17, 18, which form a triangular frame work; the longitudinal rigidity is obtained either by a similar triangular strut work, arranged lengthwise, or by tension cables, which may be set under tension, in the same manner as in the first example, by aid of the screw sleeves 19.

The handling of this device in deep or shallow water corresponds completely to that of the first described device.

What I claim is:

1. An auxiliary rolling device for naval flying machines comprising a strut work, devices on said strut work for detachably fastening it to the main structure of a flying machine, rolling wheels on said strut work, and means for holding said strut work on a water level.

2. An auxiliary rolling device for naval flying machines comprising a strut work, devices on said strut work for detachably fastening it to the main structure of a flying machine, rolling wheels on said strut work and pivots connecting the struts of said strut work so that they can be folded together into a common plane with the axis of said wheels.

3. An auxiliary rolling device for naval flying machines comprising a strut work, devices on said strut work for detachably fastening it to the main structure of a flying machine, the struts of said strut work being pivotally connected to each other, tension cables for securing the position of said struts, devices adapted to alter the length of said struts so as to put said cables under tension, and rolling wheels on said strut work.

4. An auxiliary rolling device for naval flying machines comprising a strut work, devices on said strut work for detachably fastening it to the main structure of a flying machine, the struts of said strut work being pivotally connected to each other, tension cables for securing the position of said struts, devices adapted to alter the length of said struts so as to put said cables under tension, and rolling wheels on said strut work, the tension cables being of such length with relation to the struts that in the lengthened position of said struts the cables are under tension and the rolling wheels are in service position.

5. An auxiliary rolling device for naval flying machines comprising the parts enumerated in claim 4, the tension cables being of such length with relation to the struts, that in the lengthened position of said struts the cables are under tension and the rolling wheels are in service position.

6. An auxiliary rolling device for naval flying machines comprising a strut work, devices on said strut work for fastening it to the main structure of a flying machine, rolling wheels on said strut work, and cushions provided on the parts, which are near to the floats or other weak parts of the flying machine.

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

HUGO JUNKERS.

Witnesses:
LUDWIG WAGENSEIL,
FRIEDA STEINBRINCK.

Feb. 24, 1925. 1,527,673

C. DORNIER

LANDING GEAR FOR FLYING BOATS

Filed May 10, 1924

Fig. 1.

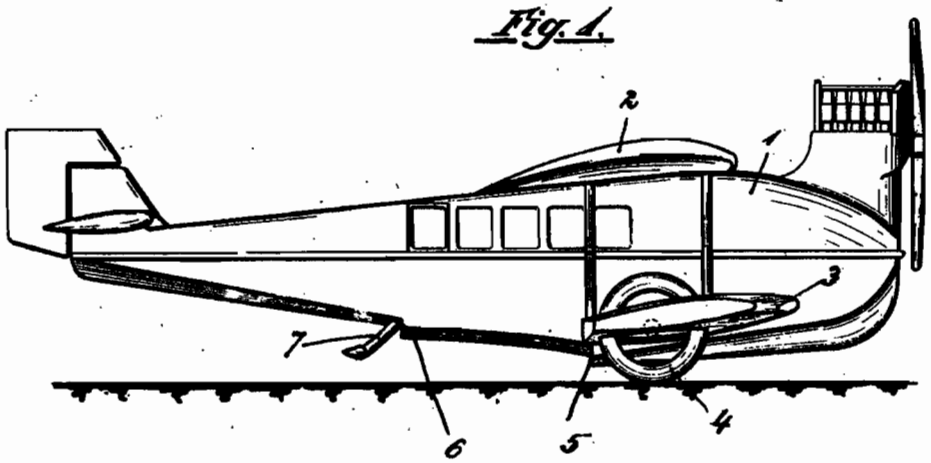
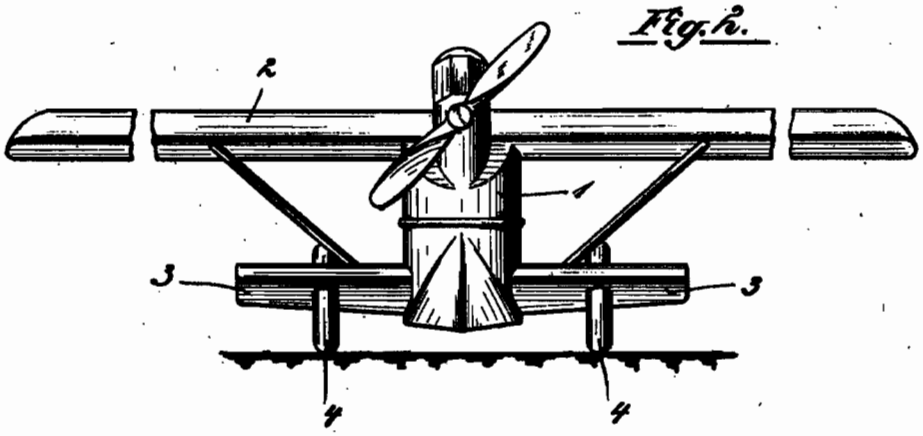


Fig. 2.



Inventor:

Claudius Dornier

by Dinkelacker

Atty

Patented Feb. 24, 1925. 1,527,673

UNITED STATES PATENT OFFICE.

CLAUDIUS DORNIER, OF FRIEDRICHSHAFEN-ON-THE-BODENSEE, GERMANY.

LANDING GEAR FOR FLYING BOATS.

Application filed May 10, 1924. Serial No. 713,369.

To all whom it may concern:

Be it known that I, CLAUDIUS DORNIER, a citizen of Germany, residing at Friedrichshafen-on-the-Bodensee, Germany, have invented certain new and useful Improvements in Landing Gears for Flying Boats, of which the following is a specification.

My invention refers to flying machines and more especially to a flying boat comprising a boat's hull having a stepped bottom. It is an object of my invention to provide a flying boat of this kind with starting and landing means whereby it is enabled to start from and land on water or solid ground, snow and ice, as required.

To this end the boat's hull is provided with strong laterally extending fins near the bottom, starting and landing means such as wheels being mounted in cavities provided in these fins and a spike or the like being provided at or near a bottom step.

By these means the provision of a separate starting and landing carriage is avoided, whereby starting and landing on solid ground is rendered easily possible, without increasing the weight of the craft. The fins are strong enough to take up all shocks arising on landing and, at the same time, serve for insuring a good lateral stability of the craft when resting on the surface of the water. The wheels are preferably mounted in the fins in an easily disengageable manner.

In the drawings affixed to this specification and forming part thereof, a flying boat embodying my invention is illustrated by way of example,

Fig. 1 being a side elevation and

Fig. 2 a front elevation.

Referring to the drawings, 1 is the boat's hull, 2 is a wing extending across said hull and 3, 3 are fins or stump wings extending laterally of the hull's bottom and being provided with cavities, wherein starting wheels 4 are mounted. The hull's bottom is provided with two steps 5 and 6. Near the latter step a spike 7 is mounted below the bottom and in the middle line of the hull.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:—

1. A flying boat comprising a boat's hull, a wing mounted on said hull, strong fins or stump wings extending laterally of and near the bottom of said hull, a stepped bottom on said hull and a spike near a step of said bottom.

2. A flying boat comprising a boat's hull, a wing mounted on said hull, strong fins or stump wings extending laterally of and near the bottom of said hull, a stepped bottom on said hull, a spike near a step of said bottom and a wheel mounted in and projecting through a cavity provided in each fin.

In testimony whereof I affix my signature.

CLAUDIUS DORNIER.

Witnesses:
CARLOS NEUMIER,
LUIGI SCHUPPCASSE.

Aug. 2, 1932. W. B. STOUT 1,869,871

AIRPLANE

Filed July 19, 1926 10 Sheets-Sheet 1

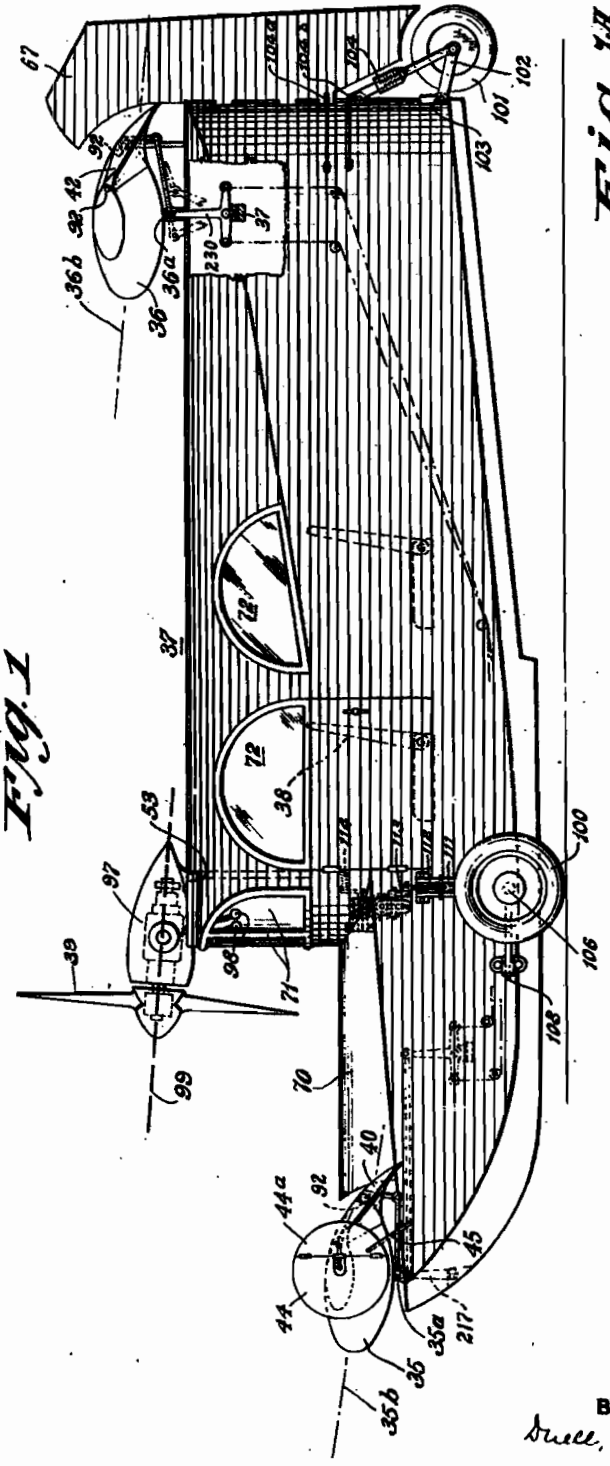


Fig. 1

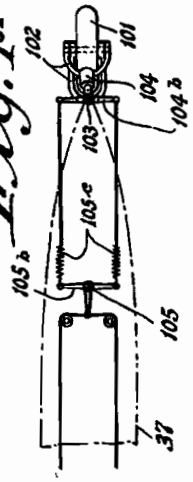


Fig. 1A

INVENTOR
William B. Stout
BY
Duell, Dunn & Anderson
ATTORNEY

Patented Aug. 2, 1932 1,869,871

UNITED STATES PATENT OFFICE

WILLIAM B. STOUT, OF DETROIT, MICHIGAN, ASSIGNOR TO FORD MOTOR COMPANY, OF HIGHLAND PARK, MICHIGAN

AIRPLANE

Application filed July 19, 1926. Serial No. 123,404.

This invention relates to airplanes.

Airplanes as previously proposed and actually flown, have represented a safety factor which has been probably 90% pilot and 10% ship. Aerial transportation cannot properly progress unless the human element becomes the minor safety factor. Therefore, the prime object of the invention is to provide an airplane wherein the safety factor is, so far as possible, inherent in the airplane—a so-called "fool proof" type.

An important object of the invention is to provide a novel type of airplane, and one which shall have a high degree of safety and dependability as the result of inherent aerodynamic and structural characteristics.

Another object is to provide an airplane, the aerodynamic surfaces of which are so shaped and related that natural longitudinal stability is present in such high degree that either a dangerous stall or nose-dive is virtually impossible.

Another object of the invention is to provide an airplane also having a natural lateral stability such that side-slip is virtually impossible and banking is semi-automatic.

Another object is to provide an airplane, so constructed as to insure safety not only in flight and in taking off, but in alighting, under all reasonable conditions.

Another object is to provide an airplane so constructed that lower feasible landing speeds and shorter landing fields than heretofore may be used; and also an airplane which, after a comparatively short float period, may be dropped to set its full weight on the ground, safely and without shock, practically at will.

Another object is to provide an airplane so constructed that landing may be on extremely rough ground virtually without any possibility of nosing over, or of a "ground loop" such as would injure the pilot, passengers, cargo or plane. In other words, the object is to provide an airplane which shall be virtually crash-proof on any landing, even on rough ground or ice, where wheels are ordinarily of no help.

Another object, nevertheless, is to provide an airplane having a landing gear such that the airplane may be moved and steered under its own power on land as a wheeled vehicle; yet at the same time to provide an airplane which shall be truly amphibian.

Another object is to provide an airplane so constructed that faster initial climb to the straight-away flight altitude may be obtained, yet with an expenditure of horsepower per pound weight no greater than in previous types.

An important object is to provide an airplane which, while having automatic or semi-automatic safety features, is easily and reliably controlled by the pilot.

Still another object, accordingly, is to provide an airplane as above, so constructed as to have great delicacy and responsiveness to manual controls, and yet great strength and rigidity throughout.

A further object is to provide an airplane of comparatively low cost of manufacture, maintenance and operation.

Various other objects will be in part obvious and in part pointed out in the course of the following description of a preferred form or embodiment of various features of the invention. While this form is shown as of the two passenger type, it will of course be understood that other types of airplane pursuant to the invention might be of great size and power, to carry many passengers and considerable cargo. Further, I desire it to be clearly understood that my invention and its various features may be embodied in various forms and constructions, and the description and drawings herein given are intended in an illustrative and not in a limited sense.

In the drawings,

Fig. 1 is a side elevation of an airplane embodying one form of the present invention.

Fig. 1*a* is a detail, somewhat diagrammatic showing the back wheel steering mechanism.

Fig. 2 is a top plan view of this airplane partially broken away near the wing tips on one side.

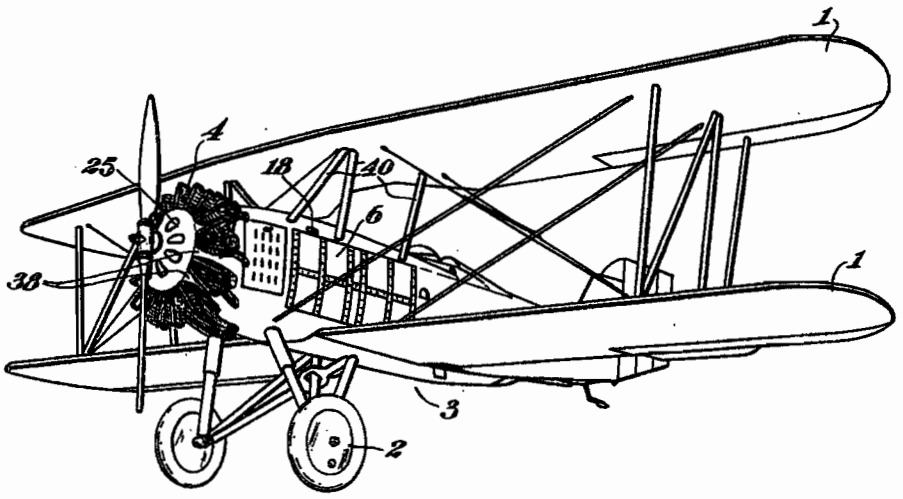
Fig. 3 shows the airplane in front elevation.

Aug. 30, 1932. C. M. VOUGHT 1,874,666

AIRCRAFT

Original Filed June 23, 1928 2 Sheets-Sheet 1

Fig. 1

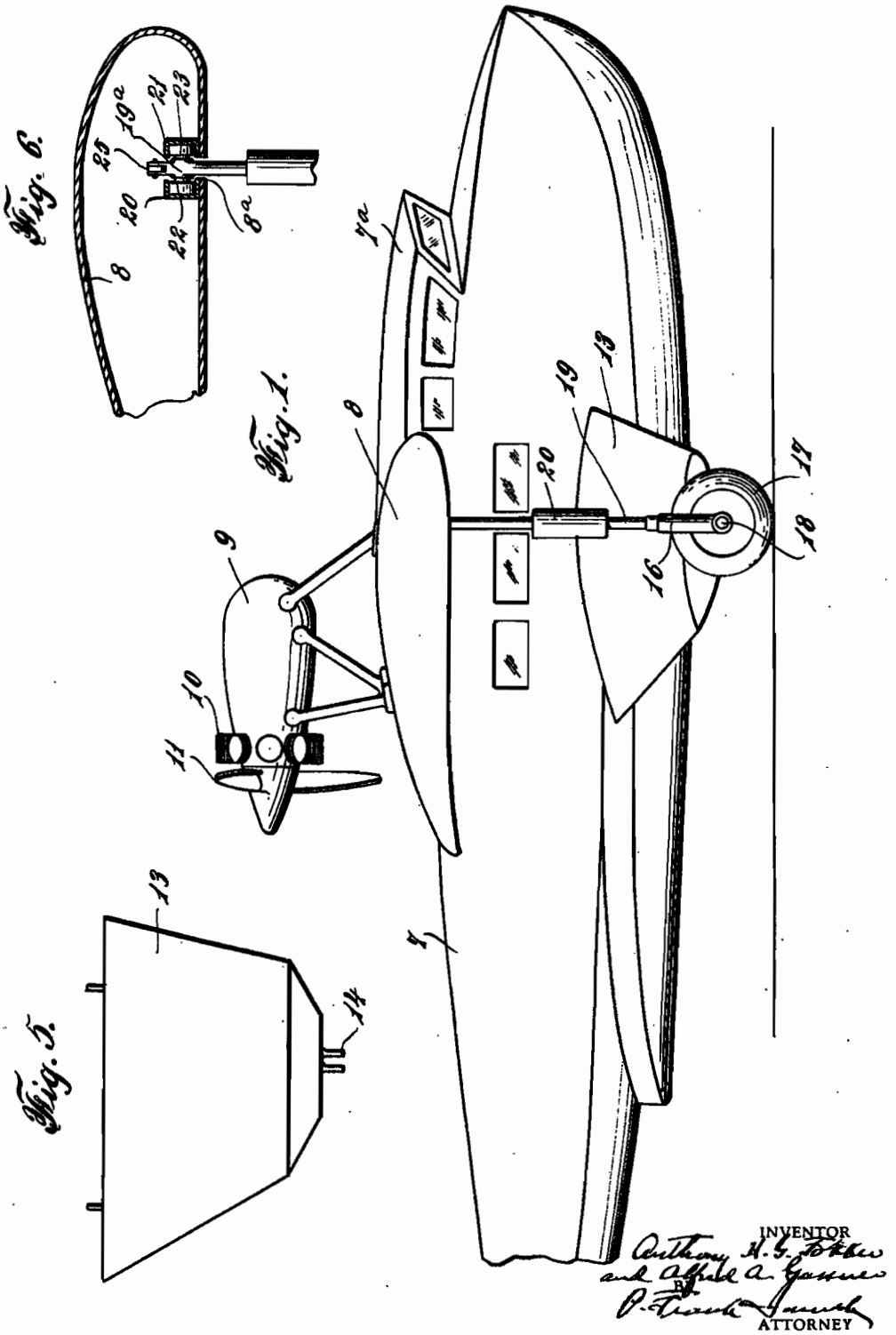


INVENTOR
Chance M. Vought,
BY
Bailey Eyre Scott & Keel
ATTORNEYS

June 17, 1930. A. H. G. FOKKER ET AL 1,765,328

AMPHIBIAN AIRCRAFT

Filed Sept. 27, 1928 3 Sheets-Sheet 1



Dec. 1, 1931. I. SIKORSKY 1,833,917

AIRCRAFT, INCLUDING WINDOWS FOR SAME

Filed May 7, 1929 2 Sheets-Sheet 1

Fig. 1.

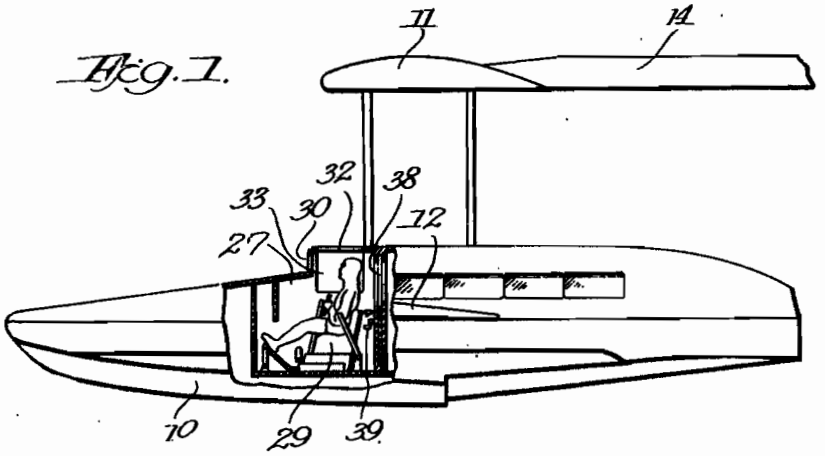
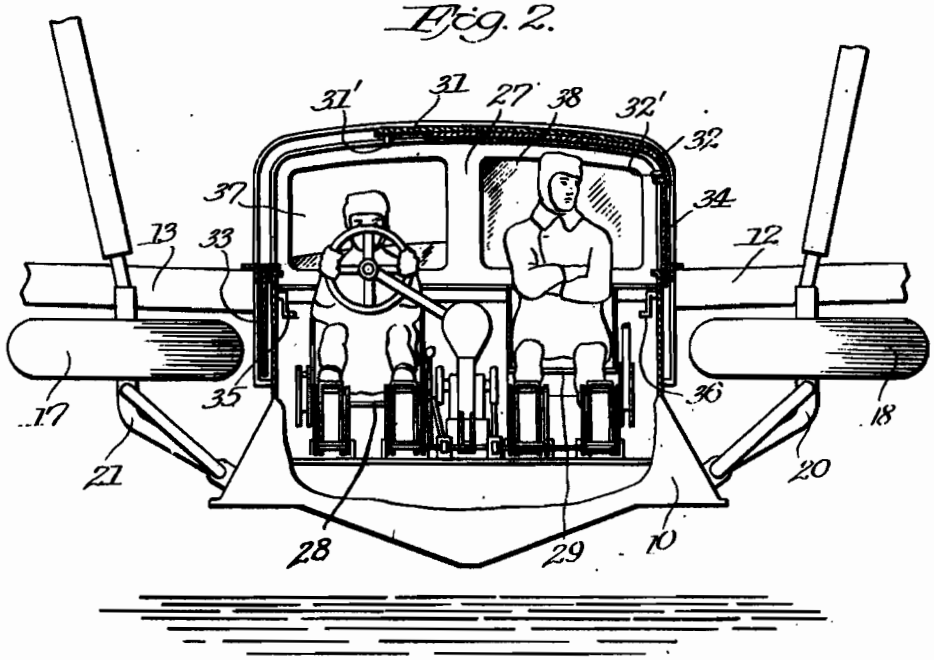


Fig. 2.



