

April 6, 1937.

G. F. MYERS

2,076,090

PROPELLER

Filed April 27, 1936

3 Sheets-Sheet 1

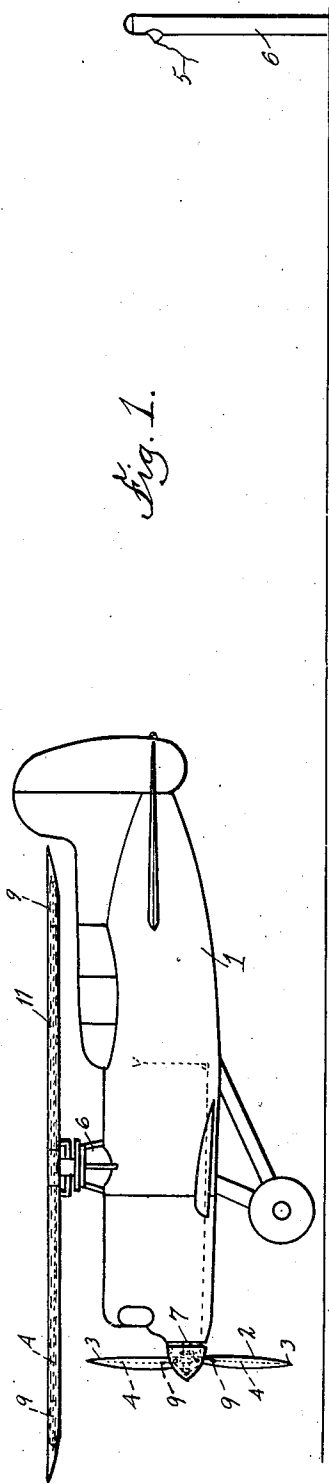


Fig. 1.

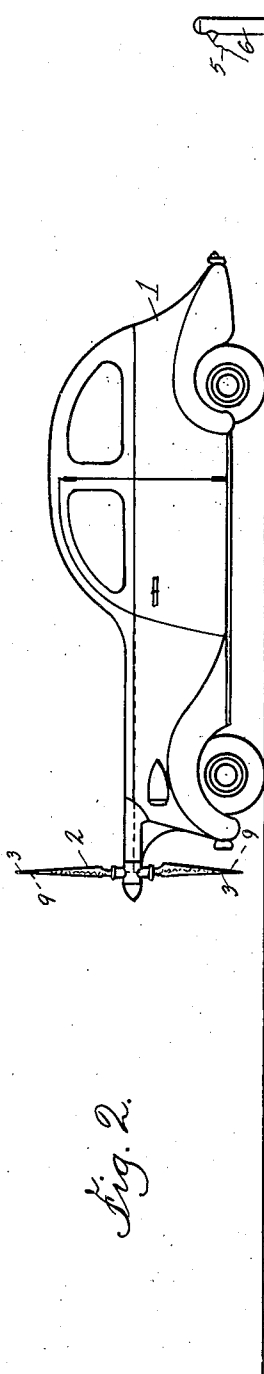


Fig. 2.



Fig. 3.