Igor Sikorsky.
INVENTOR

BY Robert Kemp
ATTORNEY

March 24, 1931. W. W. CHRISTMAS 1,797,326

FLYING WING AEROPLANE

Filed July 18, 1929 2 Sheets-Sheet 1

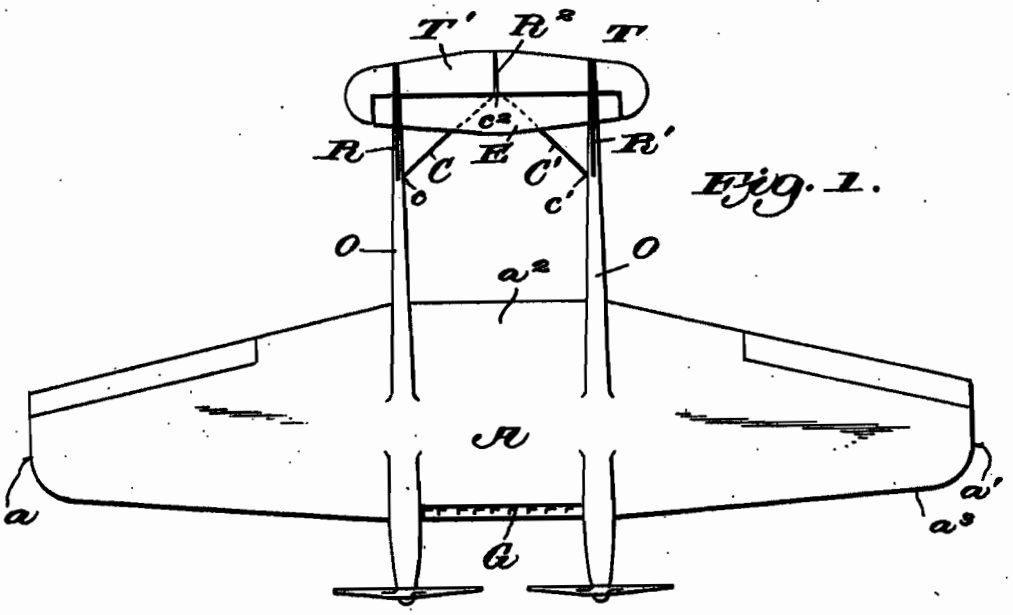


Fig. 1.

Fig. 2.

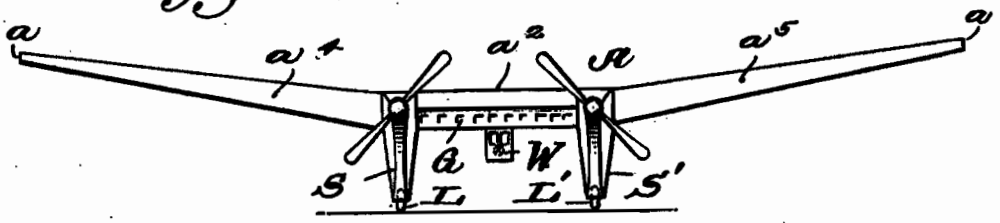
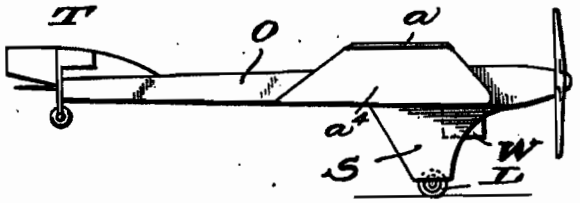


Fig. 3.



Inventor

William Whitney Christmas.

By Edward E Clemens

Attorney

UNITED STATES PATENT OFFICE.

JAMES M. GIBBS, OF SANTA ANA, CALIFORNIA, ASSIGNOR OF ONE-HALF TO GEORGE E. POWELL, OF SANTA ANA, CALIFORNIA.

VALVE-SEATING ATTACHMENT.

979,068. Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed March 26, 1910. Serial No. 551,682.

To all whom it may concern:

Be it known that I, JAMES M. GIBBS, a citizen of the United States, residing at Santa Ana, in the county of Orange and State of California, have invented new and useful Improvements in Valve-Seating Attachments, of which the following is a specification.

This invention relates to valves and particularly to disk valves.

The object of the invention is to provide a valve of this class with means for facilitating the free rotation of the valve on its axis so that the valve and its seat will wear uniformly and enable the valve to close tight. When valves of this class are closed by the action of a spring, the spring exerts its pressure usually out of alinement with the axis of the stem of the valve, and this tends to twist or "cock" the valve toward one side, producing unequal wear. My invention overcomes this difficulty.

The invention is especially applicable to mechanically operated puppet valves such as used on gas engines.

In the annexed drawing which fully illustrates my invention, Figure 1 is a longitudinal central section taken through a valve chamber provided with a valve having my invention in connection therewith, and showing a portion of the wall of the engine. Fig. 2 is a vertical section taken at the lower end of the valve stem and illustrating details of the invention. Fig. 3 is a cross section through the valve stem and further illustrating the parts shown in Fig. 2.

Referring more particularly to the parts, 4 represents a valve chamber which is provided above with a conical valve seat 5 upon which closes a conical valve or disk 6, which will admit into the passage 7 from below or vice versa when the valve is open. The lower wall of the valve chamber 4 is provided with a stuffing box 8 through which the valve stem 9 passes downwardly. Near the lower end of the valve stem a collar 10 is attached by means of a pin 11 passing through the stem, as indicated. This collar has a reduced neck 12 which extends upwardly passing through an opening 13 formed in an upper collar 14. The upper collar 14 is formed with a cup or recess 15 on its under side which coöperates with the upper face of the collar 10 so as to form a ball race to receive antifriction balls 16. On the upper end of the tubular neck 12 a ferrule 17 is attached which secures the collars together as will be readily understood. Between the upper collar 14 and the stuffing box 8, a coil spring 18 is placed, the same being disposed around the stem 9 as indicated. Against the lower end of the stem 9 a rod 19 abuts, said rod being of the same diameter as the stem and mounted to slide longitudinally with the stem by sliding through a suitable guide 20. This valve rod 19 is adapted to be actuated by a cam 21 rigidly mounted on the shaft 22, which is driven continuously when the engine is in operation. The rotation of the shaft 22 opens the valve at the proper time, as will be readily understood.

With a valve mounted as described, it will be evident that the spring 18 will hold the valve on its seat. At the same time the pressure of the spring will exert very little tendency to prevent the valve stem from rotating freely on account of the antifriction collars which seat the spring on the stem. This is highly advantageous for the reason that the valve will tend to become displaced and will seat constantly in different positions and this will tend to cause uniformity of wear between the disk and the seat. When a coil spring, such as spring 18, is contracted or expanded there is a slight rotation produced in the coils at the free end of the spring, and this rotation is communicated in a greatly reduced ratio to the valve stem 9 through the antifriction connection. In this way the valve tends to rotate automatically when in operation, and therefore practically grinds itself constantly upon its seat.

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

1. In a device of the class described, a valve chamber having a valve seat, a disk closing upon said seat, a spring tending to force said disk upon said seat, and an antifriction device in connection with said spring tending to increase the facility of rotation of said disk.

2. In a device of the class described, in combination, a valve chamber having a seat, a valve having a disk closing upon said seat, a stem extending from said disk, means for guiding said stem, a spring tending to force said disk toward said seat, an antifriction device between said spring and said

Sept. 27, 1932. I. SIKORSKY 1,879,716

AMPHIBIAN AIRCRAFT

Original Filed June 7, 1929 23 Sheets-Sheet 1

Fig. 1.

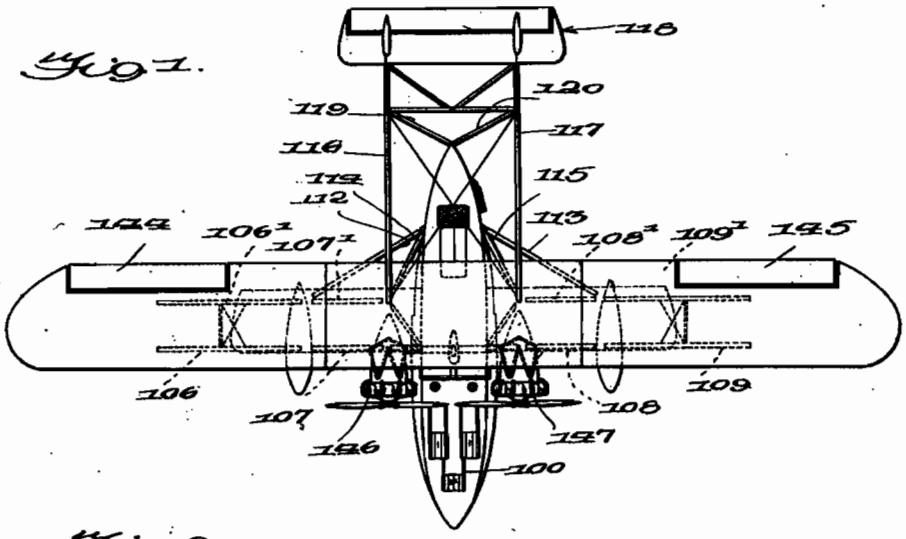
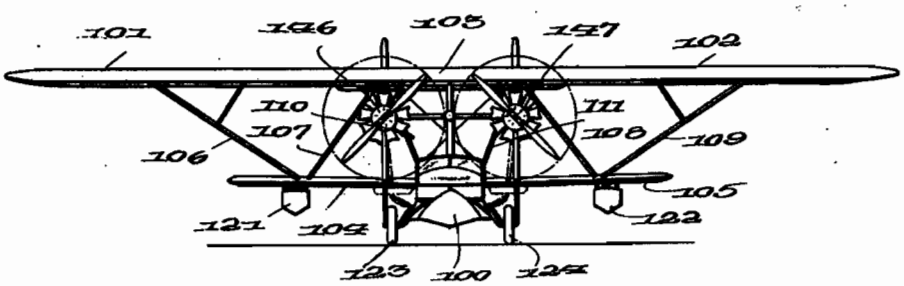


Fig. 2.



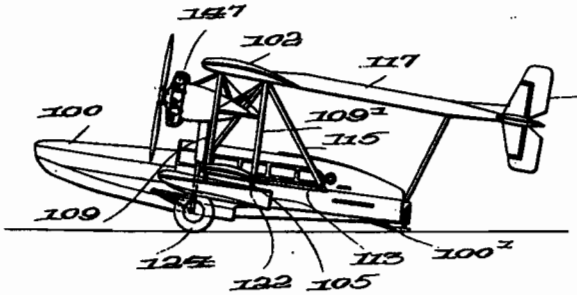


Fig. 3.

Igor Sikorsky
INVENTOR

BY Robert Kemp
ATTORNEY

Feb. 21, 1933. I. SIKORSKY 1,898,695

AIRCRAFT, ESPECIALLY AIRCRAFT OF THE AMPHIBIAN TYPE AND BODY BOAT STRUCTURE FOR SAME

Filed Dec. 30, 1929 3 Sheets-Sheet 1

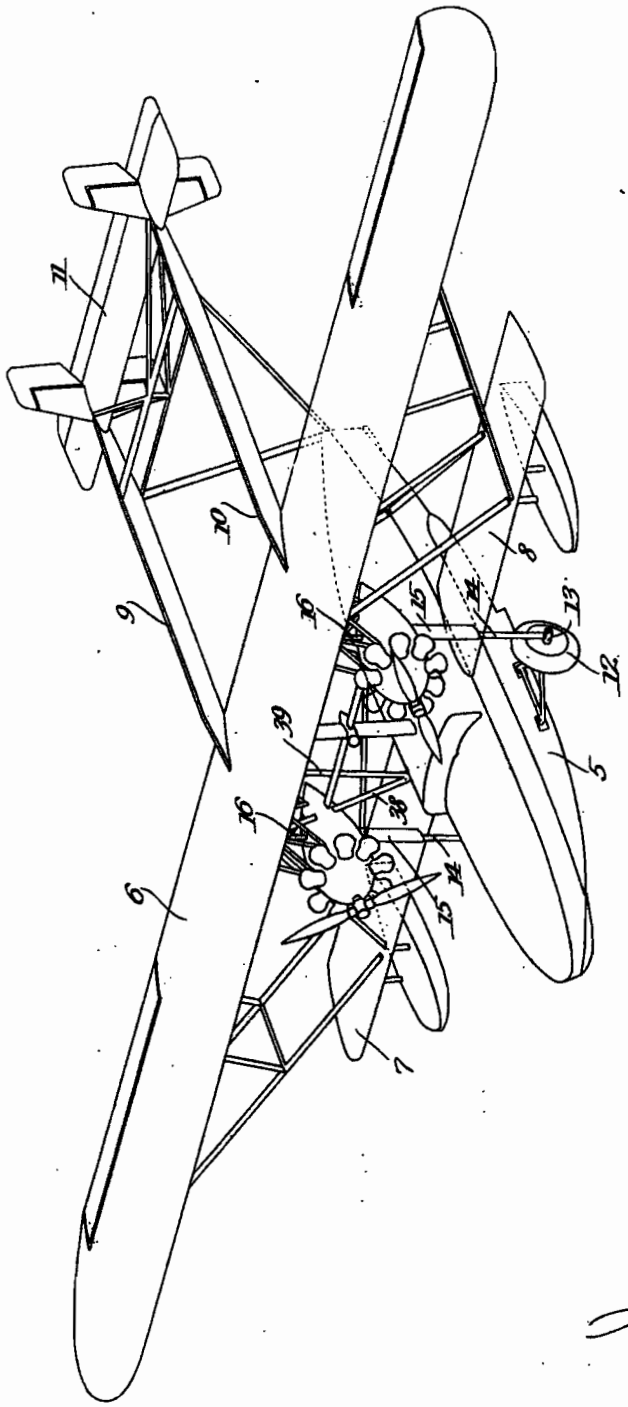


Fig. 1.

Igor Sikorsky
INVENTOR.

BY Robert Kemp
ATTORNEYS.

Feb. 12, 1935. H. JUNKERS 1,990,606

SHAFTING FOR POWER TRANSMISSION

Filed Oct. 3, 1931 2 Sheets-Sheet 1

Fig. 1

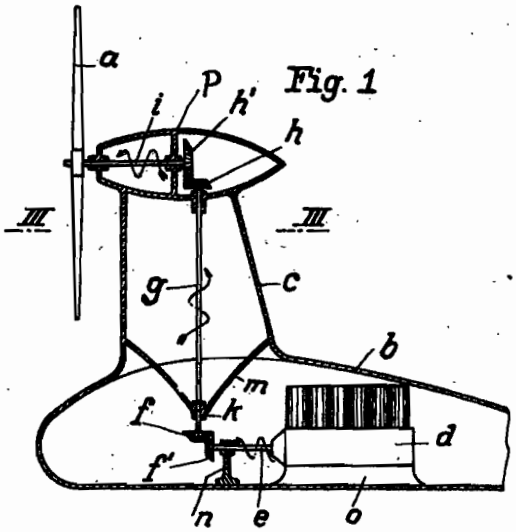
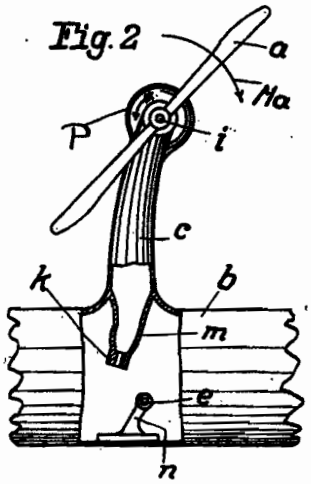


Fig. 2



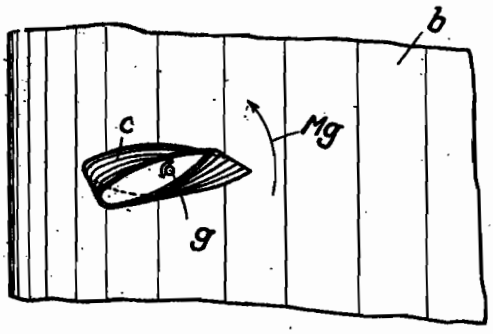


Fig. 3

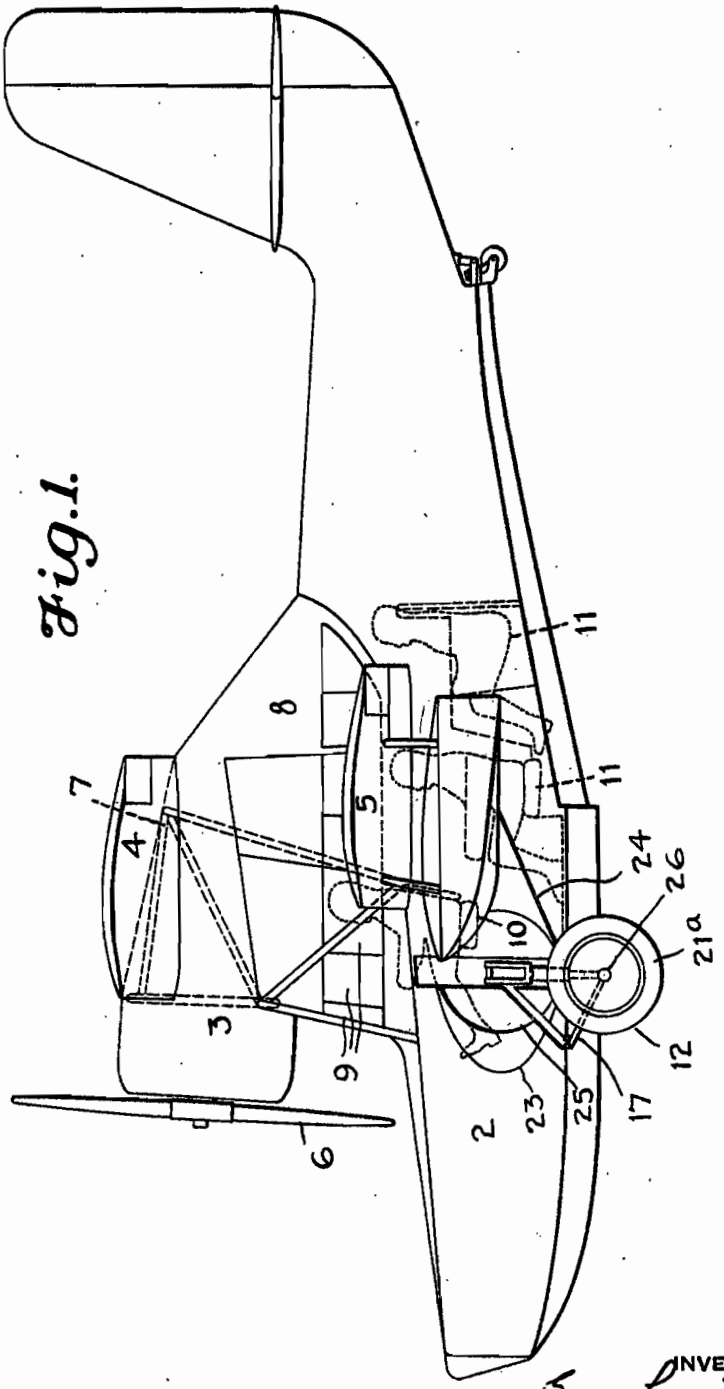
Inventor:
Hugo Junkers
by Kallenbach
Atty

Aug. 8, 1933. G. LOENING 1,921,992

AIRCRAFT

Filed Feb. 29, 1932 4 Sheets-Sheet 1

Fig. 1.



INVENTOR
Grover Loening
BY
ATTORNEY

Aug. 18, 1936. G. M. BELLANCA 2,051,021

RETRACTABLE LANDING GEAR

Filed Nov. 2, 1933 2 Sheets-Sheet 1

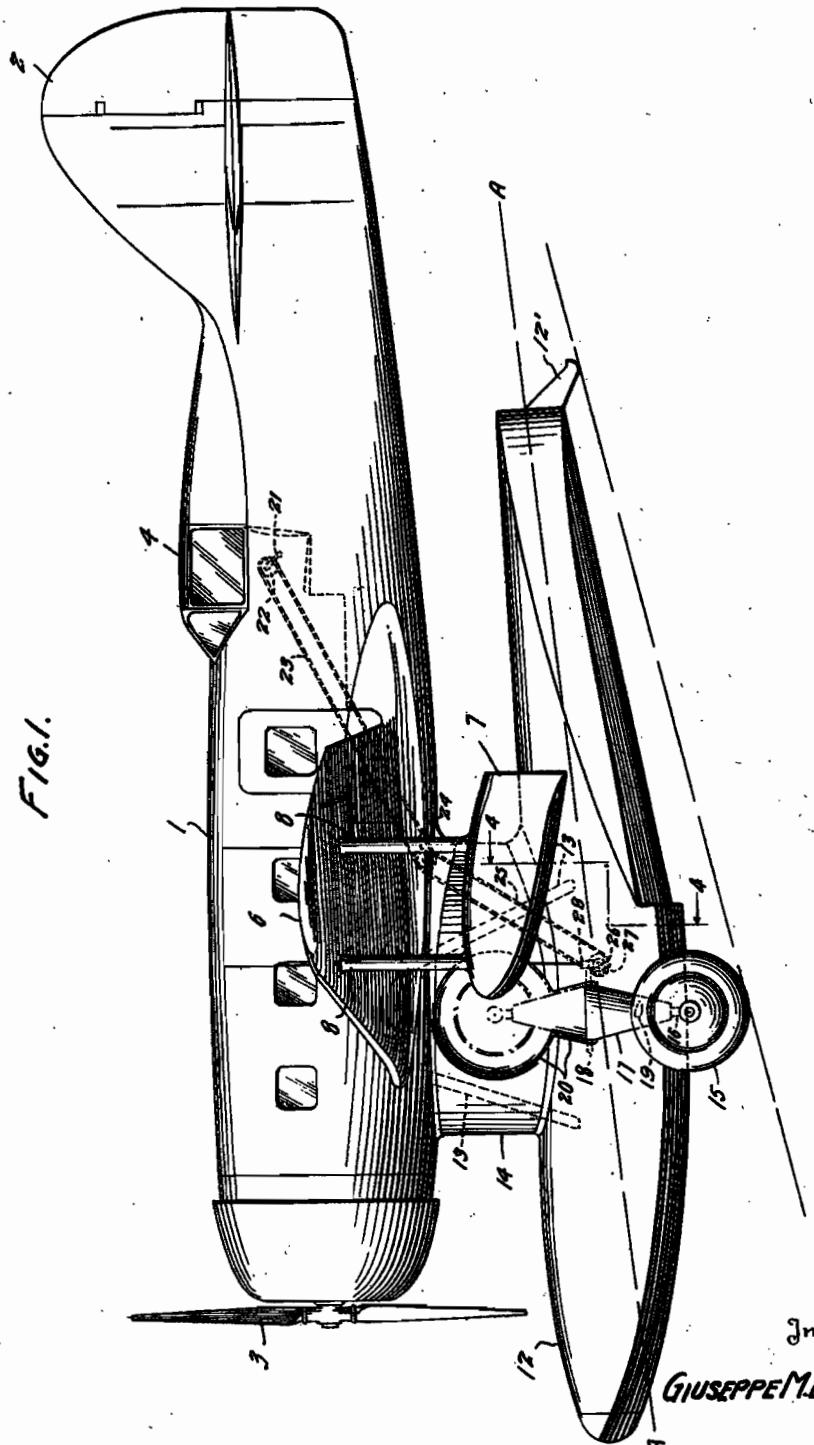


FIG. 1.

Inventor
GIUSEPPE M. BELLANCA

By Raymond J. Porter
Attorney

Nov. 17, 1936. G. LOENING 2,061,242

AIRPLANE BRACING

Filed Aug. 11, 1933

Fig. 1.