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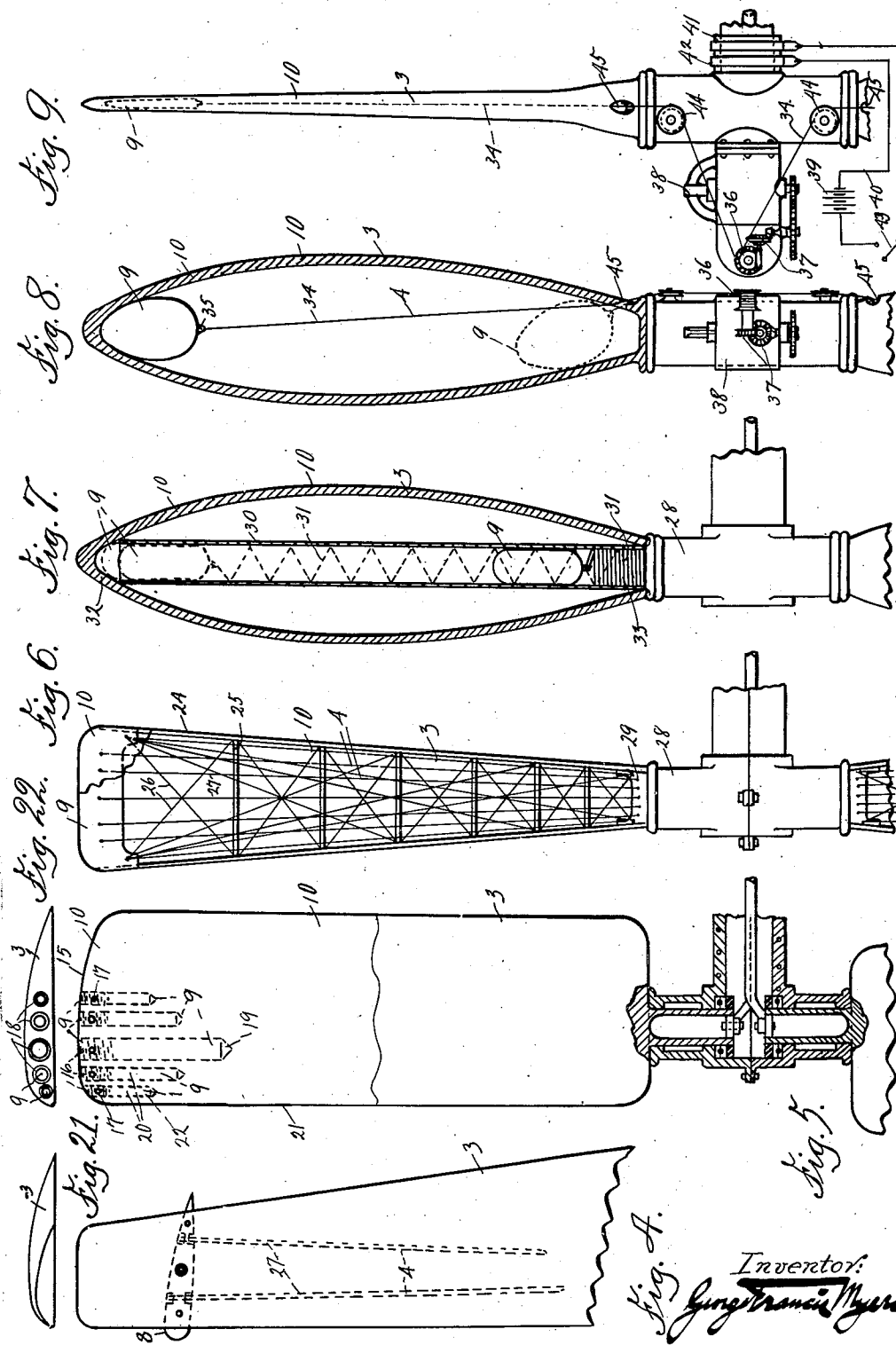
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PROPELLER