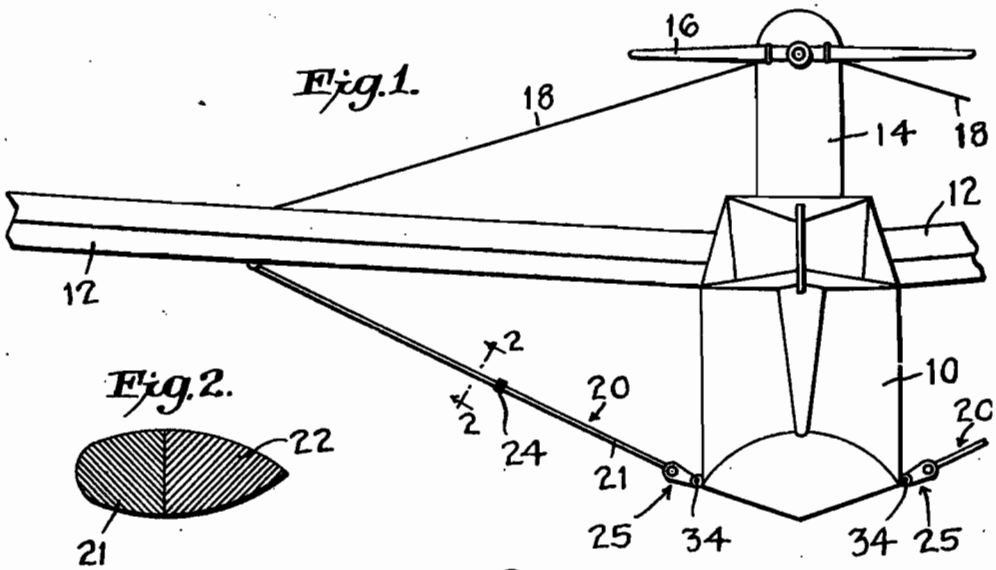


Fig. 2.

Fig. 3.

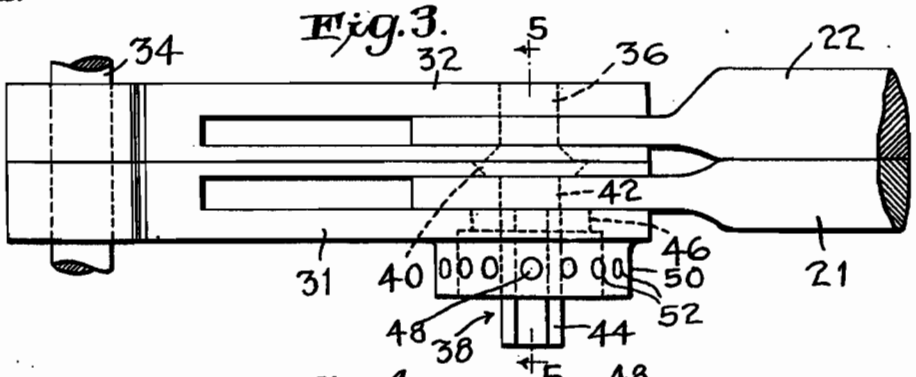


Fig. 4.

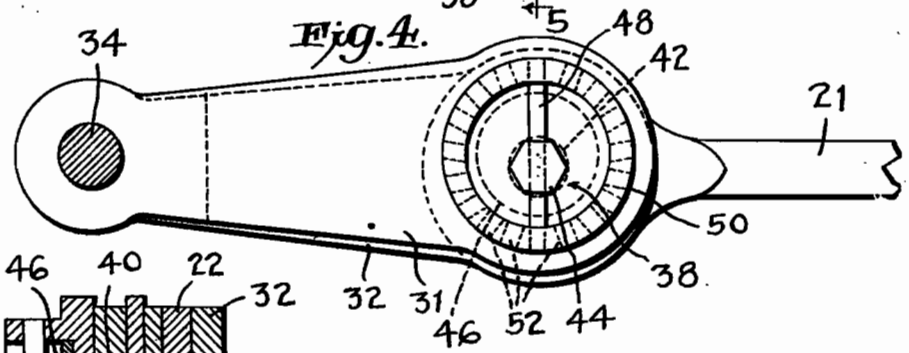
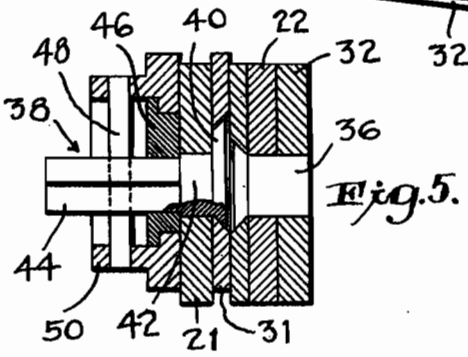


Fig. 5.



INVENTOR

BY Grover Loening

J. F. Brandenburg

ATTORNEY

Aug. 24, 1937. T. P. WRIGHT 2,090,775

TWISTED FAIRING

Filed March 30, 1934

FIG. 1.

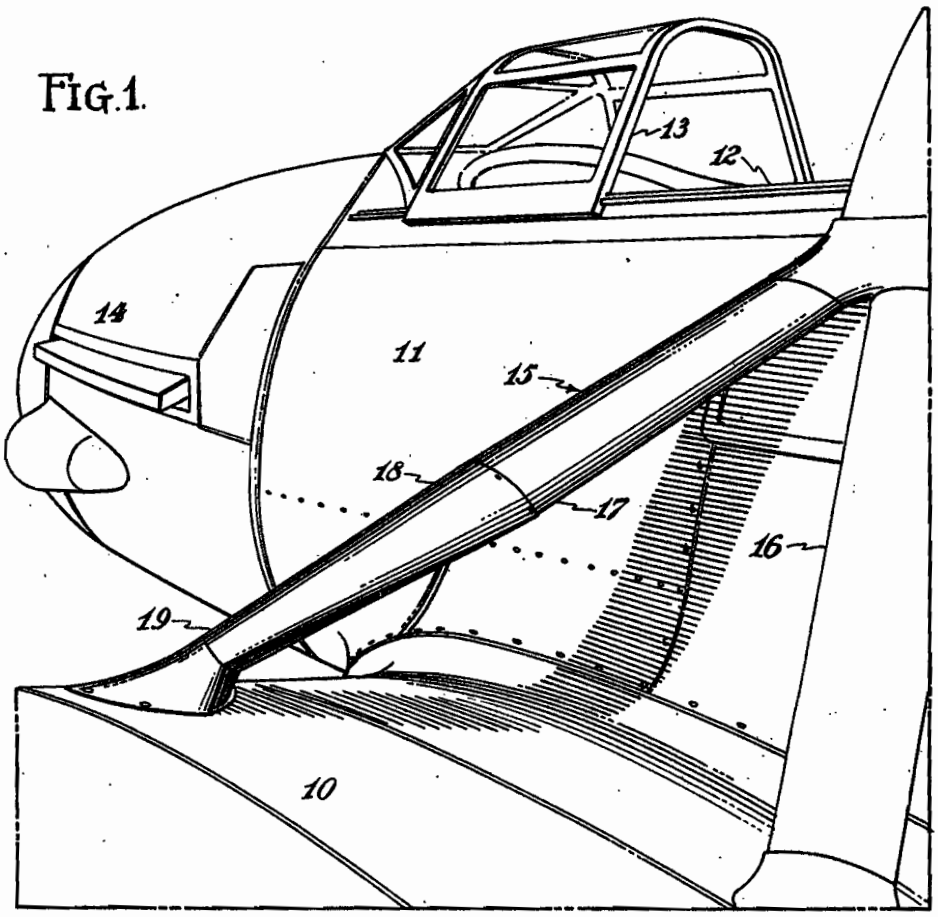


FIG. 2.

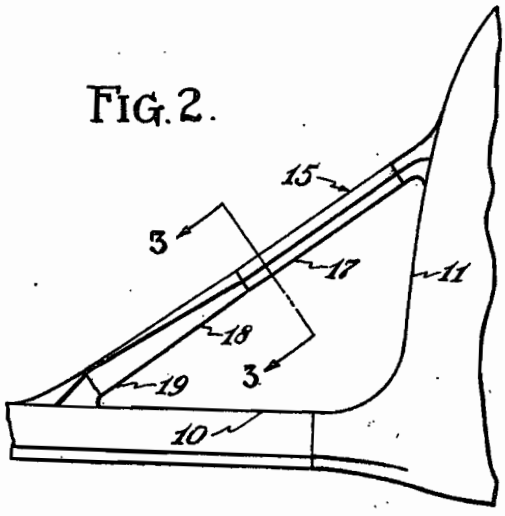
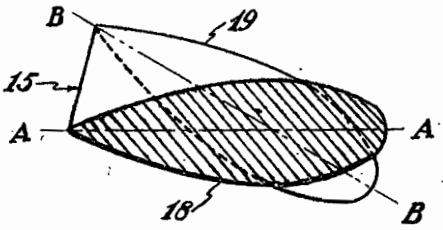


FIG. 3.



INVENTOR.
THEODORE P. WRIGHT.
BY W. Etaek Jr.
ATTORNEYS.

Jan. 29, 1935. J. H. KINDELBERGER ET AL Des. 94,427

AIRPLANE

Filed April 9, 1934 2 Sheets-Sheet 1

Fig. 1.

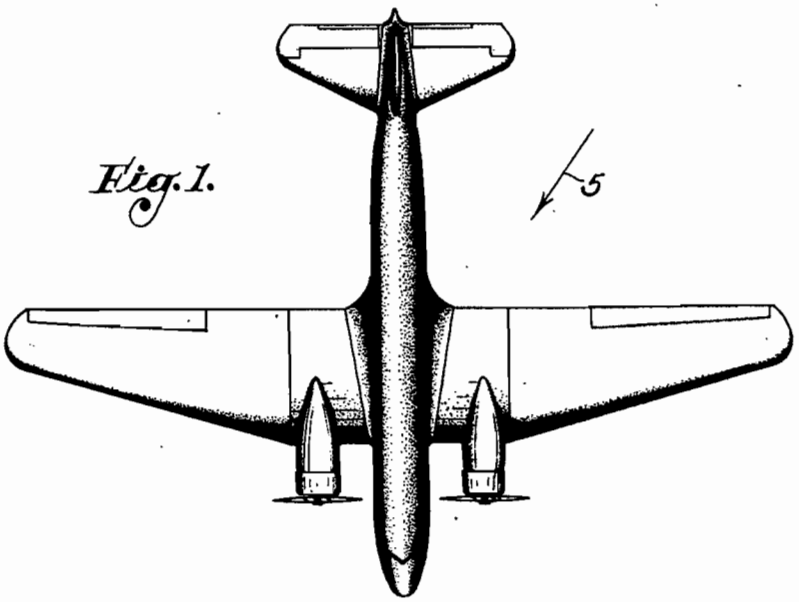
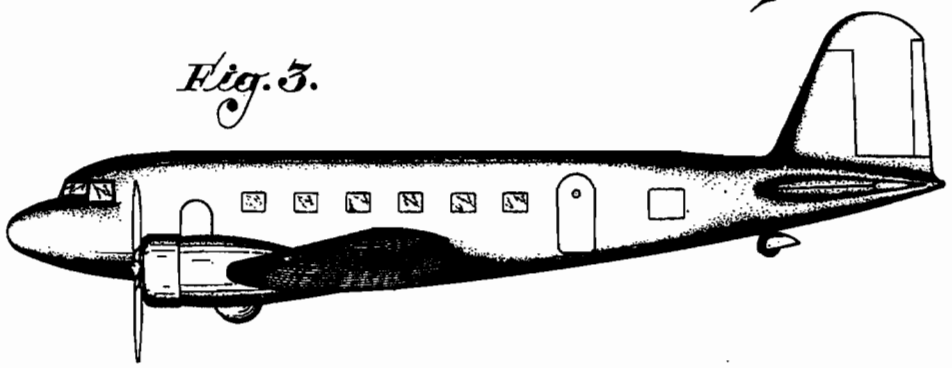


Fig. 2.

Fig. 3.



INVENTORS
JAMES H. KINDELBERGER
ARTHUR E. RAYMOND
BY Fred W Harris
ATTORNEY.

Jan. 29, 1935. J. H. KINDELBERGER ET AL Des. 94,427

AIRPLANE

Filed April 9, 1934 2 Sheets-Sheet 2

Fig. 4.

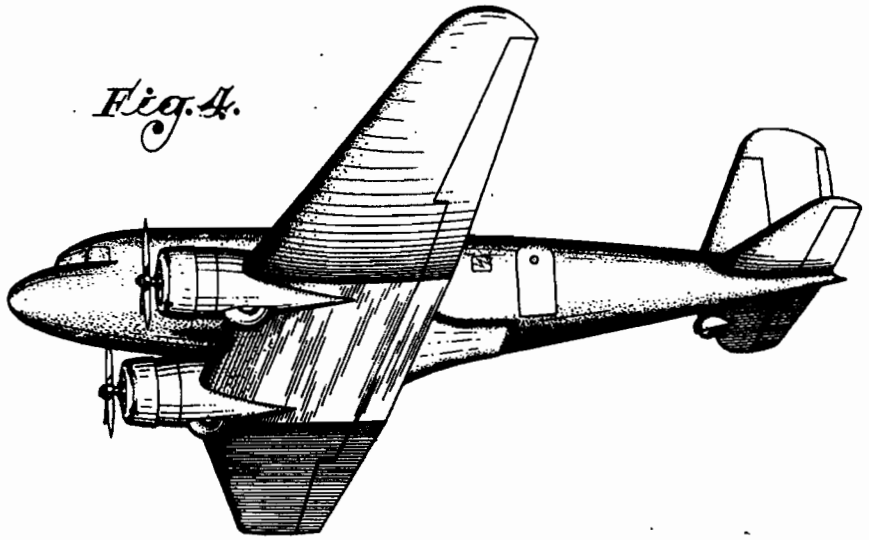


Fig. 5.

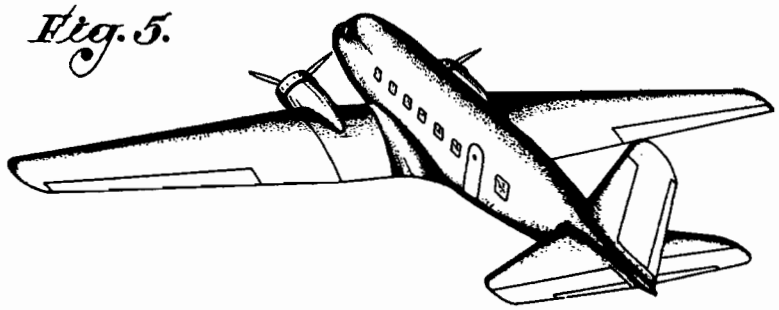
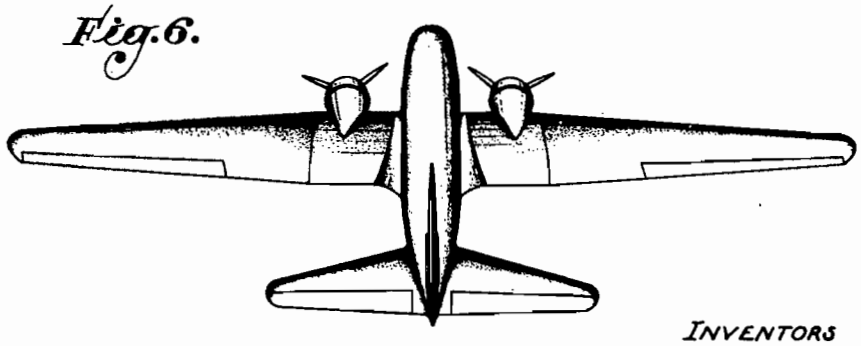


Fig. 6.



INVENTORS
JAMES H. KINDELBERGER
ARTHUR E. RAYMOND
BY Fad M. Hann
ATTORNEY.

Patented Jan. 29, 1935

Des. 94,427

UNITED STATES PATENT OFFICE

94,427

DESIGN FOR AN AIRPLANE

James H. Kindelberger, Los Angeles, and Arthur E. Raymond, Santa Monica, Calif., assignors to Douglas Aircraft Company, Inc., Santa Monica, Calif., a corporation of Delaware

Application April 9, 1934, Serial No. 51,364

Term of patent 7 years

To all whom it may concern:

Be it known that we, James H. Kindelberger and Arthur E. Raymond, citizens of the United States, the former residing at Los Angeles, in the county of Los Angeles and State of California, and the latter residing at Santa Monica, in the county of Los Angeles and State of California, have invented a new, original, and ornamental Design for an Airplane, of which the following is a specification, reference being had to the accompanying drawings, forming part hereof.

Fig. 1 is a top plan view of an airplane;

Fig. 2 is a front elevational view;

Fig. 3 is a side elevational view;

Fig. 4 is a perspective view taken as indicated by the arrow 4 of Fig. 3;

Fig. 5 is a perspective view taken as indicated by the arrow 5 of Fig. 1; and

Fig. 6 is a perspective view taken as indicated by the arrow 6 of Fig. 3, showing our new design for an airplane.

We claim:

The ornamental design for an airplane, as shown.

JAMES H. KINDELBERGER.
ARTHUR E. RAYMOND.

Dec. 3, 1935. A. E. RAYMOND Des. 97,713

AIRPLANE

Filed Sept. 9, 1935 2 Sheets-Sheet 1

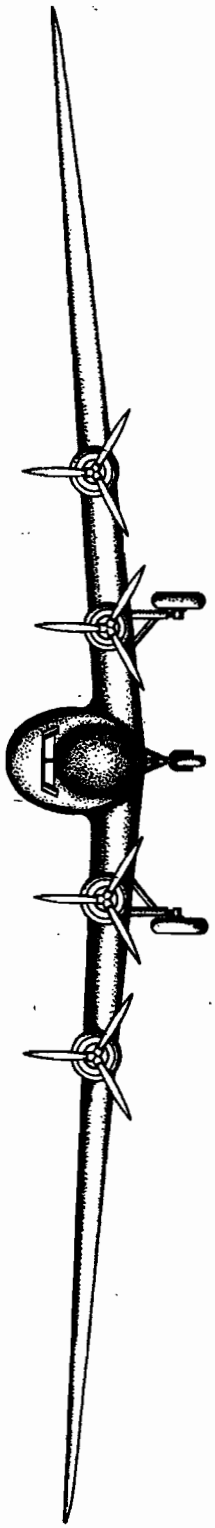


Fig. 1.

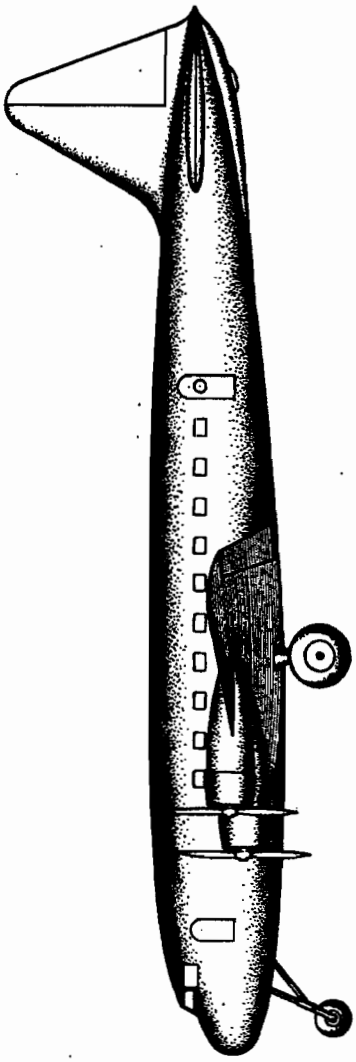


Fig. 2.

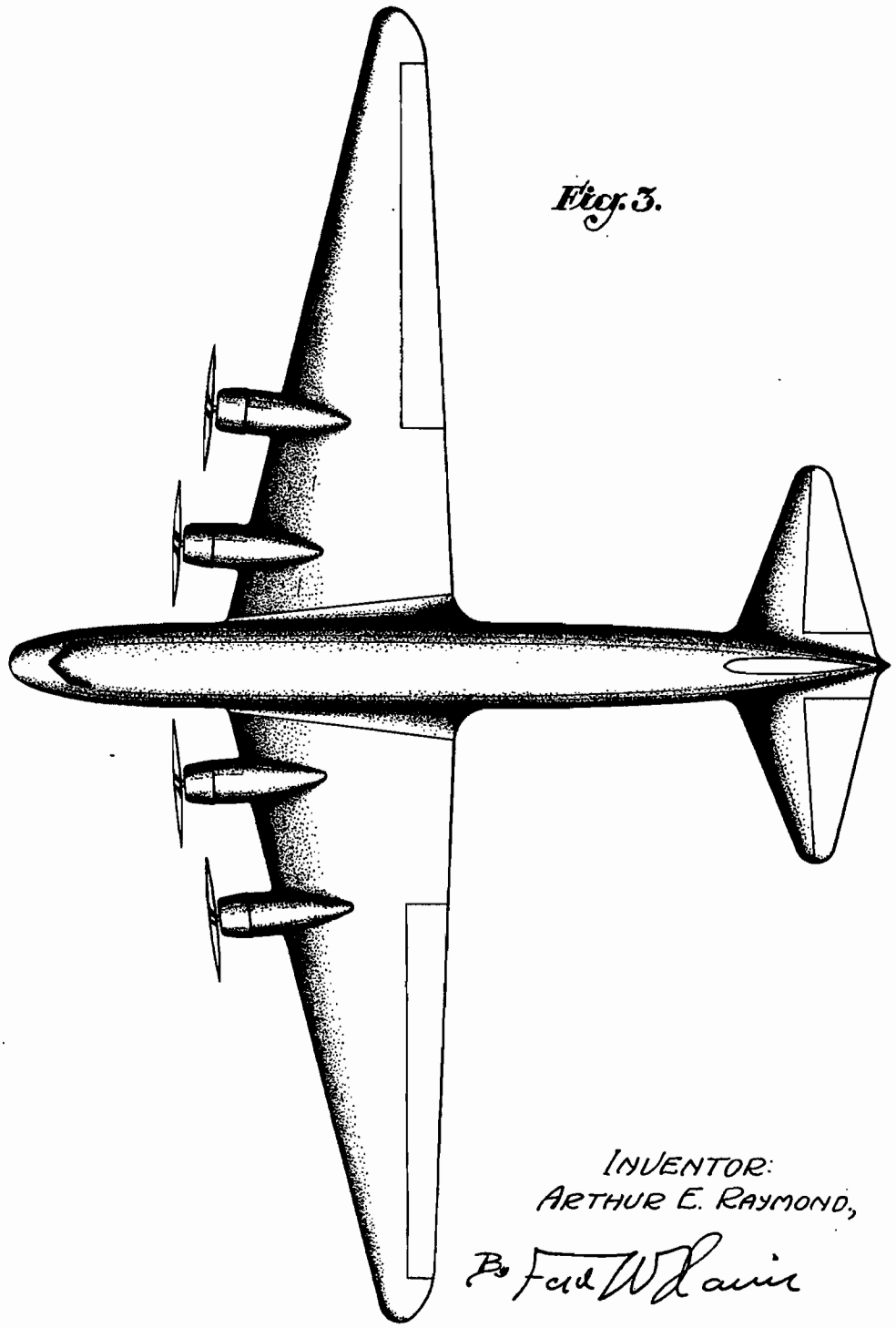
INVENTOR:
ARTHUR E. RAYMOND,
By Fred A. Ramie
ATTORNEY

Dec. 3, 1935. A. E. RAYMOND Des. 97,713

AIRPLANE

Filed Sept. 9, 1935 2 Sheets-Sheet 2

Fig. 3.



INVENTOR:
ARTHUR E. RAYMOND,
By Fred W. Lamm
ATTORNEY.

Patented Dec. 3, 1935

Des. 97,713

UNITED STATES PATENT OFFICE

97,713

DESIGN FOR AN AIRPLANE

Arthur E. Raymond, Santa Monica, Calif., assignor to Douglas Aircraft Company, Inc., Santa Monica, Calif., a corporation of Delaware

Application September 9, 1935, Serial No. 58,476

Term of patent 3½ years

To all whom it may concern:

Be it known that I, Arthur E. Raymond, a citizen of the United States, residing at Santa Monica, in the county of Los Angeles and State of California, have invented a new, original, and ornamental Design for an Airplane, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

Fig. 1 is a front elevational view;

Fig. 2 is a side elevational view; and

Fig. 3 is a plan view showing my new design.

I claim:

The ornamental design for an airplane as shown.

ARTHUR E. RAYMOND.

Dec. 15, 1936. G. A. LUBURG 2,064,675

AMPHIBIAN LANDING GEAR

Filed March 10, 1936 3 Sheets-Sheet 1

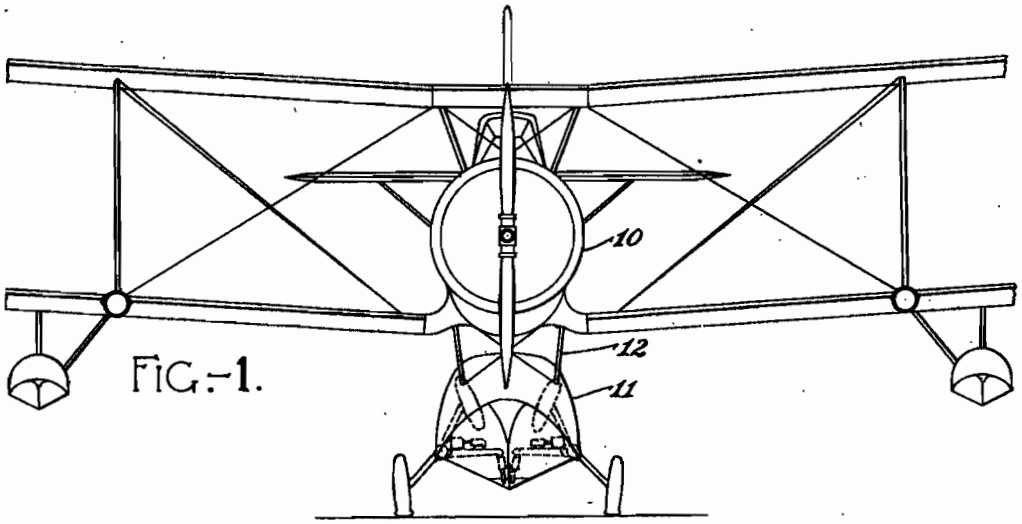


FIG.-1.

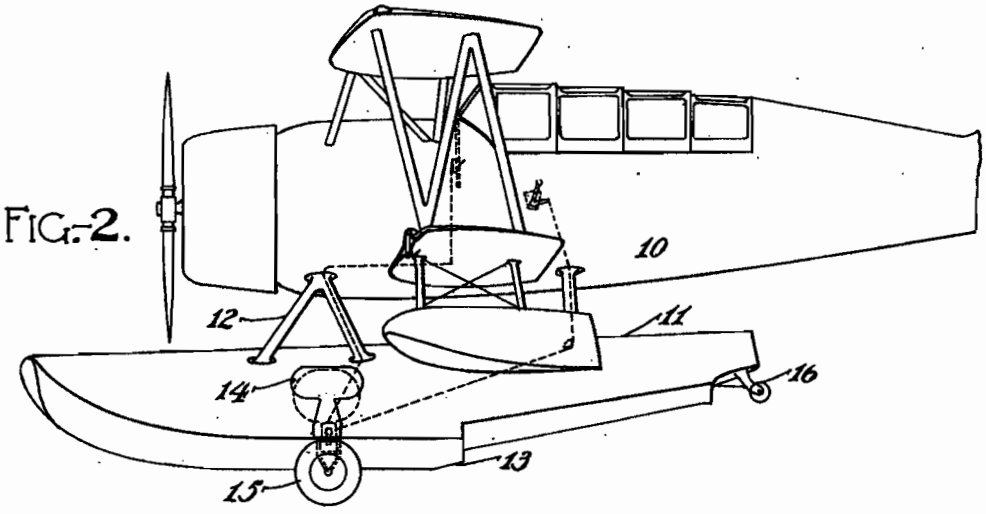


FIG.-2.

INVENTOR.
GUY A. LUBURG
BY Wm. E. Stall Jr.
ATTORNEYS.

D12/341

April 27, 1937. F. R. CANNEY ET AL Des. 104,335

FOUR-ENGINE TRANSPORT AIRPLANE

Filed Nov. 16, 1936 2 Sheets-Sheet 1

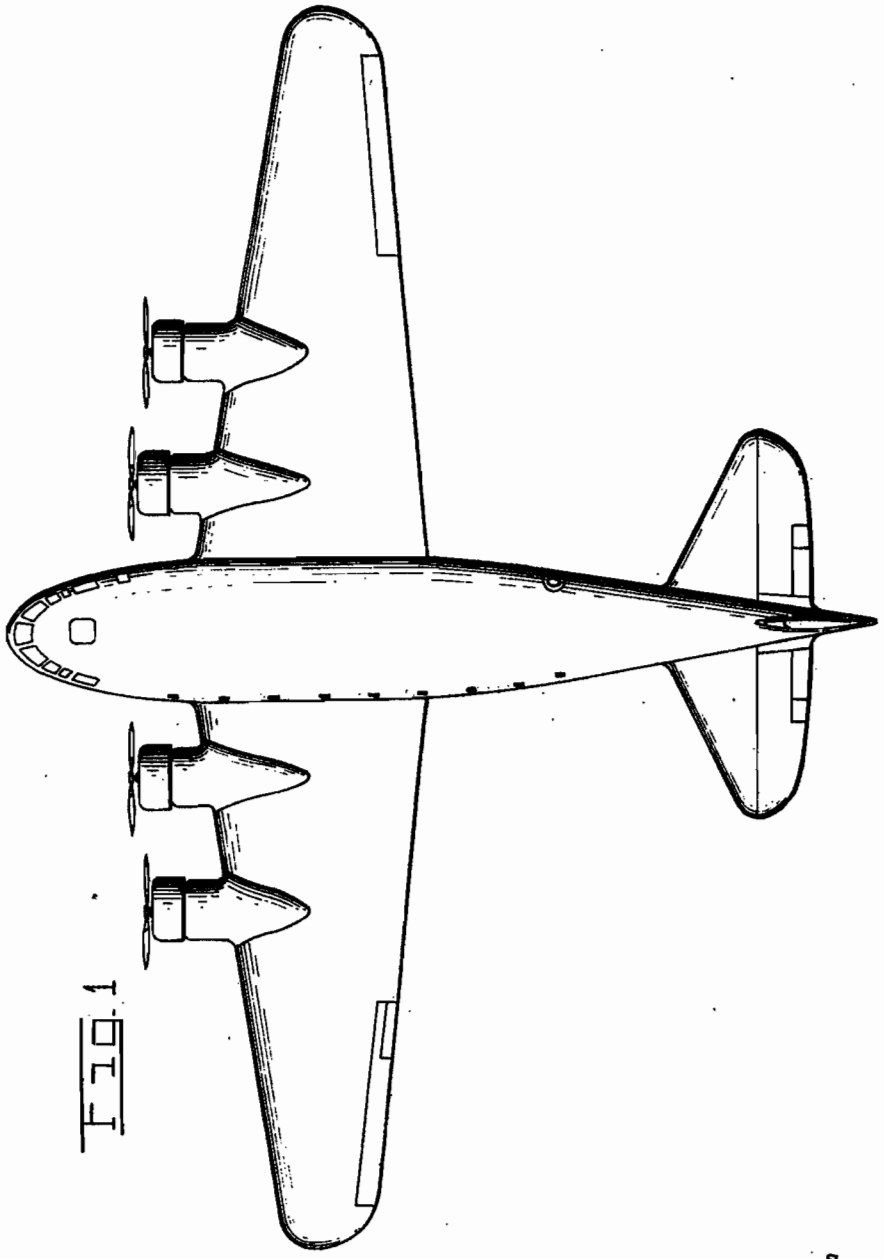


Fig. 1

Inventor
Frank R. Canney
Lysle A. Wood
By Charles L. Reynolds
Attorney

April 27, 1937. F. R. CANNEY ET AL Des. 104,335

FOUR-ENGINE TRANSPORT AIRPLANE

Filed Nov. 16, 1936 2 Sheets-Sheet 2

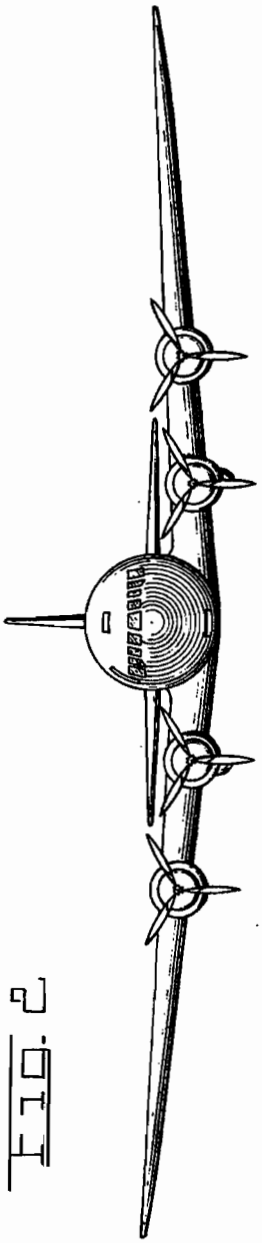


Fig. 2

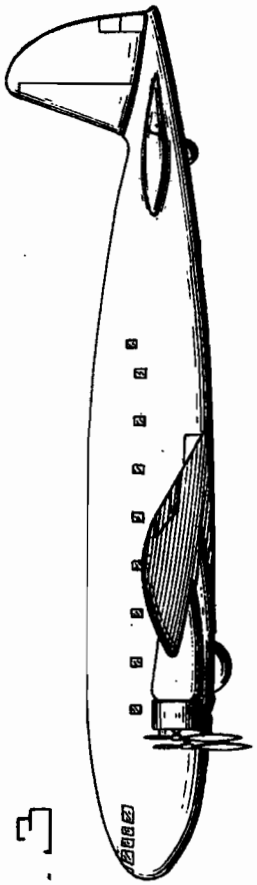


Fig. 1

Inventor
Frank R. Canney
Lysle A. Wood
By Charles L. Reynolds
Attorney

Patented Apr. 27, 1937

Des. 104,335

UNITED STATES PATENT OFFICE

104,335

DESIGN FOR A FOUR-ENGINE TRANSPORT AIRPLANE

Frank R. Canney and Lysle A. Wood, Seattle, Wash., assignors to Boeing Aircraft Company, Seattle, Wash., a corporation of Washington

Application November 16, 1936, Serial No. 65,949

Term of patent 7 years

To all whom it may concern:

Be it known that we, Frank R. Canney and Lysle A. Wood, both citizens of the United States of America, and both residing at Seattle, in the county of King and State of Washington, have invented a new, original, and ornamental Design for a Four-Engine Transport Airplane, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

Figure 1 is a plan view of the airplane, showing our new design.

Figure 2 is a front elevation of the same in flight.

Figure 3 is a side elevation of the airplane in flight.

We claim:

The ornamental design for a four-engine transport airplane, substantially as shown.

FRANK R. CANNEY.
LYSLE A. WOOD.

Patented Aug. 7, 1945 2,381,350

UNITED STATES PATENT OFFICE

2,381,350

AIRPLANE FAIRINGS

Theodore P. Hall, San Diego, Calif., assignor to Consolidated Vultee Aircraft Corporation, San Diego, Calif., a corporation of Delaware

Application November 8, 1944, Serial No. 562,441

5 Claims. (Cl. 244—130)

The present invention relates to airplane fairings.

In the manufacture or fabrication of an airplane it is customary or standard practice to connect a movable counterbalanced control surface, such as a rudder, to the trailing portion of the forwardly disposed fixed surface of the airplane by means of hinges in the form of hinge brackets which are connected to, and project rearwards from, the fixed surface and extend into notches in the leading portion of the control surface and a pivot rod which is carried by the control surface, extends through holes in the rear ends of the brackets and is disposed rearwards of the leading edge of the control surface. During flight of an airplane having a counterbalanced control surface that is hinged in the aforementioned manner it has been found that when the control surface is deflected or swung for airplane maneuvering purposes eddy currents and turbulences are formed or produced in the region of the notches in the leading portion of the control surface and such currents and turbulences result in pronounced fluttering or buffeting of the control surface.

The primary object of the present invention is to eliminate in connection with an airplane having a counterbalanced control surface with hinge bracket receiving notches in its leading portion, the formation of eddy currents and turbulences adjacent the notches when the surface is deflected or angularly adjusted during a flight maneuver. This object is attained by providing fairings which are located at the sides of the hinge brackets and serve so to fill and streamline the notches in the leading portion of the control surface that when the control surface is deflected the portions or surfaces adjacent the hinge areas present a smooth or streamline contour to the slip stream of the airplane.

Another object of the invention is to provide fairings for airplane hinge brackets which are attached to, and form a part of, the brackets and are so designed and constructed that they effectively and efficiently fulfill their intended purpose.

Other objects of the invention and the various advantages and characteristics of the present airplane hinge bracket fairings will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like letters and numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a perspective of an airplane empennage having rudder supported hinge brackets with fairings embodying the invention;

Figure 2 is an enlarged vertical section taken on the line 2—2 of Figure 1 and showing in detail the construction and arrangement of one of the fairing-equipped hinge brackets;

Figure 3 is a perspective of the hinge bracket shown in Figure 2;

Figure 4 is an enlarged horizontal section taken on the line 4—4 of Figure 1 and illustrating in detail the manner in which the fairings at the sides of the hinge brackets so fill and streamline the notches in the leading portion of the rudder that when the rudder is deflected the portions or surfaces adjacent the hinge areas present a smooth and streamline contour to the slip stream of the airplane and hence eliminate eddy currents and turbulences adjacent the notches and resultant fluttering or buffeting of the rudder; and

Figure 5 is an enlarged side view of the bracket that is shown in Figures 2, 3 and 4.

The invention is exemplified in connection with an airplane A having a fuselage a and an empennage at the rear end of the fuselage. As shown in Figure 1 of the drawings, the empennage comprises an upstanding vertical fin a^1, a rudder a^2, a horizontal stabilizer a^3, and a pair of elevators a^4. The horizontal stabilizer projects outwards in both directions from the rear end of the fuselage a and has the elevators a^4 pivotally connected to its trailing portion, as well understood in the art. The vertical fin a^1 is connected to, and projects upwards from, the upper portion of the rear end of the fuselage and has its trailing portion substantially straight, although forwardly bulged or arcuate in cross section. The rudder a^2 is disposed directly behind the vertical fin and is of the counter balanced variety. It has a control tab a^5 at its trailing edge and is pivotally connected to the trailing portion of the vertical fin by a plurality of hinges 6 in order that it is capable of swinging laterally or horizontally. The central and rear portions of the rudder are rearwardly tapered and the front portion of the rudder is transversely rounded or curved.

The hinges 6 are shown as being four in number although more or less may be employed, de-

July 14, 1942. R. J. WOODS 2,289,400

PROPELLER FAIRING

Filed March 23, 1939 5 Sheets-Sheet 1

FIG. 1.

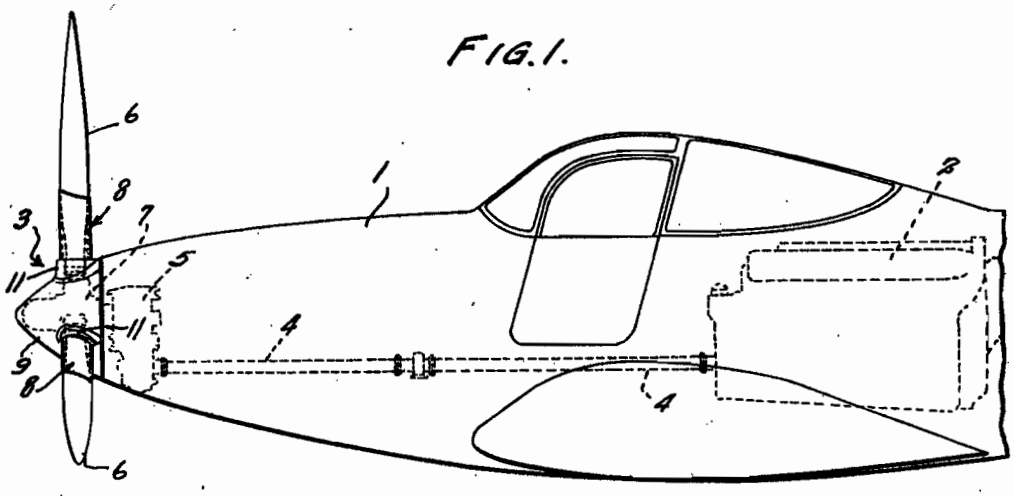
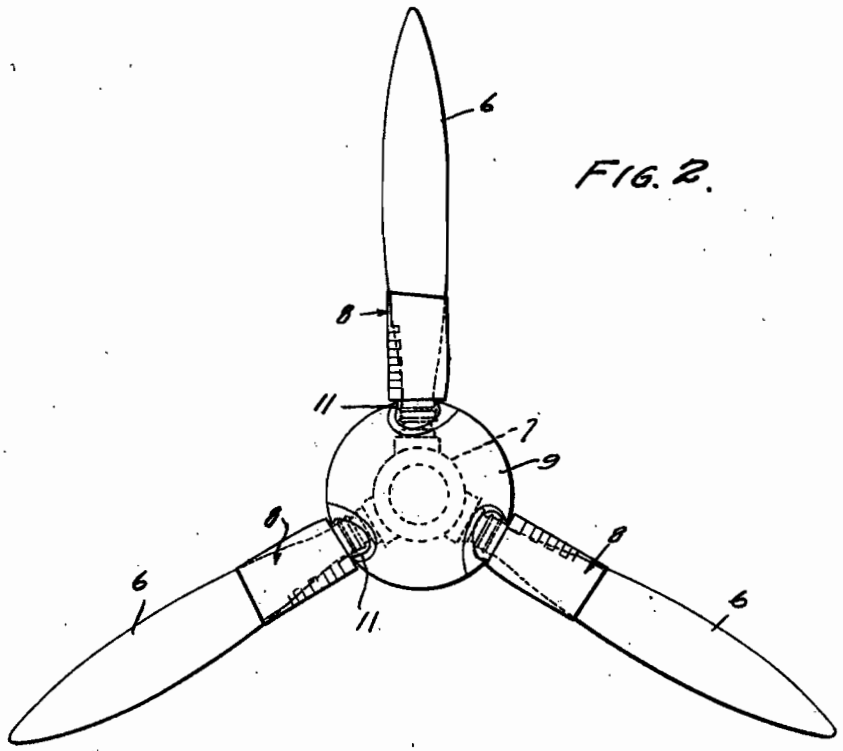


FIG. 2.



Inventor
ROBERT J. WOODS

By Semmes, Keegin & Semmes
Attorneys

July 14, 1942. R. J. WOODS 2,289,400

PROPELLER FAIRING

Filed March 23, 1939 5 Sheets-Sheet 2

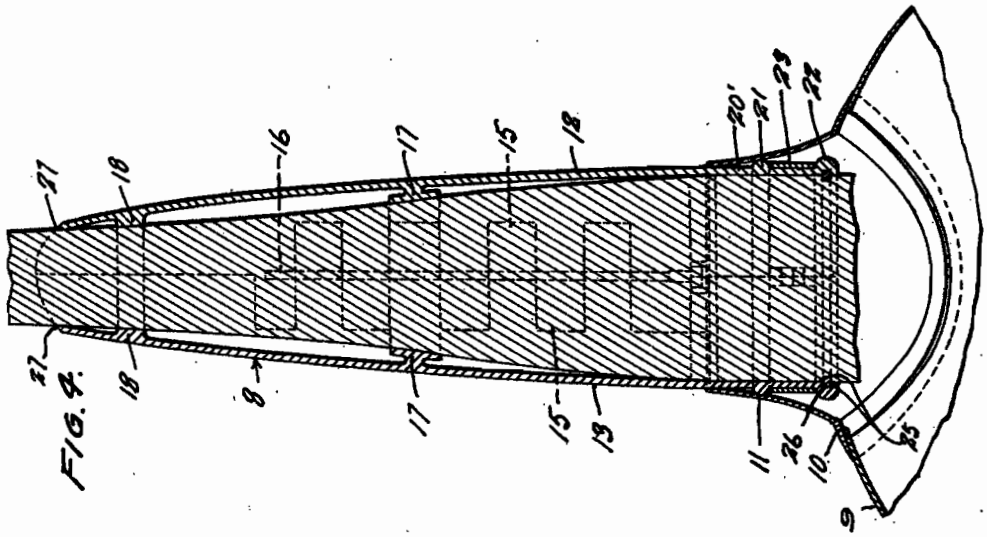


FIG. 4.

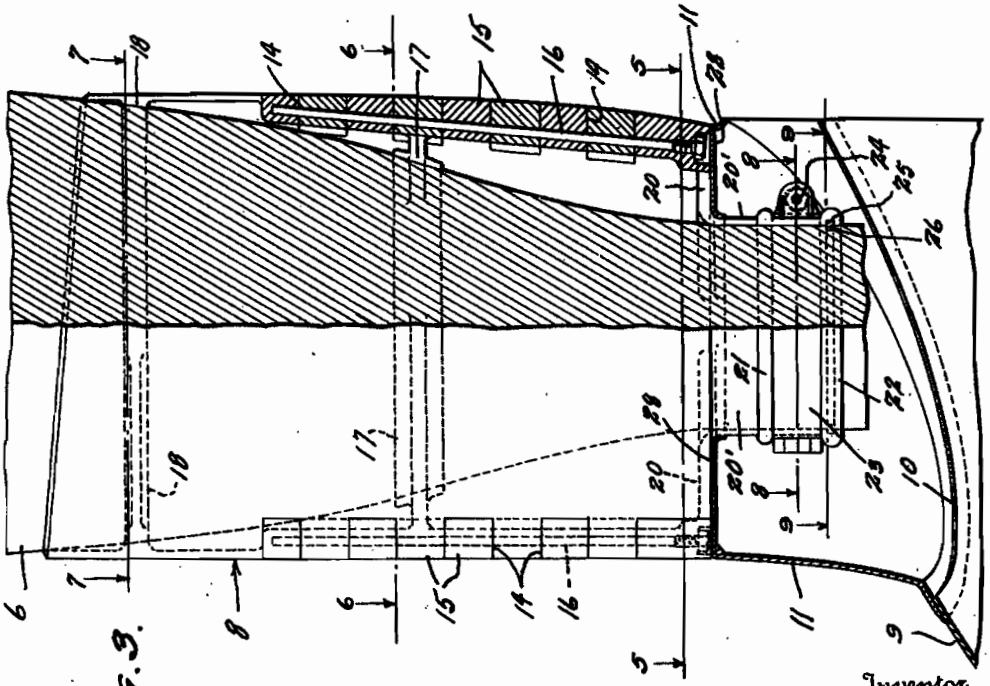


FIG. 3.