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3 Sheets-Sheet 2



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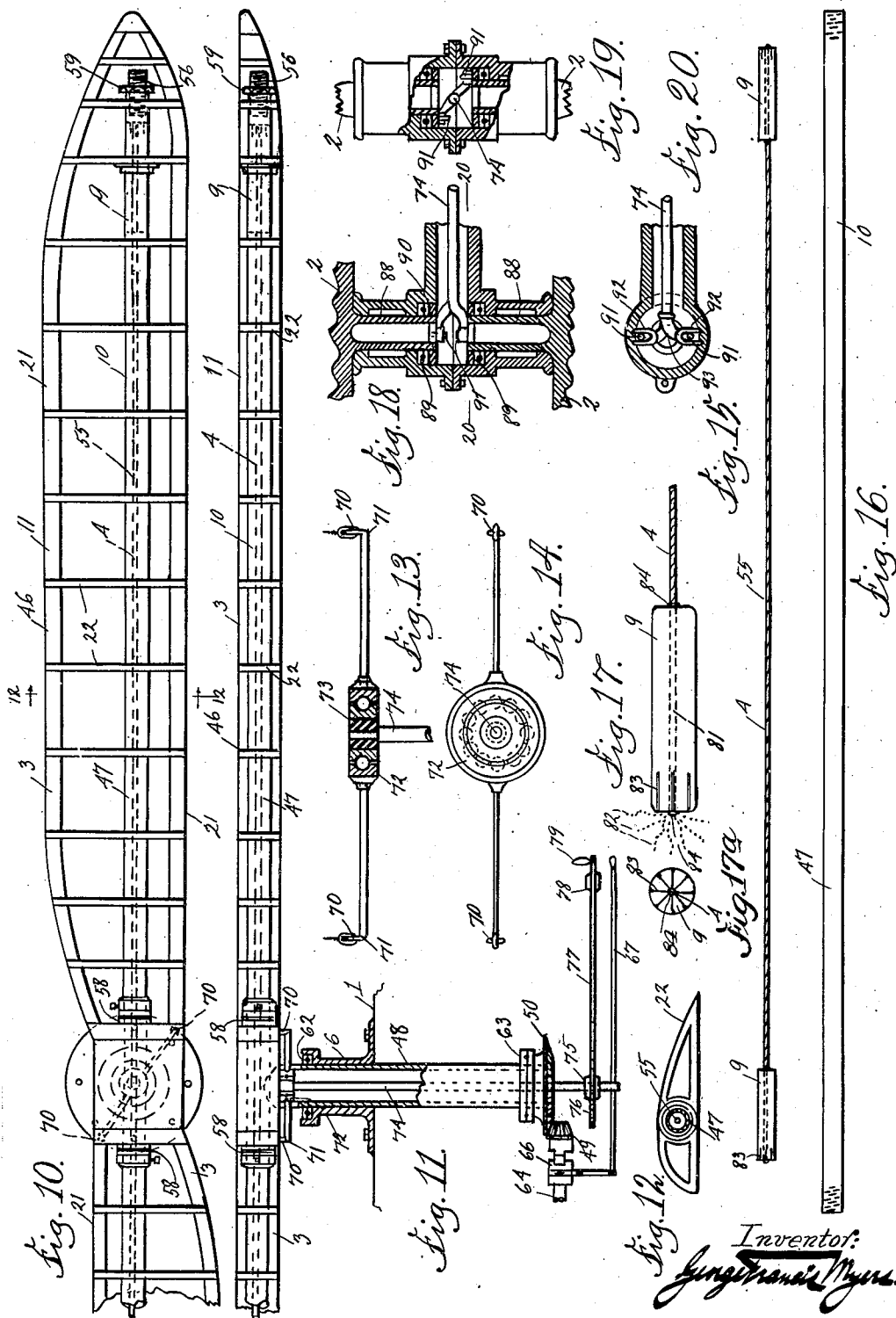
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PROPELLER

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UNITED STATES PATENT OFFICE

2,076,090

PROPELLER

George Francis Myers, New York, N. Y.

Application April 27, 1936, Serial No. 76,589

40 Claims. (Cl. 170—159)

This invention relates to propellers.

It has for its object to produce a propeller that will gather a great deal of kinetic energy while the machine to which it is attached is stationary to be given out the moment that the machine starts moving.

Another object is to provide a propeller with auxiliary unitary and nonstructural weights mounted adjacent to the tips of the blades of the propeller.

Still another object is to provide a propeller having a weight that may be drawn toward the tips thereof by centrifugal force, and drawn toward the hub either when desired or automatically.

The invention also consists in certain other features of construction, and in the combination and arrangement of the several parts to be hereinafter described, illustrated in the drawings attached hereto, in which similar numerals of reference denote similar parts throughout the several views, and specifically pointed out in the claims.