Inventor

ROBERT J. WOODS

By Semmes, Keegin & Semmes

Attorneys

July 14, 1942. R. J. WOODS 2,289,400

PROPELLER FAIRING

Filed March 23, 1939 5 Sheets-Sheet 3

FIG. 5.

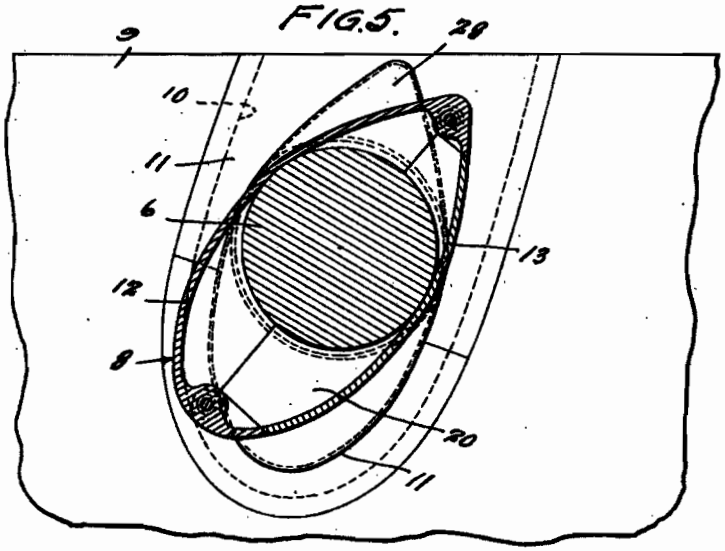


FIG. 6.

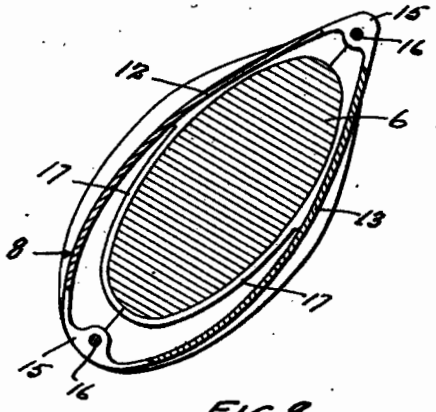


FIG. 7.

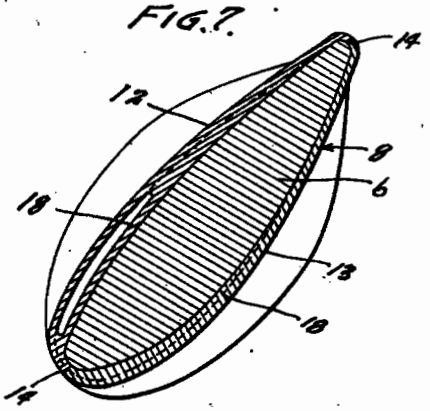


FIG. 8.

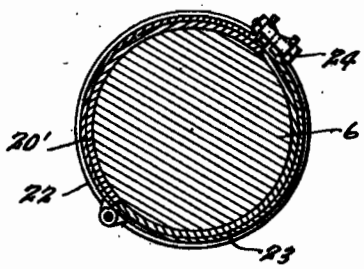
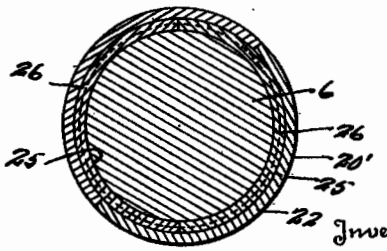


FIG. 9.



Inventor

ROBERT J. WOODS

By Semmes, Keegin & Semmes

Attorneys

July 14, 1942. R. J. WOODS 2,289,400

PROPELLER FAIRING

Filed March 23, 1939 5 Sheets-Sheet 4

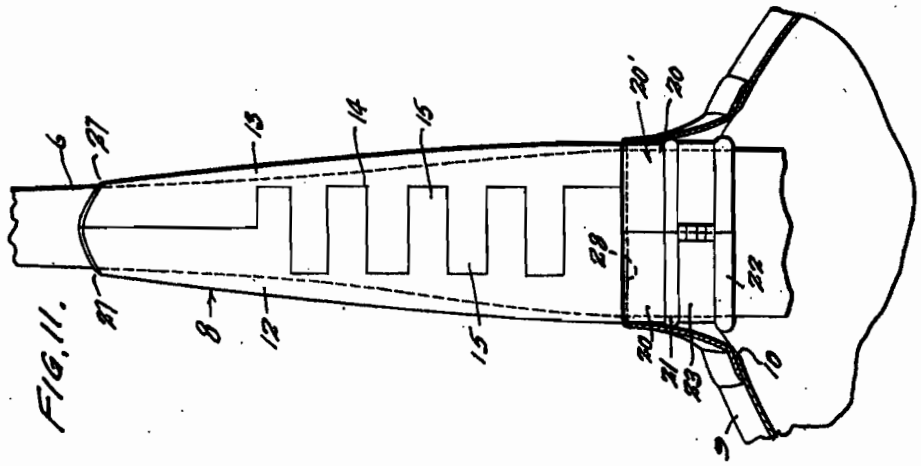


FIG. 11.

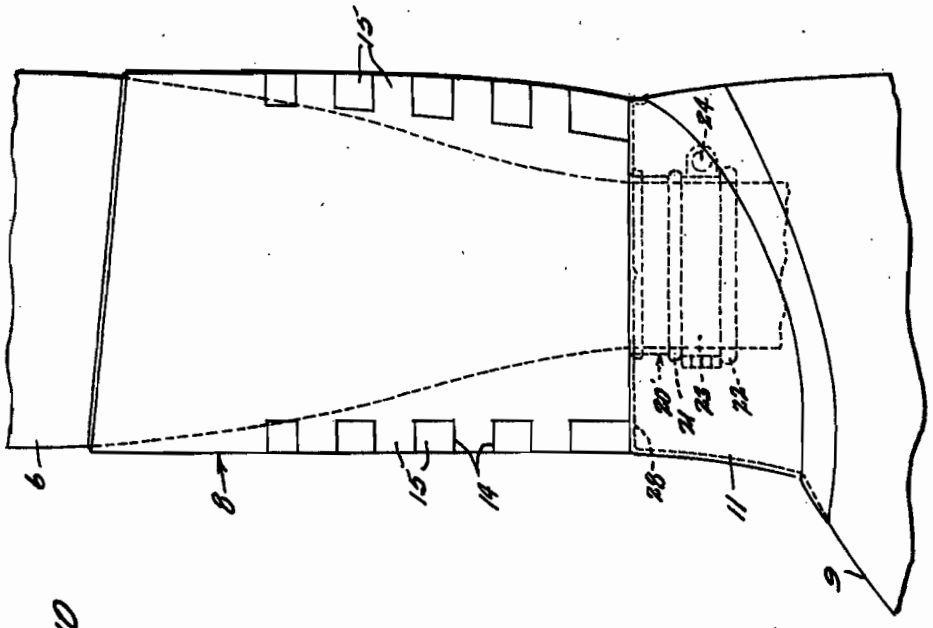


FIG 10

Inventor
ROBERT J. WOODS

By Semmes, Keegin & Semmes
Attorneys

July 14, 1942. R. J. WOODS 2,289,400

PROPELLER FAIRING

Filed March 23, 1939 5 Sheets-Sheet 5

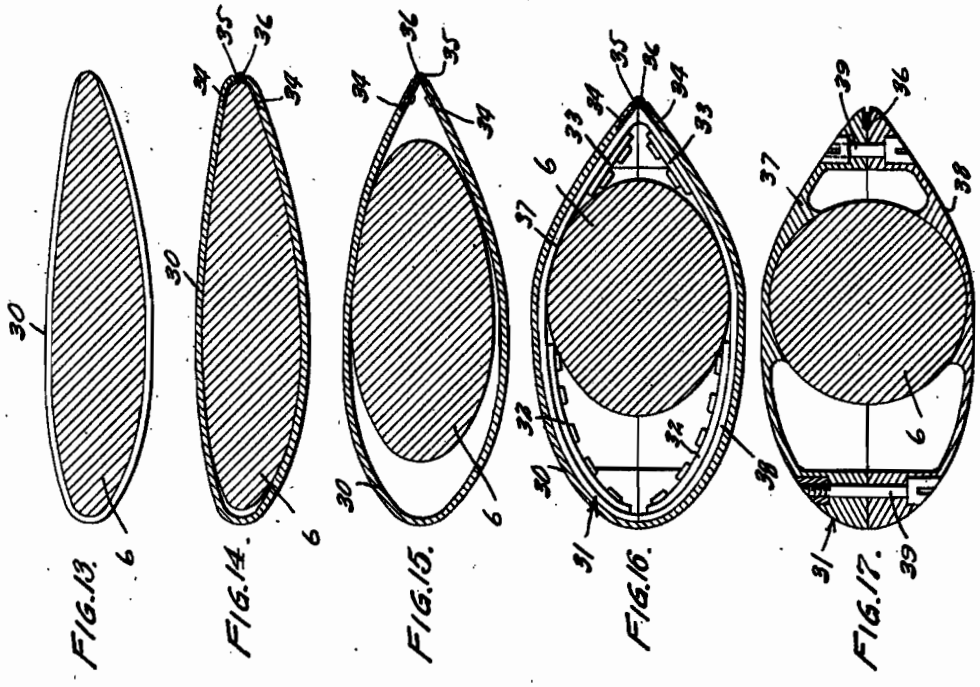


FIG. 13.

FIG. 14.

FIG. 15.

FIG. 16.

FIG. 17.

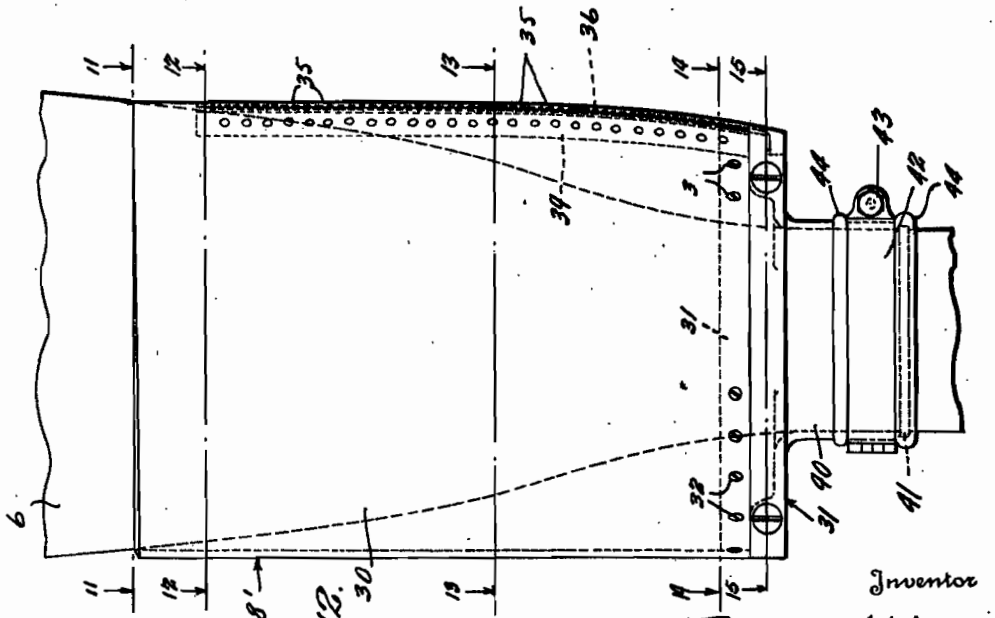


FIG. 12.

Inventor

ROBERT J. WOODS

By Semmes, Keegin & Semmes

Attorneys

Nov. 24, 1942. J. S. McDONNELL, JR Des. 134,426

PURSUIT AIRPLANE

Filed Feb. 18, 1942 2 Sheets-Sheet 1

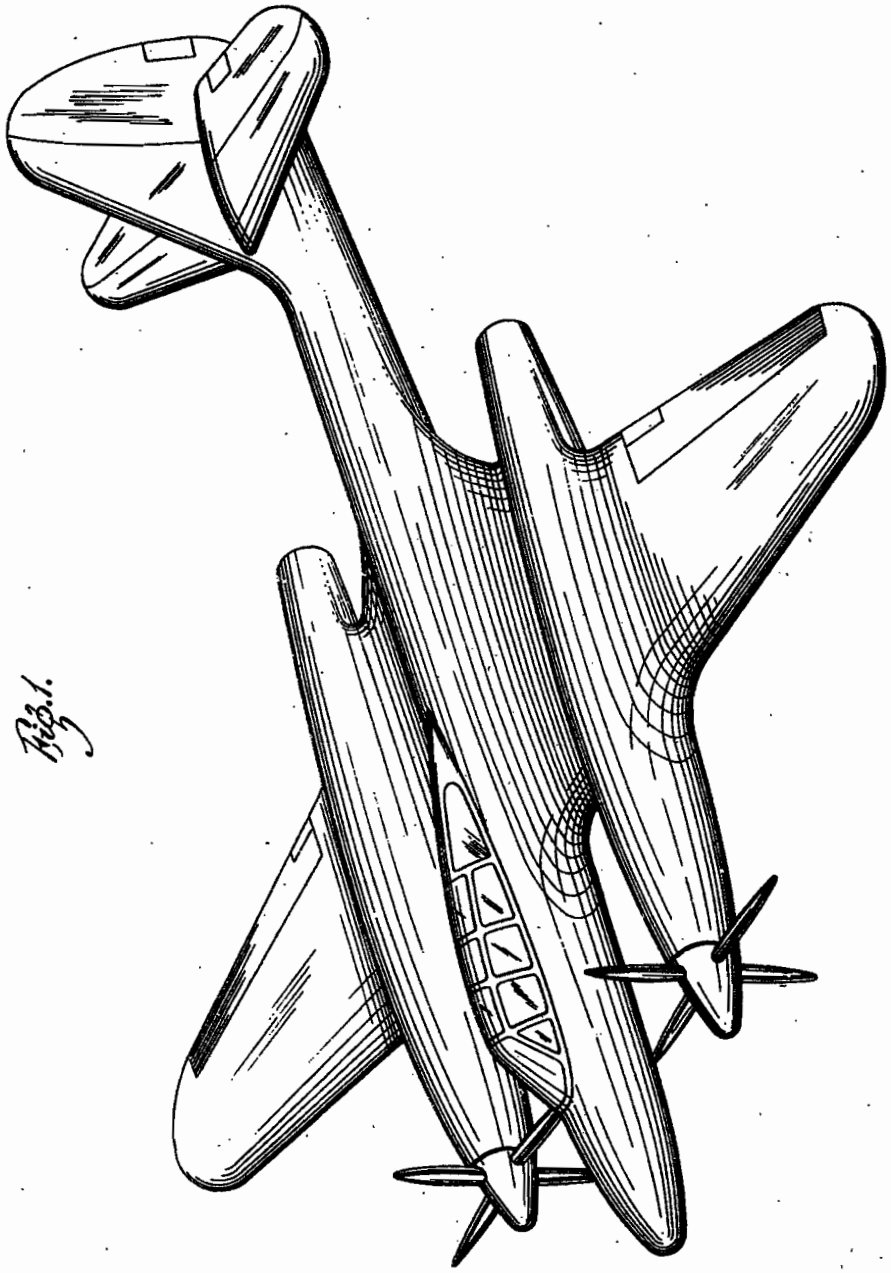


Fig. 1.

INVENTOR:
James S. McDonnell, Jr.,
by Carr Harr Kravely,
HIS ATTORNEYS.

Nov. 24, 1942. J. S. McDONNELL, JR Des. 134,426

PURSUIT AIRPLANE

Filed Feb. 18, 1942 2 Sheets-Sheet 1

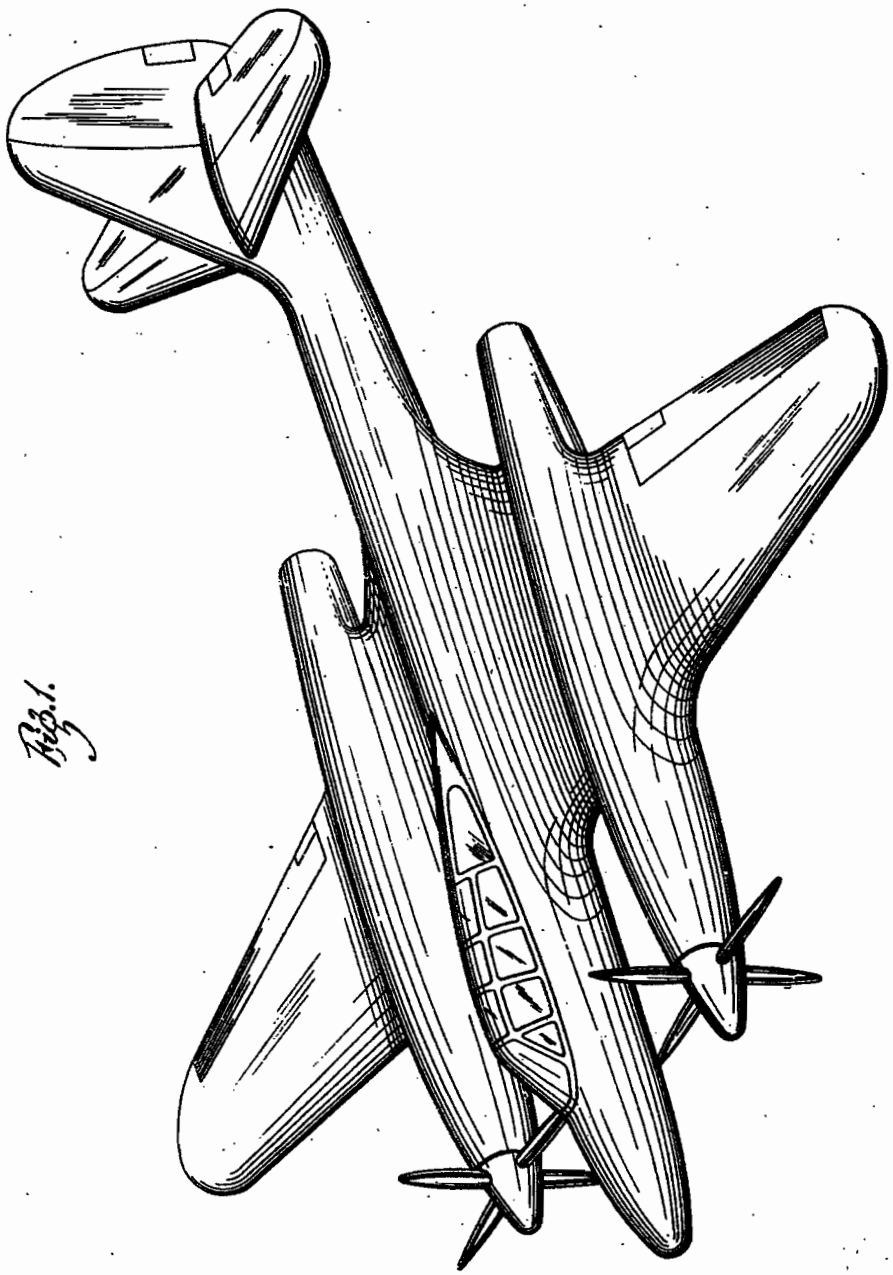


Fig. 1.

INVENTOR:
James S. McDonnell, Jr.,
by Carr Harr Kravely,
HIS ATTORNEYS.

Nov. 24, 1942. J. S. McDONNELL, JR Des. 134,426

PURSUIT AIRPLANE

Filed Feb. 18, 1942 2 Sheets-Sheet 2

Fig. 2.

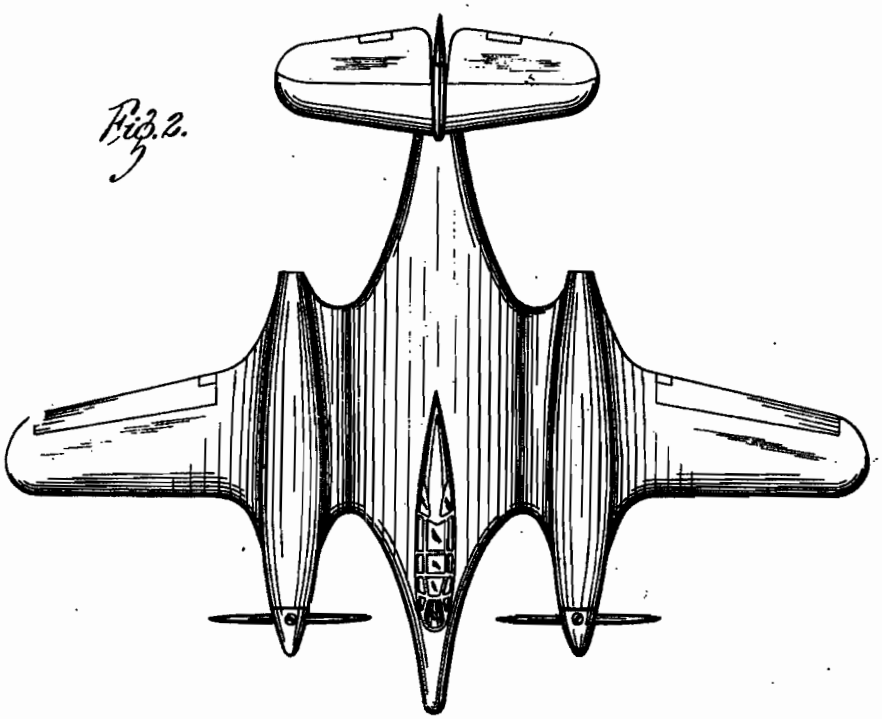


Fig. 3.

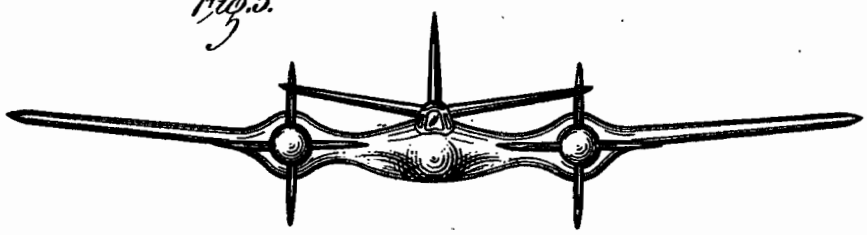
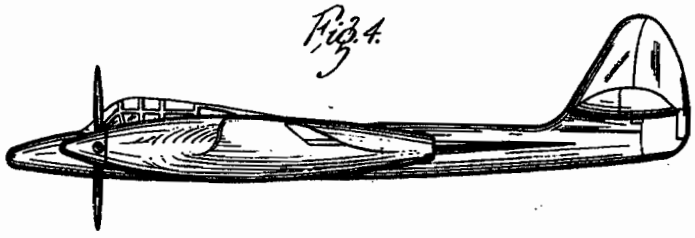


Fig. 4.



INVENTOR:
James S. McDonnell, Jr.,
by Carr Hare Glavely
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE

134,426

DESIGN FOR A PURSUIT AIRPLANE

James S. McDonnell, Jr., Clayton, Mo., assignor to McDonnell Aircraft Corporation, St. Louis, Mo., a corporation of Maryland

Application February 18, 1942, Serial No. 105,859

Term of patent 14 years

To all whom it may concern:

Be it known that I, James S. McDonnell, Jr., a citizen of the United States and a resident of Clayton, in the county of St. Louis and State of Missouri, have invented a new, original, and ornamental Design for a Pursuit Airplane, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof,

Fig. 1 is a top perspective view of a pursuit airplane showing my new design,

Fig. 2 is a top plan view,

Fig. 3 is a front elevational view; and

Fig. 4 is a side elevational view.

I claim:

The ornamental design for a pursuit airplane, substantially as shown.

JAMES S. McDONNELL, JR.

Patented July 14, 1942 2,289,400

UNITED STATES PATENT OFFICE

2,289,400

PROPELLER FAIRING

Robert J. Woods, Grand Island, N. Y., assignor to Bell Aircraft Corporation, Buffalo, N. Y., a corporation of New York

Application March 23, 1939, Serial No. 263,752

11 Claims. (Cl. 170—159)

This invention relates to a device which is designed to be attached to the shank of a propeller blade to give this portion an airfoil section, and more particularly to the combination of this device with a fairing to increase its effectiveness.

At present, propeller manufacturers are usually required to produce propellers the blades of which are airfoil sections only from a radius of approximately two and one-half feet outward. The remaining portion of the blade near its root is cylindrical in shape.

This construction is necessary for the blades of adjustable pitch propellers to give added strength, and is not objectionable where radial engines having a large frontal area are used because the presence of these areas in the slip stream destroys the effectiveness of those portions of the radii of the propeller blades which are positioned in front of the engine. However, where liquid cooled engines and in-line air cooled engines, and particularly engines which are connected to the propeller by an extension shaft, are used, thus reducing the frontal area of the fuselage, the propeller efficiency can be greatly increased by providing blades for the propeller which present an airfoil section throughout their entire length.

One of the objects of my invention is to overcome the above-mentioned disadvantages of the prior art.

Another object of my invention is to provide a device in the form of a cuff which is of airfoil section and which is adapted to be secured on the cylindrical end portion of a propeller blade.

Yet another object of my invention is to provide a cuff of the type described which is made of cast metal and is so molded that it cannot be displaced in relation to the blade by the forces created by the rapid rotation of the propeller.

Still another object of my invention is to provide a cuff of airfoil section which is composed of sheet metal and is so constructed that it cannot be displaced in relation to the blade by the forces created by the rapid rotation of the propeller.

Another object of my invention is to provide a cuff of the type described which is so constructed that when mounted on the blade of a propeller, the effective surface of the propeller will be increased without altering the blade angle.

Still another object of my invention is to provide a fairing which is mounted on the spinner of the propeller assembly and forms a streamlined surface between the said spinner and the cuff mounted on the propeller blade shank in the manner described above.

A further object of my invention is to provide a fairing which is so constructed and positioned that it will continuously provide a streamlined surface between the spinner and a cuff mounted on the shank of the blade of an adjustable pitch propeller throughout the adjustable range of the blade.

With these and other objects in view, my invention embraces the concept of providing a device of airfoil section which is designed to be secured to the shank portion of the blades of propellers in order to increase their effectiveness. A fairing is also provided which forms an airflow surface between the spinner of the propeller assembly and the cuff to prevent turbulence in the airstream adjacent the bottom of the cuff. This fairing is so constructed that when used in combination with the cuff mounted on an adjustable pitch propeller it will present a virtually streamlined surface throughout the range of positions assumed by the adjustable propeller blade.

By the use of my invention, a propeller of increased effectiveness is produced, when engine installation of small frontal areas are used, without reducing the strength of the propeller blades. Moreover, as mentioned previously, my invention can be used with an adjustable pitch propeller.

In the drawings:

Figure 1 is a side elevational view of the forward portion of the fuselage of an airplane showing the engine installation in dotted lines.

Figure 2 is a front view of the propeller shown in Figure 1, disclosing the device which forms one of the features of my invention mounted on each of the propeller blades.

Figure 3 is a projected plan form view partly in section disclosing the construction of one form of cuff which may be used in my invention and the fairing which forms a streamlined surface between the spinner of the propeller assembly and the cuff.

Figure 4 is a vertical, cross-sectional view of the device shown in Figure 3.

Figure 5 is a view taken along the line 5—5 of Figure 3, looking in the direction of the arrows.

Figure 6 is a view taken along line 6—6 of Figure 3, looking in the direction of the arrows.

Figure 7 is a view taken along line 7—7 of Figure 3, looking in the direction of the arrows.

Figure 8 is a view taken along line 8—8 of Figure 3, looking in the direction of the arrows.

Figure 9 is a view taken along line 9—9 of Figure 3, looking in the direction of the arrows.

Patented Nov. 7, 1944 2,362,381

UNITED STATES PATENT OFFICE

2,362,381

AIRCRAFT COWLING CONSTRUCTION

William F. Lawry, Jr., Elkins Park, Pa., assignor to Brewster Aeronautical Corporation, Johnsville, Pa.

Application October 20, 1942, Serial No. 462,718

9 Claims. (Cl. 244—130)

This invention relates to an aircraft cowling designed for enclosing the engine thereof within the fore part of the fuselage or other body portion of the airplane.

Heretofore it has been the practice to provide a hinged door or cowl portion which was lifted to open the engine compartment for engine inspection and repair. Access to the engine compartment was restricted and engine inspection and adjustment made difficult because of the crowded and cramped quarters within the fixed body portion of the cowling.

The primary object of the present invention is to provide a cowling structure for the aircraft engine which will increase the accessibility of the engine to the aircraft mechanic without detracting from the efficiency of the airplane in flight.

The invention further has for its object to provide a sectional encircling cowling which is demountable as a whole for opening the entire engine compartment to inspection from all sides but will nevertheless seat firmly upon and snugly embrace the fuselage in a manner to maintain the streamlined design and the airflow surface of the body for greatest efficiency.

In the drawing:

Fig. 1 is a fragmentary side elevation of an airplane depicting the improved cowling construction, portions of the latter being broken away;

Fig. 2 is a fragmentary cross sectional view taken about on line 2—2 of Fig. 1 through one of the cowl joints and showing the parts in the process of being assembled;

Fig. 3 is a view similar to Fig. 2 but showing the parts in their fully engaged position;

Fig. 4 is a fragmentary inside elevation of the united parts of Fig. 3, a portion of one of the fasteners being in section; and

Fig. 5 is a detailed view of one of the cowl clamps.

Referring more particularly to the drawing, the numeral 1 designates the forward portion of the fuselage which may have a nose portion 2 spaced forwardly therefrom. An engine compartment 3, open on all sides, is provided with annular shoulders or seats 4 which completely encircle the engine compartment and are inset slightly from the outer skin or surface of the aircraft body portion to provide support for the sectional cowling.

The cowling is composed of multiple sections detachably interlocked so that it may readily be dismantled in its entirety to give free access to the entire engine compartment. The number of sections will vary with the diameter of the cowling, the present disclosure showing a top section 5, bottom section 6 and a side section 7, which latter will be duplicated on the opposite side of the fuselage thereby providing a cowling composed of four sections which have their side margins seating on the inset shoulders 4. These sections are interconnected by detachable fasteners in the form of headed studs or buttons 8, located on an edge of one section, fitting in recesses or apertures 9 formed in the abutting edge of an adjacent section. The flexible cowling is preferably secured in position by quickly detachable clamps each of which may consist of a toggle lever 10 pivoted on one end of the cowling and connected by an overcenter link 11 to a hook 12 on the opposite end. By folding the levers to their operative position, within surface pockets 13, the endless flexible cowling will be contracted about the fuselage or body portion and down onto the seats 4 to seal the engine compartment closed.

In order to bring the several joints of the cowling within the body lines of the streamlined fuselage, and flush with the outer surface of the latter against projection into the airstream, means are provided to urge the outlying one of abutting edge portions inwardly to its seat. In accordance with the present disclosure such flushing action is accomplished by a camming face portion 14 provided on the fastener stud 8. This camming face is adapted to initially ride on the adjacent edge portion of its engaged aperture 9, as depicted in Fig. 2, whereupon tightening the flexible cowling it will draw the outer one of the abutting edge portions radially inward and not only flush the two edge portions with each other, as illustrated in Fig. 3, but also with the adjoining fuselage body. After this closing of the joint parts the edge of the aperture will rest against the shank 15 where it will remain beneath the overhanging head shoulder 16 by reason of the tension on the cowling. The apertures 9 may be formed in an offset joint strip 17 carried by one section and designed to underlap the companion section from which the headed studs project inwardly.

From the foregoing it will be observed that the operation of the tensioning means or cowl clamps will not only contract the sections toward their seats 4 but will also adjust the abutting edges of the several sections to lie flush with one another and with the adjoining body portion whereby the outer surface of the cowling will be continuous and practically uninterrupted to air-

Patented Aug. 7, 1945 2,381,350

UNITED STATES PATENT OFFICE

2,381,350

AIRPLANE FAIRINGS

Theodore P. Hall, San Diego, Calif., assignor to Consolidated Vultee Aircraft Corporation, San Diego, Calif., a corporation of Delaware

Application November 8, 1944, Serial No. 562,441

5 Claims. (Cl. 244—130)

The present invention relates to airplane fairings.

In the manufacture or fabrication of an airplane it is customary or standard practice to connect a movable counterbalanced control surface, such as a rudder, to the trailing portion of the forwardly disposed fixed surface of the airplane by means of hinges in the form of hinge brackets which are connected to, and project rearwards from, the fixed surface and extend into notches in the leading portion of the control surface and a pivot rod which is carried by the control surface, extends through holes in the rear ends of the brackets and is disposed rearwards of the leading edge of the control surface. During flight of an airplane having a counterbalanced control surface that is hinged in the aforementioned manner it has been found that when the control surface is deflected or swung for airplane maneuvering purposes eddy currents and turbulences are formed or produced in the region of the notches in the leading portion of the control surface and such currents and turbulences result in pronounced fluttering or buffeting of the control surface.

The primary object of the present invention is to eliminate in connection with an airplane having a counterbalanced control surface with hinge bracket receiving notches in its leading portion, the formation of eddy currents and turbulences adjacent the notches when the surface is deflected or angularly adjusted during a flight maneuver. This object is attained by providing fairings which are located at the sides of the hinge brackets and serve so to fill and streamline the notches in the leading portion of the control surface that when the control surface is deflected the portions or surfaces adjacent the hinge areas present a smooth or streamline contour to the slip stream of the airplane.

Another object of the invention is to provide fairings for airplane hinge brackets which are attached to, and form a part of, the brackets and are so designed and constructed that they effectively and efficiently fulfill their intended purpose.

Other objects of the invention and the various advantages and characteristics of the present airplane hinge bracket fairings will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like letters and numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a perspective of an airplane empennage having rudder supported hinge brackets with fairings embodying the invention;

Figure 2 is an enlarged vertical section taken on the line 2—2 of Figure 1 and showing in detail the construction and arrangement of one of the fairing-equipped hinge brackets;

Figure 3 is a perspective of the hinge bracket shown in Figure 2;

Figure 4 is an enlarged horizontal section taken on the line 4—4 of Figure 1 and illustrating in detail the manner in which the fairings at the sides of the hinge brackets so fill and streamline the notches in the leading portion of the rudder that when the rudder is deflected the portions or surfaces adjacent the hinge areas present a smooth and streamline contour to the slip stream of the airplane and hence eliminate eddy currents and turbulences adjacent the notches and resultant fluttering or buffeting of the rudder; and

Figure 5 is an enlarged side view of the bracket that is shown in Figures 2, 3 and 4.

The invention is exemplified in connection with an airplane A having a fuselage a and an empennage at the rear end of the fuselage. As shown in Figure 1 of the drawings, the empennage comprises an upstanding vertical fin a^1, a rudder a^2, a horizontal stabilizer a^3, and a pair of elevators a^4. The horizontal stabilizer projects outwards in both directions from the rear end of the fuselage a and has the elevators a^4 pivotally connected to its trailing portion, as well understood in the art. The vertical fin a^1 is connected to, and projects upwards from, the upper portion of the rear end of the fuselage and has its trailing portion substantially straight, although forwardly bulged or arcuate in cross section. The rudder a^2 is disposed directly behind the vertical fin and is of the counter balanced variety. It has a control tab a^5 at its trailing edge and is pivotally connected to the trailing portion of the vertical fin by a plurality of hinges 6 in order that it is capable of swinging laterally or horizontally. The central and rear portions of the rudder are rearwardly tapered and the front portion of the rudder is transversely rounded or curved.

The hinges 6 are shown as being four in number although more or less may be employed, de-

March 21, 1939. W. E. LOONEY 2,151,128

AIRPLANE

Filed Jan. 8, 1937 3 Sheets-Sheet 1

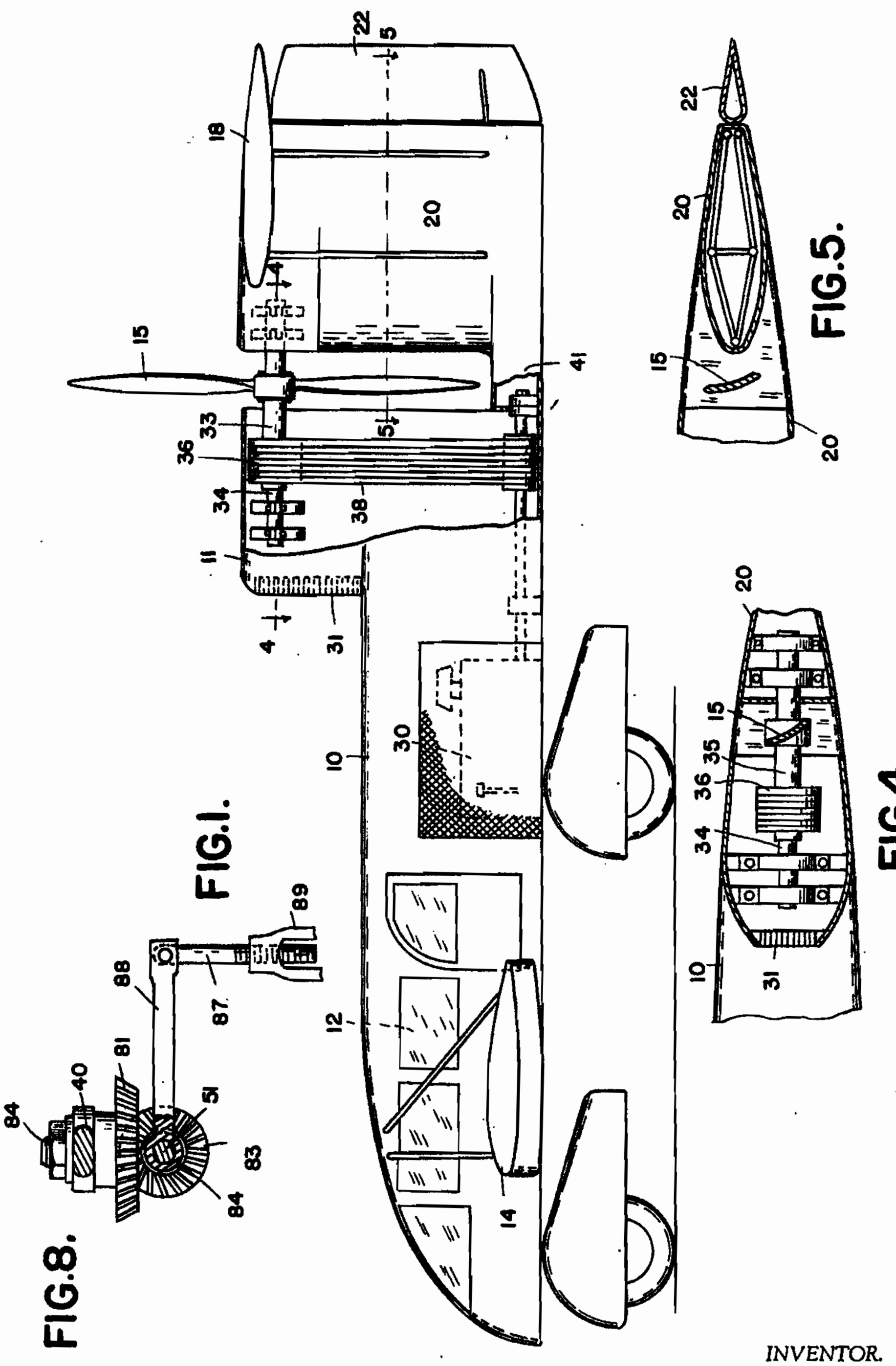


FIG.1. FIG.4. FIG.5. FIG.8.

INVENTOR.

WILLIAM E. LOONEY

BY

Swan, Toye, Hardesty

ATTORNEYS

Dec. 9, 1930. D. W. DOUGLAS 1,784,784

AMPHIBIAN PLANE

Filed April 23, 1927 3 Sheets-Sheet 1

Fig. 1.

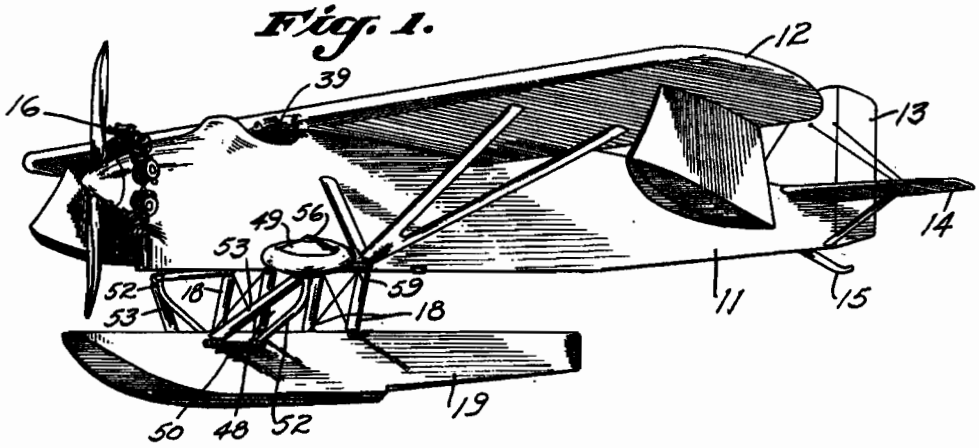


Fig. 2.

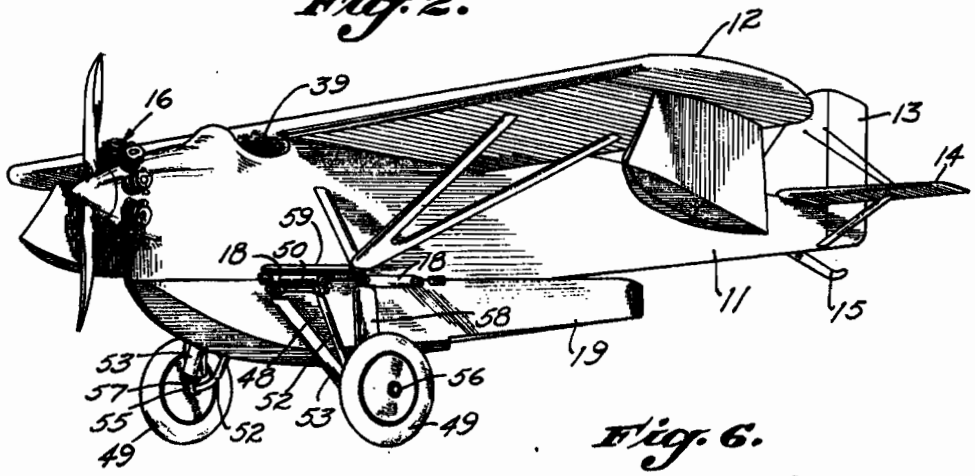
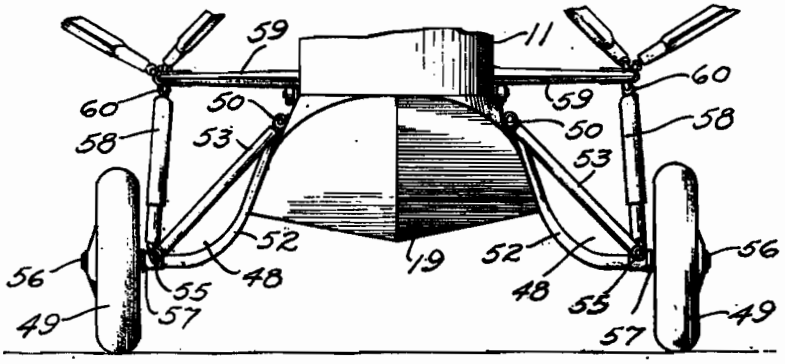


Fig. 6.



INVENTOR.
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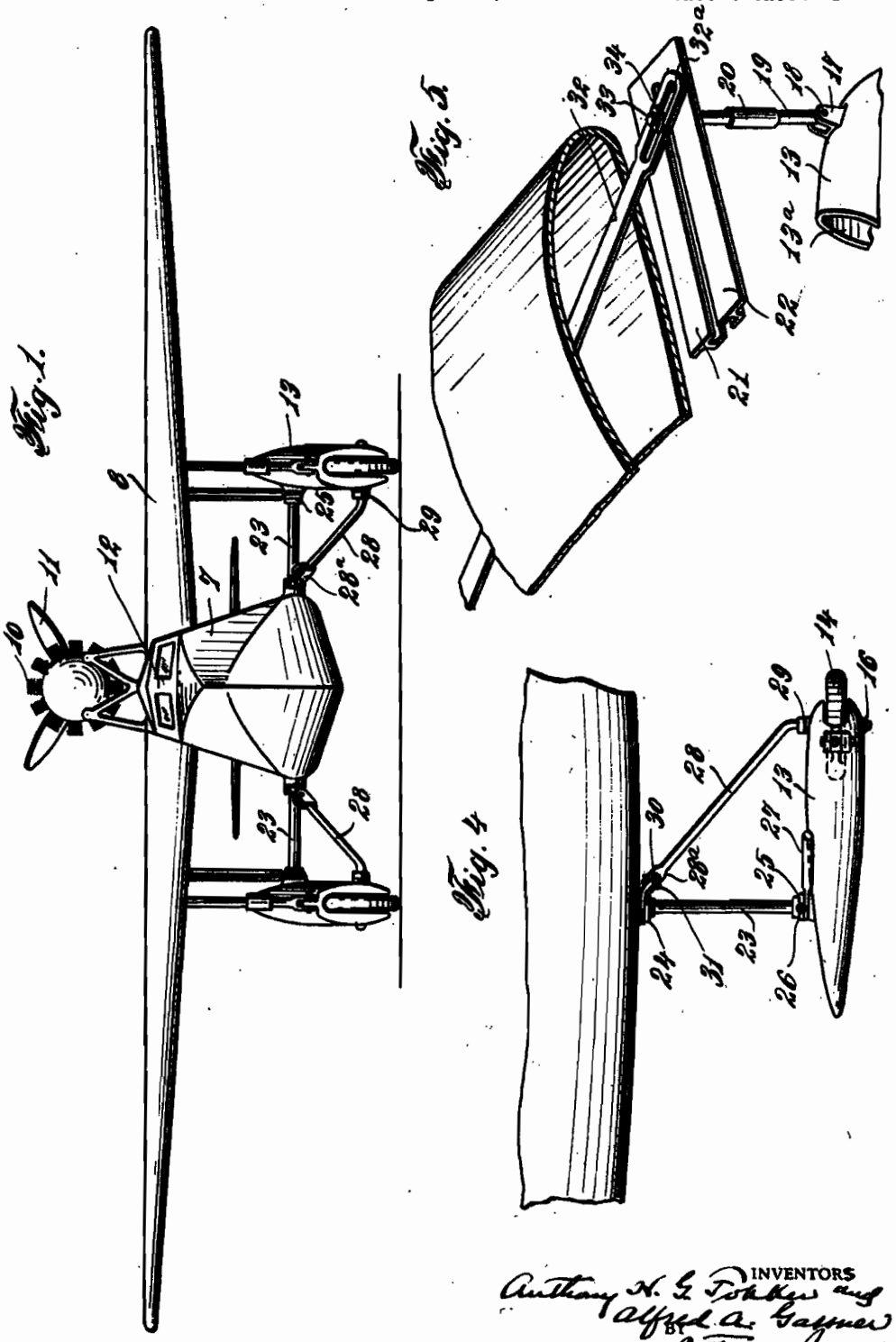
June 17, 1930. A. H. G. FOKKER ET AL 1,765,329

AMPHIBIAN AIRCRAFT

Filed Sept. 27, 1928 2 Sheets-Sheet 1



Anthony H. G. Fokker and Alfred A. Gaynes INVENTORS

By P. Frank Sumek ATTORNEY

Oct. 1, 1929. J. H. KINDELBERGER 1,729,878

AMPHIBIAN AIRPLANE

Filed June 1, 1927 2 Sheets-Sheet 1

Fig. 1.