In the accompanying drawings consisting of three sheets:

Figure 1 is a side elevation of an airplane equipped with the preferred embodiment of the invention. Fig. 2 is a side elevation of a modification of the invention attached to an automobile. Fig. 3 is another side elevation of a modification of the invention attached to a motor boat.

Fig. 4 is a plan view, on an enlarged scale of the invention showing the auxiliary weight attached to the exterior of the blade of the propeller, and held from flying off tangentially by rivets and by wires, rods, or the like fastened to the weight and running toward the hub. Fig. 5 is a similar view showing the auxiliary weights mounted in the very tip of the blade and held in place in the tubes or bored out places by threaded members. Fig. 6 shows an enlarged view, in plan, of a built up propeller with the weight at the very end of the tip, in fact forming the tip of the blade and mounted under the covering thereof, the weight being held by wires, rods or the like to the hub. Fig. 7 is an enlarged plan view of the propeller shown in Fig. 2 where the weight is movable outwardly toward the tip by centrifugal force and retracted by a spring automatically; the retracted position being shown in full lines and the extended position being shown in dotted lines. Fig. 8 is an enlarged plan view partly in section of the front or airplane propeller shown in Fig. 1 and shows the inactive

position of the weight and restraining cord in dotted lines, while the active position, assumed under the action of centrifugal force, is shown in full lines. Fig. 9 is a side elevation of Fig. 8 and shows the electric motor and connections more fully.

Fig. 10 is a plan view of the top propeller of Fig. 1 with the cover removed. Fig. 11 is a similar view in side elevation, also showing the driving mechanism. Fig. 12 is a cross section on 12—12 of Fig. 10 showing one of the ribs more particularly. Fig. 13 is an enlarged side elevation of the pitch changing mechanism of Fig. 10; Fig. 14 is a plan view thereof. Fig. 15 shows the auxiliary weights and single cable connecting the same. Fig. 16 shows the tube or pipe holding the weights. Fig. 17 is an enlarged view of one of the auxiliary weights of Fig. 15; and 17a is an end view thereof; the loose ends of the cable before they embrace the head of the weight are shown in dotted lines. Fig. 18 is a vertical cross section of the pitch changing mechanism of the front or airplane propeller; Fig. 19 is a side elevation thereof partly in section; and Fig. 20 is a horizontal cross section on the line 20—20 of Fig. 18. Figs. 21, 22 are end views.

The invention is constructed and operated substantially and preferably as follows:

1 represents the fuselage or body or hull or the like, 2 the propulsion or tractor propeller, 3 the blades thereof, 4 the wires, cables, rods, or the like running from the weight to the hub and fastened thereto, 5 is an auxiliary weight mounted outside of the blade of the propeller and 6 is said weight mounted inside the outer periphery or covering 10. 11 is the helicopter propeller. The weight 8 is more particularly shown in Fig. 4.

In Fig. 5 the auxiliary weights 9 are mounted at the ends or tips of the blades as at 15 with screw ends 16 held in place by set-screws or the like 17; these weights may be solid or in the form of sand or shot or the like, and are held in the borings, or tubes inside the borings as at 18, if the propeller be made of wood. As shown, one (19) of these weights 9, is mounted substantially along the center of pressure line of the blade; two of the same 20 are between said line and the leading edge 21 of the blade; and one thereof 22 is quite close to the leading edge, in case it should be desired to keep the leading edges of each of the blades overweighted or overbalanced in respect to their longitudinal axes.

The built up propeller shown in Fig. 6 has spars 24 and ribs 25, tie wires 26 and special wires or auxiliary means 27 fastened to the

weight 9 and to the hub 28 as at 29. The weight 9 as shown is at the very tip end 18, in fact forms the tip, under the covering thereof; although in some cases 9 may be exposed.

5 The propeller of Fig. 7 has a tube 30 either round or flattened with the weight 9 movable therein and held by the spring 31 to the hub 28.

In Figs. 8 and 9 the weight 9 is held back by the cord 34 being attached thereto as at 35, the 10 further end thereof being wound up on the drum or the like 36 rotated by suitable gearing 37 by the electric motor 38 by means of current from a source of energy 39, wires or conductors 40, commutators 41, brushes 42 and switch 43, 15 the cord 34 running over pulleys 44 through an orifice 45 in the blade 3.

46 is the framework of the blades of the helicopter propeller 11 as shown more particularly in Figs. 10-17 and is composed of spars 21 and 20 ribs 22. These frames rotate freely on the tube or pipe 47 which extends from end to end of the said propeller, the tube being fastened to the upright shaft 48 and driven by the bevel gears 49 and 50. Inside the tube 47 are the auxiliary 25 weights 9 connected by a single cable 55. At the ends of the tube, which are threaded internally, are screwed the plugs 56 with lock nuts 59.

The weights 9 lie inert in the tube 47, being 30 balanced beforehand, but the plugs will keep them in the tube should any tendency develop to slide out therefrom. In this way the weights are entirely free and separate from the movable portions or wings of the blades 3; and the blades 35 can move easily, only a small thrust bearing, if any, need be placed at 58 to counteract the great centrifugal force that ordinarily would be present if the weights were connected to the movable blades themselves, but being entirely 40 free from the weights the blades may be made of very light material throughout.

The upright shaft 48 is supported by the standard 6 from the fuselage 1 and may contain the bearing 62 and below the same the 45 bearing 63. The bevel pinion 49 is on the crankshaft 64 of the motor 7. A clutch 66, also on the crankshaft is operated by the lever 67 reaching to the pilot's compartment.

The pitch changing mechanism of the top or 50 helicopter propeller consists of two fingers 70 with bent portions 71 hingedly connected to the leading edges of the blades thereof. These two fingers are fastened to the outer ring 72 of the ball bearing 73, the inner ring thereof being 55 attached to the rod 74 running downward through the hollow shaft 48; and though this hollow shaft rotates the inner shaft or rod 74 remains stationary as far as rotation is concerned. The rod however has a movement up 60 and down inside the hollow shaft, there being at the lower end thereof a threaded portion meshing with a nut 75 in sprocket wheel 76, run by chain 77, sprocket 78 with handle 79. When the handle is turned it operates the nut 75 which 65 will move the rod 74 up or down as desired and change the angle of incidence of the blades 3 either to a positive angle or a negative angle; or will keep the blades at a zero angle.

The cable 55 is led through each weight as 70 at 81 and the separated strands 82 (shown in dotted lines in Fig. 17) are bent over the ends of the weights and hammered down into the slots 83 and welded therein, as well as at 84.

The pitch changing mechanism of the front 75 or airplane propeller is shown more particularly

in Figs. 18-20, and comprises a hub or shank 88 with thrust bearing 89 held in place by collar 90. On these collars, diagonally opposite one to the other, are two fingers 91 operated by the 5 open slot members 92 radiating as at 93 from the rod 74 as it moves up and down through the hollow shaft 48.

As is well known, in college boat races the shells are lined up at the wharf each crew with their oars dipping into the water ready to pull 10 violently, while men on the wharf hold the stern of each boat and let them go at the starting signal. In like manner a number of motor boats as in Fig. 3, or automobiles as in Fig. 2, or helicopters or airplanes as in Fig. 1 may be attached 15 by cords or the like 5, to starting posts 6. The operators, while the machines are still tied to the posts place the blades at a zero angle of incidence and run the propellers at their speed limit. This will gather up a great deal of energy 20 in the propellers so that when the blades are turned to a positive angle of incidence the machines will start forward with a burst of speed.

If the helicopter propeller be used as shown in Fig. 1 to lift the machine off the ground vertically, it is rotated very rapidly at a zero or 25 negative angle of incidence with the clutch in engagement; the clutch is then thrown out of engagement, the blades turned to a positive angle and the machine will jump off the ground 30 and into the air. In the meantime the airplane propeller moves the machine forward faster and faster until the wings take up the load when the rotation of the top propeller is stopped; and the 35 machine flies on exactly like an airplane.