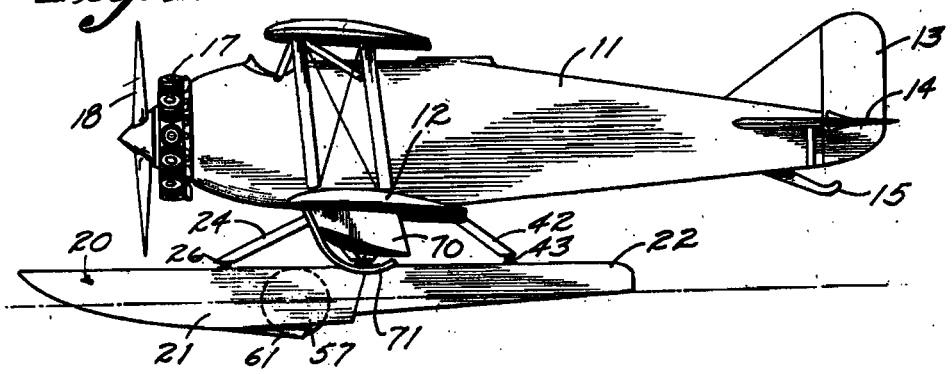


Fig. 2.

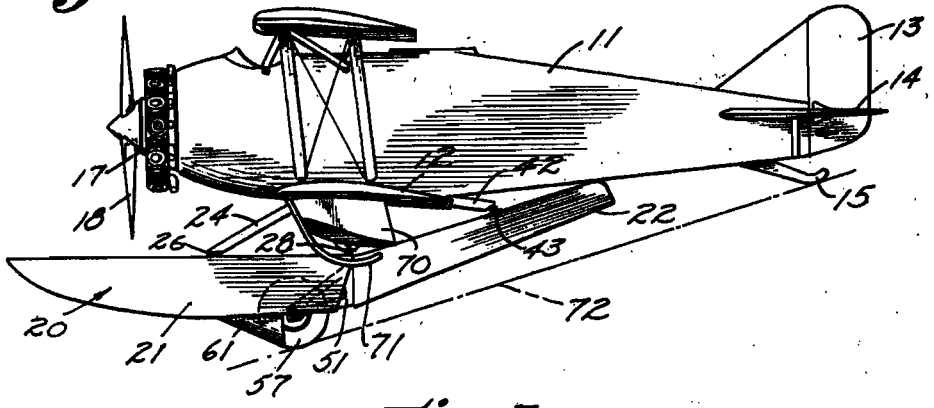


Fig. 3.

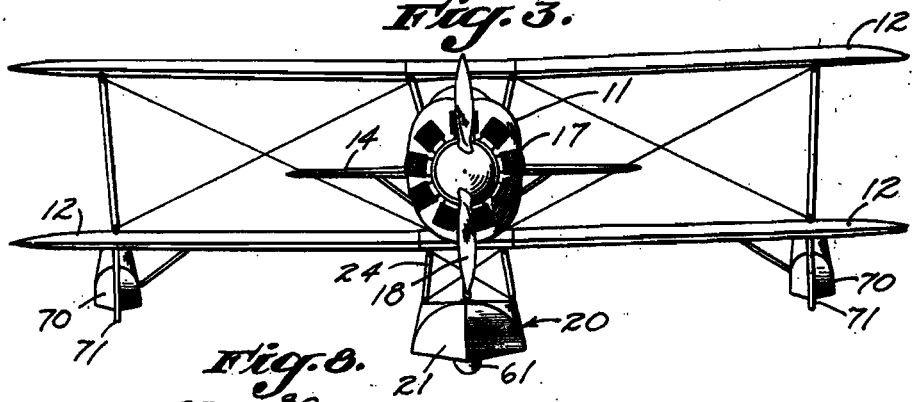
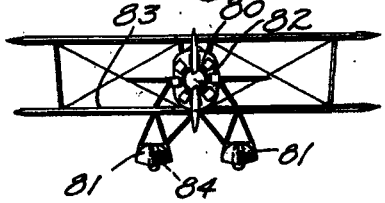


Fig. 8.



INVENTOR.
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Oct. 1, 1929. J. H. KINDELBERGER 1,729,878

AMPHIBIAN AIRPLANE

Filed June 1, 1927 2 Sheets-Sheet 2

Fig. 4.

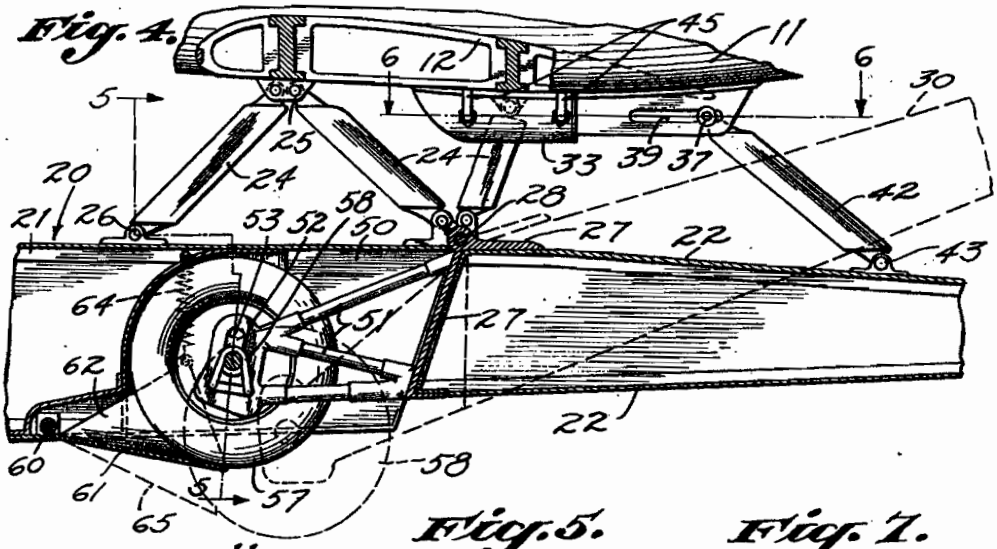


Fig. 5.

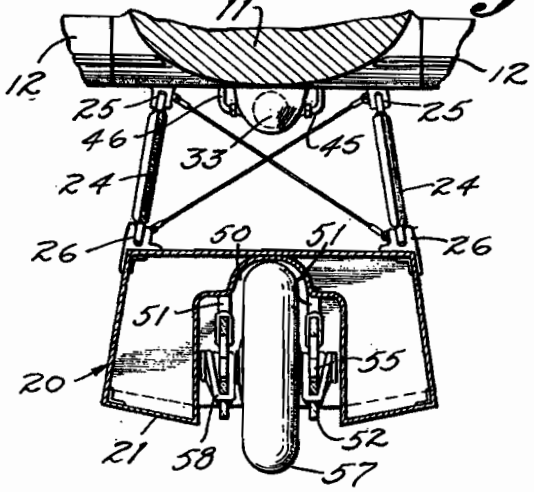


Fig. 7.

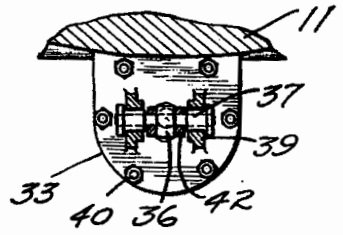
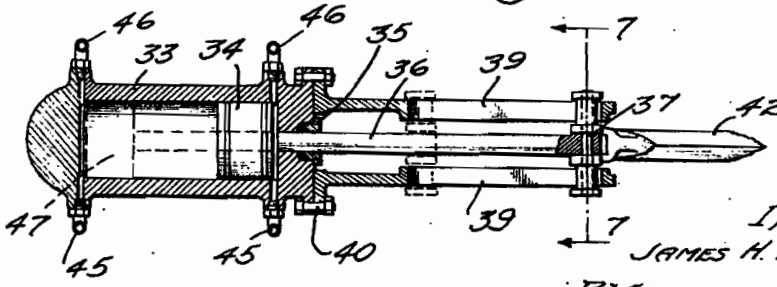


Fig. 6.



INVENTOR.
JAMES H. KINDELBERGER
BY
Ford Harris
ATTORNEY.

Patented Oct. 1, 1929 1,729,878

UNITED STATES PATENT OFFICE

JAMES H. KINDELBERGER, OF SANTA MONICA, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO DOUGLAS AIRCRAFT COMPANY, INC., OF LOS ANGELES, CALIFORNIA, A CORPORATION OF DELAWARE

AMPHIBIAN AIRPLANE

Application filed June 1, 1927. Serial No. 195,635.

My invention relates to amphibian airplanes, and has for one of its objects to provide an amphibian airplane which can be easily and quickly converted from a land-plane into a seaplane, or vice versa.

It is also an object of the invention to provide an amphibian airplane of this nature in which the converting of the airplane from a land-plane into a seaplane and vice versa is accomplished by moving a portion of the water landing-gear of the airplane.

Another object of this invention is to provide an amphibian airplane of this character in which an operating mechanism provides an air-cushion for one of the landing-gears.

Other objects and advantages of the invention will be made evident in the following description.

In the accompanying drawings which will be referred to,

Fig. 1 is an elevation of the invention with the landing-gears in position to alight on the water.

Fig. 2 is an elevation similar to Fig. 1 but having the landing-gears in position to alight on land.

Fig. 3 is a front elevation of Fig. 1.

Fig. 4 is an enlarged fragmentary view through the landing-gear structure showing the details thereof.

Fig. 5 is a section taken on the line 5—5 of Fig 4.

Fig. 6 is a section taken on the line 6—6 of Fig. 4.

Fig. 7 is a section taken on the line 7—7 of Fig. 6.

Fig. 8 is a front elevational view of an alternative form of the invention.

Referring to the drawings in detail and particularly to Figs. 1 to 3 inclusive, the airplane embodying the features of this invention has a fuselage 11, airfoils 12, a rudder 13, an elevator 14, a tail-skid 15, a motor 17, and a propeller 18. The parts just enumerated comprise the main structure of the airplane and may be built substantially in accordance with general airplane construction. The different parts are provided with suitable struts and other bracings.

In the form of the invention now being described, a water landing-gear in the form of a pontoon 20 is disposed below the fuselage 11. The pontoon 20 consists of a front stationary part 21 and a back movable part 22. As illustrated best in Fig. 4, the stationary part 21 is rigidly secured to the lower part of the fuselage 11 by struts 24, these struts 24 being connected to the fuselage 11 by brackets 25 and to the stationary part 21 by brackets 26. The movable part 22 of the pontoon 20 is provided with a pivot-bracket 27 which is pivoted on a pivot-shaft 28, the pivot-shaft 28 being secured at the back end of the stationary part 21 at the upper edge thereof. Full lines in Fig. 4 show the movable part 22 in alighting position, and dotted lines 30 show it in retracted position. The movable part 22 is moved between the two positions illustrated in Fig. 4 by mechanism which will now be described.

Secured preferably to the lower part of the fuselage 11 is a cylinder 33 in which a piston 34 is adapted to be reciprocated. Extending from the piston 34 through a stuffing-box 35 is a rod 36. The rod 36 has at its outer end a cross-head 37 which operates in guides 39, these guides 39 being secured to the cylinder 33 by bolts 40 or, if desired, they may be secured directly to the fuselage. Pivoted to the cross-head 37 or the rod 36 is an arm 42, this pivoted end of the arm 42 being located between the guides 39. The lower end of the arm 42 is pivoted by a bracket 43 to the upper portion of the movable part 22 of the pontoon 20. Compressed air may be supplied to the opposite ends of the cylinder 33 by supply-pipes 45 and withdrawn therefrom by exhaust-pipes 46. Suitable means, not shown, may be provided in the airplane whereby compressed air may be supplied to one end of the cylinder 33 so as to force the piston from the position shown in full lines in Fig. 6 into the position indicated by dotted lines 47. At this time the exhaust-line 46 at the opposite end of the cylinder 33 should be opened. When the piston is in the position shown in full lines in Fig. 6, the movable part of the pontoon is retained in the position shown in full lines in Figs. 1 and 4, and

when the piston is moved into dotted line position 47, the pontoon is moved into the position shown by full lines in Fig. 2 and by dotted lines 30 in Fig. 4.

As illustrated best in Figs. 4 and 5, the rear end of the stationary part of the pontoon 20 is provided with a chamber 50 which is open at the back and at the bottom. Carried by the movable part of the pontoon 20 are frames 51. These frames 51 may be secured to the pivot-bracket 27, if desired. The frames 51, when the movable part is in the position shown by full lines in Figs. 1 and 4, extend forward into the chamber 50. The forward ends of the frames 51 are provided with plates 52 having vertical slots 53. Carried in the vertical slots 53 is a horizontal shaft 55 which supports a land landing-gear in the form of a wheel 57 between the frames 51. Rubber-band shock-absorbers 58 are provided for absorbing the shocks when alighting upon land. When the movable part 22 of the pontoon is moved into the position shown in Fig. 2 by full lines and in Fig. 4 by dotted lines 30, the wheel 57 is moved into the position shown by full lines in Fig. 2 and by dotted lines 58 in Fig. 4. It will be seen that at this time the wheel projects a sufficient distance below the pontoon 20 so that the pontoon 20 cannot engage the surface of the ground. Pivoted at 60 to the lower part of the stationary part 21 immediately in front of the chamber 50 is a deflector 61. The deflector 61 has sides 62 which extend upward into the chamber 50 near the side walls thereof. A coil-spring 64 is connected to the sides 62 and to the stationary part 21 of the pontoon 20 for the purpose of retaining the deflector against the wheel 57. When the wheel 57 is in the position shown in full lines in Fig. 4, the deflector 61 rests in full line position. When the wheel 57 is in the position indicated by dotted lines 58 in Fig. 4, the deflector is moved into dotted line position 65. The purpose of this deflector is to keep water from rushing into the chamber 50 when the airplane is landing on water. The friction of the deflector 61 against the wheel 57 is not great enough to cause any damage when the wheel is rotated when alighting on land.

The complete operation of the invention is as follows:

When it is desired to alight on the water, the movable part 22 of the pontoon 20 is in the position shown in Fig. 1. The wheel 27 is at this time almost entirely within the chamber 50, and the deflector 61 is in the position shown in Figs. 1 and 4 so that the water will be kept from rushing into the chamber 50. In view of the fact that only a single central pontoon and landing-wheel 57 are provided in this form of the invention, the airfoils 12 are provided with floats 70 and wing-skids 71 which prevent the airfoils from engaging the water when landing on water and engaging the land when alighting on land.

When it is desired to alight on land, the operating mechanism is actuated in the pilot's or the observer's cock-pit so that compressed air is supplied to the right end of the cylinder 33 which moves the piston from full line position into dotted line position 47. This action swings the movable part 22 of the pontoon 20 into the position shown by full lines in Fig. 1 and into dotted line position 30 in Fig. 4. The wheel 57 is at this time automatically swung downward from its retracted position in the chamber 50 to alighting position. The movable part 22 of the pontoon 20 swings upward so that it cannot possibly engage the ground. By referring to Fig. 2 it will be seen that the movable part 22 rests well above a straight line 72 drawn from the portions of the wheel 57 and the tail-skid 15 which engage the ground. The deflector 61 at this time is swung downward with the wheel 57 but does not in any way interfere with its operation. The rubber-band shock-absorbers 58 take the shock of landing on the ground, and in addition to this the compressed air in the cylinder 33 also takes some of the shock so that the other parts of the airplane will be relieved of jars. It will be seen from the drawings that an upward pressure on the wheel tends to pull the piston 34 in a rearward direction against the compressed air in the cylinder 33.

My invention may also be incorporated in other types of airplane; for example, in Fig. 8 I show an airplane 80 having a pair of pontoons 81 which are placed on opposite sides of the fuselage 82 of the airplane 80 and below airfoils 83. These pontoons 81 are formed in accordance with the pontoon 22 and carry wheels 84 shown by dotted lines in Fig. 8. The operation of the landing-gears is the same as in the other form of the invention and the movable parts of the two pontoons 81 are operated in synchronism.

Although I have shown the mechanism for operating the landing-gears in the form of a piston operated by fluid under pressure, it should be understood that other suitable operating means may be substituted.

I claim as my invention:

1. An amphibian airplane comprising: a main structure; a water landing-gear supported by said main structure, said water landing-gear having a stationary part and a movable part pivoted thereto; a land landing-gear carried by said movable part, said land landing-gear being adapted to rest in a chamber of said stationary part when said land landing-gear is in retracted position; an arm connected to said movable part; a piston connected to said arm; means providing a cylinder in which said piston operates; means for supplying compressed gas to said cylinder; and a deflector pivoted to said stationary part

for preventing water from rushing into said chamber.

2. An amphibian airplane comprising: a main structure; a water lading-gear supported by said main structure, having a stationary and a movable part, said movable part pivoting on an axis extending at right angles to the line of flight; a land landing-gear carried by said movable part and resting in a chamber of said stationary part when in retracted position; means for moving said movable part and said land landing-gear in order to move said land landing-gear from retracted into alighting position; and a deflector pivoted to said stationary part and extended below said chamber for preventing water from turbulently rushing into said chamber.

3. An amphibian airplane comprising: a main structure; a water landing-gear supported by said main structure, having a stationary and a movable part, said movable part pivoting on an axis extending at right angles to the line of flight; a land landing-gear carried by said movable part and resting in a chamber of said stationary part when in retracted position; means for moving said movable part and said land landing-gear in order to move said land landing-gear from retracted into alighting position; a deflector pivoted to said stationary part and extended below said chamber for preventing water from turbulently rushing into said chamber; and resilient means for holding said deflector against said land landing-gear.

4. An amphibian airplane comprising: a main structure; a stationary pontoon-part having a chamber at the back end; a land landing-gear pivoted near the back end of said pontoon-part and adapted to rest in said chamber; means for moving said land landing-gear into alighting position; and a deflector pivoted to said pontoon-part for preventing water from turbulently rushing into said chamber.

5. An amphibian airplane comprising: a main structure; a water landing-gear supported by said main structure, said water landing-gear comprising a pontoon unit transversely split to provide longitudinally adjacent front and rear pontoon sections hingedly connected at the upper portion of the split with the axis of said hinge disposed parallel to the plane of said split; a land landing-gear carried by one of said pontoon sections and resting in a chamber in the other of said pontoon sections when in retracted position; and means for elevating the free end of said one pontoon section from position of use to retracted position to project the land landing-gear from retracted position to alighting position, and for reversely lowering the free end of said one section to position of use to elevate said land landing-gear to retracted position within said chamber, the elevating hinge movement of said one pontoon section opening said split and the lowering hinge movement thereof closing said split to insure unbroken pontoon side walls in the region of the split when the pontoon sections are in condition for use.

6. An amphibian airplane comprising: a main structure; a water landing-gear supported by said main structure, said water landing-gear comprising a pontoon unit transversely split to provide longitudinally adjacent front and rear pontoon sections hingedly connected at the upper portion of the split with the axis of said hinge disposed parallel to the plane of said split; a land landing-gear carried by one of said pontoon sections and resting in a chamber in the other of said pontoon sections when in retracted position; means for elevating the free end of said one pontoon section from position of use to retracted position to project the land landing-gear from retracted position to alighting position, and for reversely lowering the free end of said one section to position of use to elevate said land landing-gear to retracted position within said chamber, the elevating hinge movement of said one pontoon section opening said split and the lowering hinge movement thereof closing said split to insure unbroken pontoon side walls in the region of the split when the pontoon sections are in condition for use; and a deflector for preventing water from turbulently rushing into said chamber.

7. An amphibian airplane comprising: a main structure; a water landing-gear supported by said main structure, said water landing-gear comprising a pontoon unit transversely split to provide longitudinally adjacent front and rear pontoon sections hingedly connected at the upper portion of the split with the axis of said hinge disposed parallel to the plane of said split; a land landing-gear carried by one of said pontoon sections and resting in a chamber in the other of said pontoon sections when in retracted position; shock absorbing means for elevating the free end of said one pontoon section from position of use to retracted position to project the land landing-gear from retracted position to alighting position, and for reversely lowering the free end of said one section to position of use to elevate said land landing-gear to retracted position within said chamber, the elevating hinge movement of said one pontoon section opening said split and the lowering hinge movement thereof closing said split to insure unbroken pontoon side walls in the region of the split when the pontoon sections are in condition for use.

8. A landing-gear for an amphibian airplane, said landing-gear comprising: a pontoon unit transversely split to provide longitudinally adjacent front and rear pontoon sections hingedly connected at the upper por-

tion of the split with the axis of said hinge disposed parallel to the plane of said split; and a land landing-gear carried by one of said pontoon sections and resting in a chamber in the other of said pontoon sections when in retracted position so that upon elevation of the free end of said one pontoon section from position of use to retracted position the land landing-gear will be projected from retracted position to alighting position, and reversely, when the free end of said one pontoon section is lowered to position of use in longitudinal alignment with the other of said pontoon sections, the land landing-gear will be elevated into said chamber to retracted position, said split being opened when said one pontoon section is retracted and the land landing-gear is in use and closed when the land landing-gear is retracted and the said one pontoon section is lowered into longitudinal alignment with the other pontoon section so as to insure unbroken pontoon side walls in the region of the split when the pontoon sections are in condition for use.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 27th day of May, 1927.

JAMES H. KINDELBERGER.