If the machine be equipped with a propeller like that shown in Figs. 1, 8 and 9 and operated as an airplane the operator turns the blades to a substantially zero angle of incidence, and keeps the electric switch open. Consequently the 40 weight 9, as soon as the propeller begins to rotate, will move from its inert position (dotted lines) to its active position (full lines). After the machine has its speed in the forward direction and the weight is no longer required at the tip 45 of the blade, the operator closes the switch 43 which will energize the electric motor through the brushes and commutators, the cords will be wound up on the drum 36, and the weight retracted.

In the case of the top-front propeller machine as in Figs. 1 and 10-20 and 8 and 9, operating as an airplane helicopter, both propellers are kept 55 initially at a zero angle of incidence while being rotated to their limit of speed with the clutch in, as aforesaid. When this limit of speed is reached the clutch is thrown out of engagement which allows the top or helicopter propeller to rotate freely. The angle of the blades is then 60 quickly turned from a non-lifting angle to positive lift and the machine will rise rapidly into the air driven forward at the same time by the airplane propeller the action of the two propellers being such that the machine will rise at an oblique angle to the horizon, although the angle 65 of the fuselage to the horizon will be zero; in other words the fuselage is kept horizontal all the time that the machine is being lifted by the helicopter propeller—for the top propeller is now a gyroscope of giant proportions and can not be moved out of its plane of rotation. As soon as the wings take up the load the rotation of the top propeller is stopped and the machine flies forward like an airplane. By the above expression, a non-lifting angle, or like term, is meant, 75

naturally, an angle of incidence or pitch of the blades insufficient to lift the whole machine bodily off the earth.

As the invention is in some of its aspects generic I do not limit myself to the particular construction shown and described, but also contemplate the employment of such equivalents as fairly fall within the scope of the claims.

In this connection it may be stated that the invention can be used on any kind of a helicopter; or on an autogiro, or on any other kind of aircraft; where a single propeller gives too much torque for safety any of the well known methods of counteracting the torque may be employed, as for instance a second propeller turning in the opposite direction; the pitch changing mechanism on any of the blades may be of the well known commercial kind if desired; all of the blades shown are of airfoil section as more particularly pointed out in Figs. 12, 21 and 22; the auxiliary weights are mounted either at the extreme tips of the blades, in some cases actually forming the tip, or are mounted adjacent to the tips, and under the cover, metal, wood, or fabric or the like; the threaded plugs in Figs. 5 and 10 are of course weights in themselves that can be moved longitudinally thereby balancing the opposing blades, as well as regulating the position of the weights mounted inside the tube or tubes or tubular portions; two of the weights in Fig. 5 are mounted near to or adjacent to the leading edge of the blade, or between the leading edge and the thickest portion of the blade or between the leading edge and a line drawn through the center of pressure, or the longitudinal axis thereof; the connections to the auxiliary weights may be either heavy wires or rods as shown more particularly in Fig. 4, or many finer wires as in Fig. 6, or a single cable of many wires as in Fig. 10, or Fig. 15; these connections run toward the hub, and may be connected thereto, or connected directly to the opposite weight with the single cable mentioned; these connections keep the weights from the influence of centrifugal force, and from flying off tangentially as they otherwise would; where the weights are free to slide or move toward and from the tips of the blades they are governed automatically; although several of the propellers are shown and described as airplane propellers they may be used as helicopter propellers, and the helicopter propeller shown may be used as an airplane propeller if desired; and while two opposing blades are shown on the propellers herein, any number of blades may be employed.

This application is in the nature of an improvement on some of my previous applications, for instance: Serial No. 51,502 filed November 25, 1935; Serial No. 8,618 filed February 28, 1935; Serial No. 639,458 filed October 25, 1932; Serial No. 102,110 filed April 15, 1926; Serial No. 514,338 filed November 10, 1921; Serial No. 334,562 filed October 30, 1919; and Serial No. 574,777 filed August 1, 1910.

Therefore it will be understood that various changes may be made in the form, proportion, size and detail of the several structures shown, the number and position of certain elements used, as well as the character of the motive power employed, without departing from the spirit of the invention.