March 3, 1931. M. WATTER 1,794,814

AEROPLANE

Filed March 20, 1928 3 Sheets-Sheet 1

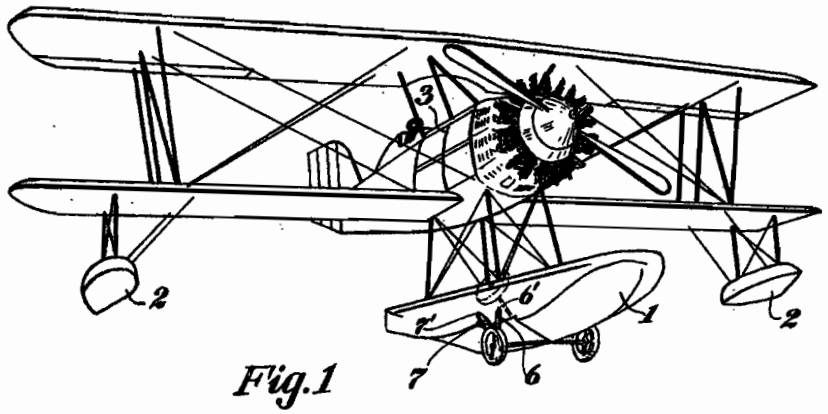


Fig. 1

Fig. 2a

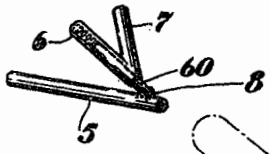
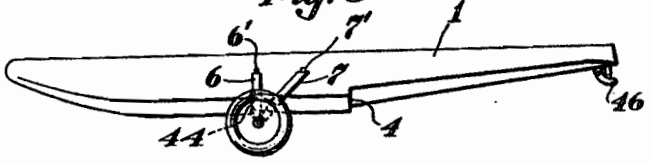


Fig. 2

Fig. 8



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AEROPLANE

Filed March 20, 1928 3 Sheets-Sheet 2

Fig. 3

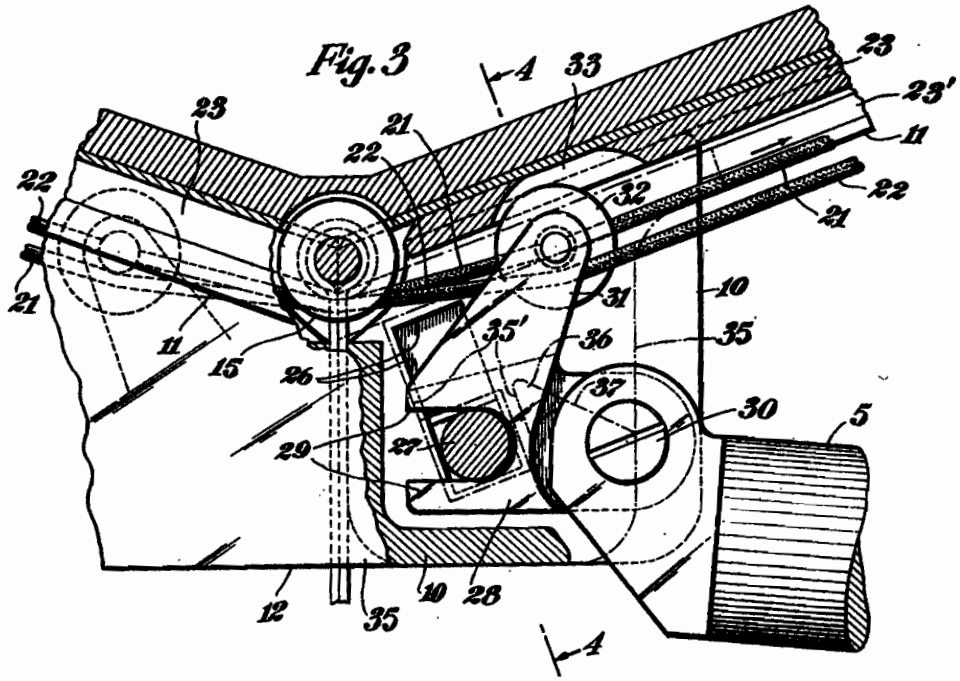


Fig. 4

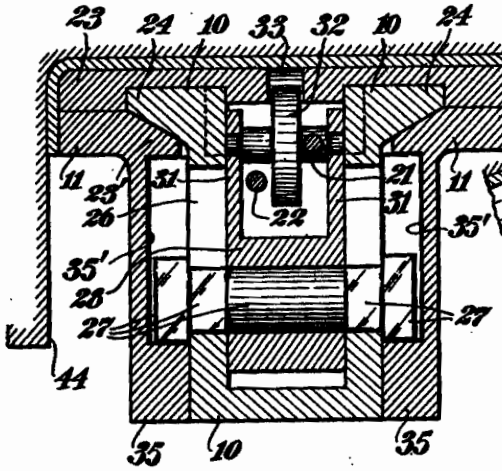
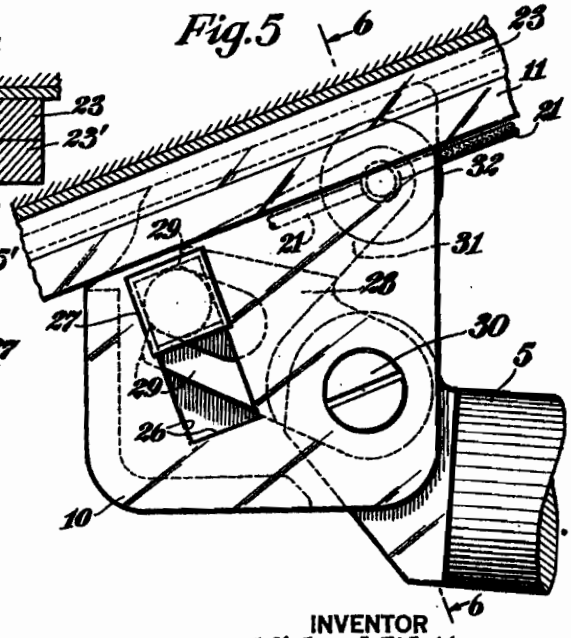


Fig. 5



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AEROPLANE

Filed March 20, 1928 3 Sheets-Sheet 3

Fig. 6

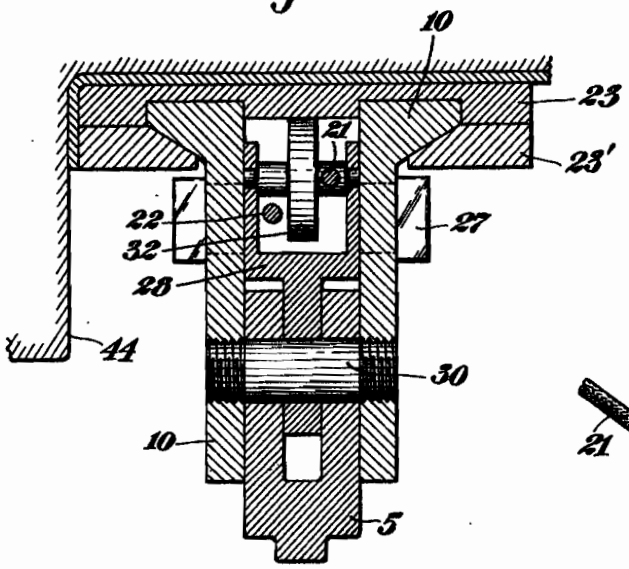
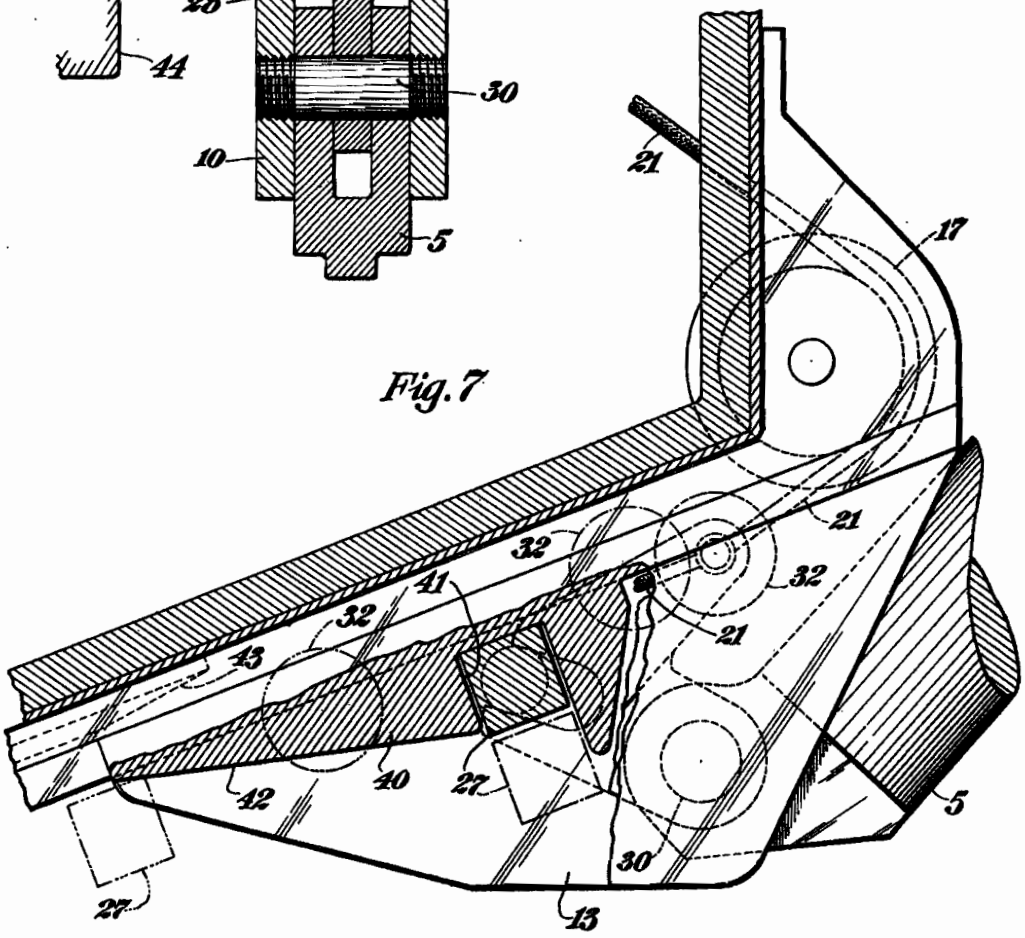


Fig. 7



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Patented Mar. 3, 1931 1,794,814

UNITED STATES PATENT OFFICE

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AEROPLANE

Application filed March 20, 1928. Serial No. 263,069.

This invention relates to aircraft and particularly to aeroplanes of the amphibian type. The object of the invention is a retractable landing gear which is so constructed and associated with the floating structure of a hydroaeroplane or flying boat that it may be retracted or lowered with marked facility while in flight. A further object of the invention is a landing gear of this general character including a mounting and operating mechanism which is characterized by its simplicity in construction and operation, and which may be mounted upon the floating structure with a minimum of modification of the standard float or boat, such for example as a float or boat of the V bottom type. More particularly I have devised a retractable landing gear which is attached directly to the keel structure of the boat, and preferably to the side at a point or points above the chine, in such manner that the gear may be lifted and lowered by moving the connection with the keel structure laterally thereof between the keel and the chine.

For a better understanding of the invention, reference may be had to the accompanying drawings forming a part of this application wherein—

Fig. 1 illustrates an aeroplane embodying my invention,

Fig. 2 is a rear view of the floating structure and associated landing gear with parts of the craft removed for convenience in illustration,

Fig. 2*a* is a detail of the strut connections, showing the shock absorber,

Fig. 3 is a detailed view,

Fig. 4 is a sectional view along the line 4—4 of Fig. 3,

Fig. 5 is a view corresponding to Fig. 3 showing the parts in a different position,

Fig. 6 is a view along the line 6—6 of Fig. 5,

Fig. 7 is a view corresponding to Figs. 3 and 5 in still another position of the mechanism, and

Fig. 8 is a side view of the float and landing gear.

Referring to the drawings, I have indicated my invention as embodied in a hydroaeroplane having a central floating structure 1 and having wing tip balancing floats 2, the floating structure 1 being disposed beneath the fuselage or main body 3 of the craft. The float structure 1 is indicated as having a standard step 4 in the bottom thereof. The landing gear includes a wheeled axle 5 on each side of the central floating structure 1 and each axle is connected to the float by means of a pair of struts 6 and 7 arranged in the form of a V and pivotally connected to the axle 5 near its outer end at the point 8. These struts 6 and 7 diverge upwardly from the lowered position of the landing gear and are pivotally connected at the fore and aft alined points 6′ and 7′ to the side of the floating structure, preferably above the chine 9, one of these struts, as for example the forward strut 6, being of the shock absorber type or containing a yielding spring mechanism. In the lowered position of the landing gear the inner ends 5′ of the axles are rigidly connected to the bottom of the float at a point or points between the chines, preferably to the keel structure, but the construction and arrangement is such as to permit the outward movement of the ends 5′ which results, as indicated in Fig. 2, in the elevating of the wheels about the pivot points 6′ and 7′. In the particular embodiment shown the inner ends of the wheeled axles 5 are rigidly connected to the bottom of the float near the center line thereof, as for example to the keel structure, by means of the intermediate slide blocks 10. These slide blocks 10 are adapted to travel in runways 11 secured to the V float bottom and are lockable in their limiting positions as for example to the keel structure and to the sides or chine structures in any suitable manner. I have indicated diagrammatically in Fig. 2 a means 12 for locking the slide blocks 10 to the keel structure and means 13 for locking them to the chine structures of the V bottom. Each wheeled axle 5 is pivoted to the slide block 10 as indicated for vertical pivotal movements and upon the outward movement of the slide block along its runway 11 the wheel and its axle is lifted to the elevated position as indicated in Fig. 2 by the strut 6 and 7 pivoting about the longitudinal axis 6′, 7′. I have indicated

the blocks as movable by means of a system of cables, each block having two cables attached thereto or having the ends of a single cable attached thereto, which cable passes over the pulleys 15, 16, 17, 18 and 19 and these cables are operable by a windlass 20 or any other suitable means whereby the operator or pilot may simultaneously actuate the slide blocks 10 to move them outwardly along the runways or inwardly to lock them rigidly to the central bottom structure or keel structure. In Fig. 2 the cable having its ends attached to the right hand slide block is indicated at 21, while the cable attached to the left hand slide block 10 is indicated at 22.

I have indicated diagrammatically in Fig. 2 the structure and control arrangement of the amphibian and in Figs. 3–7 I have indicated in more or less detail one embodiment of the slide block 10, the runway 11 and the means for locking the slide block at the ends of its travel, but it is understood that these parts may assume other forms than those particular ones illustrated. Referring to these drawings, the carriage or slide block 10 is provided with the beveled feet or base 24 which slide in correspondingly shaped transverse grooves or guide ways formed in the bottom of the floating structure or in the runway 11 secured to the bottom of the floating structure. This runway 11 may be conveniently formed by means of a bottom plate 23 and side rails 23′ secured thereto, the plate 23 having grooves formed therein and the rails being beveled off to accommodate the beveled off feet 24 of the slide block connection or carriage. The slide block 10 is provided with a transverse slot or guide 26, this slot being slightly inclined to the vertical or at right angles to the bottom. This slot serves as a runway or guide for a locking pin or bolt 27. The locking bolt 27 is movable up and down in the guide way 26 and is actuated by a bell crank lever 28, this lever having a fork 29 straddling the intermediate portion of the locking pin 27 and being pivoted at 30 to the slide block on the pivotal axis of the axle 5. The lever 28 has an arm 31 projecting from the fork 29 and this arm carries a roller 32 which, in any other position but the operative lowered position of the axle 5, engages the bottom of the boat structure or rather the plate 23 and tilts the fork 29 into a position to hold the locking pin 27 in the upper part of the guide 26 (Fig. 5). In the locked lowered position, however, this roller 32 enters a recess 33 formed in the bottom of the boat or plate 23 and this permits the locking bolt 27 to drop or be carried to the bottom of its guide. Rigidly fixed to the central bottom or keel structure of the boat is a double bracket 35, indicated as integral with rails 23′ and depending down therefrom, this bracket having formed on its inner sides grooves 35′ registering with the guide ways 26 for the accommodation of the heads of the locking bolt 27 and also on either side there is a keeper 36 with a beveled off front edge 37, permitting the locking bolt heads to pass over into the grooves 35′ for engagement with the keepers. The keepers 36 firmly and rigidly hold the slide block 10 in the innermost position. The free ends of the cable 21 are attached to the end of the arm carrying the roller 32, as for example to the axle of the roller 32, and by pulling upon the cable 21 to the right, as indicated by the arrow in Fig. 3, the first movement results in the tilting of the bell crank lever 31 to lift the locking bolt 27 from engagement with the keepers 36 and above the lever thereof, whereupon the carriage or slide block 10 is then free to be moved outwardly to elevate the landing gear, Fig. 5 indicating an intermediate position. This movement is continued until the locking mechanism 13 near the float chine is reached, whereupon the slide block is automatically locked in this position. This locking mechanism includes a double bracket 40 fastened to the float bottom at the chine, straddling the slide block 10 and containing transverse recesses 41 in their inner ends parallel to the guide way 26 in the slide block 10 which rectangular recesses 41 are adapted to receive the squared ends of the locking bolt 27. In advance of the recesses 41 the bracket member 40 is provided with the cam surfaces 42, which cam surfaces engage the squared ends of the locking bolt 27 as the slide block moves up and cause the bell crank lever 28 to turn about the axis 30 against the pull of the cable 21, the roller 32 being elevated above the level of the runway plate 22 and the latter being cut away at 43 to permit the turning of the lever when the bolt 27 rides up the cams 42. When the locking bolt 27, therefore, reaches the recesses 41, it is automatically forced thereinto by the pull of the cable 21 which turns the bell crank lever about the axis 30 and lifts the bolt to the top of the guide slide 26 and into the recesses 41. The landing gear is automatically disengaged from the locking bracket 40 when the pilot or operator pulls oppositely by means of the left hand cable 21 to turn the bell crank lever 28 about its pivotal axis 30 in the opposite direction (counterclockwise, Fig. 7) to carry the locking bolt 27 toward the bottom of its guide slot and out of recesses 41 of the locking bracket. The slide block then is free to move in the opposite direction along its raceway to lower the landing gear, the weight of the landing gears facilitating this movement which is effected by the pull on the cable 21 in the proper direction. When the slide block gets to the inner locking position at the keel the roller 32, upon passing into the recess 33, permits the bell crank lever to be pulled over by the cable 21 to cause the locking pin

27 to engage the lock or keepers 36. The bracket 40 extends around the chine of the floating structure and embraces the side thereof, carrying the pulley 17. The landing gear is identical for both sides, and a description of one is sufficient.

In the particular embodiment shown, I have indicated the axles 5 and the adjusting and locking mechanisms as disposed behind a step 44 so as to minimize disturbance and water resistance while taxying on the water or while hydroplaning for the purpose of getting off into the air.

The operation of the landing gear is clear from the above description. By merely pulling on the cables 21—22 simultaneously in opposite directions from the center, both landing gear axles 5 are lifted and by pulling toward the center or keel structure they are lowered, and the gears are automatically locked in both the lowered and lifted positions. In the particular embodiment shown the struts 6 and 7 are rigidly fastened together at their outer ends so as to form a rigid unit, with the shock absorbing mechanism 60 contained in the strut 6 (see Fig. 2*a*) and accordingly, each gear moves in a plane at right angles to the axis 6′—7′.

It is understood that the invention is applicable to hydroaeroplanes of either the single or double float type or to planes of either the pontoon or the flying boat type, and many of the features of the invention disclosed are applicable to retractable landing gears generally, whether on water craft or land machines. In the particular embodiment shown, the floating structure is indicated of the V-bottom type, but floating bodies of differently shaped bottoms may be employed. It is obvious also that instead of wheels, skid structures may be employed of the retractable type.

I claim:

1. In an amphibian aeroplane, a floating and hydroplaning body and a retractable landing gear on one side of said floating body and normally connected with the keel structure thereof but readily disconnectable therefrom and attachable thereto.

2. In an amphibian aeroplane a floating and hydroplaning body, a retractable landing gear on one side of said floating body and normally connected with the keel structure thereof, and a readily detachable connection therefor which is movable away from the keel structure and movable to another part of the hull structure.

3. In an amphibian of the character set forth in claim 2 wherein the detachable connection is attachable to the hull chine in the retracted position of the gear.

4. In an amphibian of the character set forth in claim 2 wherein the detachable connection is in the form of a sliding member and the hull bottom is provided with a runway for said connection together with means for automatically locking and unlocking the landing gear to and with the keel structure by the act of moving the detachable connection to and from the keel structure.

5. In an amphibian of the character set forth in claim 2 wherein the detachable connection is in the form of a sliding member and the hull bottom is V-shaped and provided with a runway for said connection from the keel structure to the chine together with means for moving the detachable connection to and from the keel structure and automatic means responsive to said moving means for locking and unlocking the detachable connection when the moving means is actuated.

6. In an amphibian aeroplane, a floating and hydroplaning body, a retractable landing gear on one side of said floating body including a wheeled axle having a readily detachable and movable connection with the keel structure of the body at its inner end and being pivoted to the side of the body for up and down adjustments by means of a strut pivoted nearer the outer end of the wheeled axle.

7. An aeroplane of the character set forth in claim 6 wherein the wheeled axle is pivoted to the side of the floating body up above the chine thereof at points spaced in a fore and aft direction.

8. In an aeroplane of the character set forth in claim 6 wherein the detachable and movable connection with the underbody structure is in the form of a slide member which is movable and attachable to another part of the body for adjusting the landing gear.

9. In an aeroplane of the character set forth in claim 6 wherein the detachable and movable connection with the keel structure is in the form of a slide member and the floating body bottom is provided with a transverse runway from the keel structure to the chine along which the sliding connection is movable.

10. In an aeroplane of the character set forth in claim 6 wherein the floating body has a V-shaped bottom, the detachable and movable connection is in the form of a sliding member, the V bottom is provided with a transverse runway extending to the chine along which said sliding member is movable, and means for holding the slide member at the chine.

11. In an aeroplane of the character set forth in claim 6 wherein the floating body has a V-shaped bottom, the detachable and movable connection is in the form of a sliding member, the V bottom is provided with a transverse runway extending to the chine along which said sliding member is movable, and automatic locking means for automatically locking the sliding member to the under-

body at one end and automatically locking the same to the chine structure at the other end of the runway.

12. In an aeroplane of the character set forth in claim 6 wherein the floating body has a V-shaped bottom, the detachable and movable connection is in the form of a sliding member, the V bottom is provided with a transverse runway extending to the chine along which said sliding member is movable, and automatic locking means for automatically locking the sliding member to the underbody structure at one end and automatically locking the same to the chine structure at the other end of the runway, including cables attached to the opposite sides of the sliding members operable by the pilot.

13. In an aeroplane of the character set forth in claim 6 wherein there are two retractable landing gears on opposite sides of the floating boat with wheeled axles normally attached at their inner ends to the keel structure of the float.

14. In an aeroplane a body structure, a retractable landing gear on one side of said body and normally connected with the bottom thereof, a readily detachable connection on said landing gear which is movable from the normal point of connection to another part of the body structure, a locking bolt and keeper mechanism for locking the detachable connection to the normal connection point, means for moving the detachable connection and means responsive to the moving means for operating the locking bolt and keeper.

15. In an aeroplane of the character set forth in claim 14 wherein the locking bolt and keeper mechanism includes a keeper at the normal connection point and another keeper at a remote point.

16. In an aeroplane of the character set forth in claim 14 wherein a cam is provided adjacent the keeper at the remote point which engages the bolt and actuates it against the force of the moving means to cause the automatic engagement of the bolt with the keeper by the act of moving the detachable connection in that direction.

17. In an aeroplane of the character set forth in claim 14 wherein the means for locking the bolt and keeper mechanism includes a pivoted lever which at the normal point of connection occupies a position to cause the bolt and keeper to be operatively engaged but when the moving means is actuated is caused to actuate the bolt and keeper mechanism to disengage the same and permit the movement of the detachable connection.

18. In an aeroplane of the character set forth in claim 14 wherein the means for locking the bolt and keeper mechanism includes a pivoted lever which at the normal point of connection occupies a position to cause the bolt and keeper to be operatively engaged, but when the moving means is actuated is caused to actuate the bolt and keeper mechanism to disengage the same and permit the movement of the detachable connection, said lever carrying a roller which occupies a recess when the landing gear is connected at the normal point of connection, said roller engaging the bottom of the body to retain the bolt and keeper out of alinement during the separation and approach of the bolt and keeper while the detachable connection is being moved from one point to another.

In testimony whereof, I have signed my name to this specification.

MICHAEL WATTER.