I claim:

1. A propeller having a plurality of blades with tips, a tubular shaped portion mounted adjacent to the tips in each of the blades longitudinally

thereof, and a unitary and nonstructural weight movable in relation to each of the tubular shaped portions.

2. A helicopter propeller having a plurality of opposing blades with tips flat parts and shanks and a tubular shaped portion in the flat part of each of the blades, an adjustable unitary and nonstructural weight mounted on the tubular shaped portion adjacent to the tip thereof, and means for adjusting the weights in opposing blades from the tips toward the shanks thereof when the propeller is in a horizontal position.

3. A propeller having a plurality of blades provided with tips, an adjustable nonstructural weight mounted adjacent to the tip of each of the blades, and means comprising a cord for adjusting the weights to and from the tips.

4. A propeller having a plurality of blades provided with tips and a hub, an adjustable nonstructural weight mounted adjacent to the tip of each of the blades, and means comprising a power operated drum and cable for withdrawing the weight from adjacent to the tip to adjacent to the hub.

5. A propeller having a plurality of blades provided with tips and a hub, an adjustable nonstructural weight mounted adjacent to the tip of each of the blades, and means comprising an electric motor mounted adjacent to the hub, gearing driven by the motor, a drum driven by the gearing, and a cable attached to the weight and to the drum for drawing the weight from adjacent to the tip to adjacent to the hub.

6. A propeller having a plurality of blades provided with tips and a hub, an adjustable nonstructural weight mounted adjacent to the tip of each of the blades, and remote controlled and manually operated means for adjusting the weights by drawing the same from adjacent to the tip to adjacent to the hub.

7. A propeller having a plurality of blades provided with tips and a hub, means for rotating the propeller, an adjustable nonstructural weight mounted adjacent to the tip of each of the blades, and means while the propeller is rotating at uniform speed for drawing in the weight toward the hub.

8. A propeller having a hub, a plurality of blades attached to the hub each with a hollow covering of airfoil shape, and a flat unitary weight movable inside the covering under the action of centrifugal force, and means comprising a cord for retracting the weight toward the hub.

9. A propeller having a plurality of blades provided with tips and a tubular shaped threaded portion, and an adjustable weight mounted adjacent to the tip of each of the blades and also having a threaded portion thereon registering with the first mentioned threaded portion.

10. A propeller having a plurality of blades provided with tips and a tubular shaped threaded portion, and an adjustable weight mounted adjacent to the tip of each of the blades and also having a threaded portion thereon registering with the first mentioned threaded portion and which can be threaded and unthreaded without disturbing the structure of the blade, for balancing the blades when desired.

11. A propeller having a plurality of blades provided with tips and a tubular shaped threaded portion, a weight mounted in the tubular shaped portion, and a second and adjustable nonstructural weight mounted on the tubular shaped portion adjacent to the tip of each of

the blades for keeping the first mentioned weights from escaping.

12. A propeller having a plurality of blades provided with tips and a hub and a tubular shaped portion running from adjacent to the tip of one blade through the hub to adjacent to the tip of the opposing blade having an uninterrupted orifice therein and threaded at both ends thereof, and an adjustable weight mounted adjacent to each of the tips of the blades and registering with the first mentioned threaded ends.

13. A propeller having a plurality of blades with tips each with a plurality of holes drilled in the said tips longitudinally thereof, weights mounted in the holes, and threaded plugs mounted in the outer ends of the holes and movable out and in the holes without disturbing the integrity of the structure of the blades.

14. A propeller having a plurality of blades provided with tips, pivots for the blades, auxiliary weights mounted adjacent to the tips, and means for swinging the blades on the pivots and retaining the weights stationary.

15. A propeller having a plurality of blades provided with tips, pivots for the blades, adjustable weights mounted adjacent to the tips, and means for swinging the blades on the pivots and retaining the weights stationary.

16. A propeller having a plurality of pivotable blades with tips, a tubular member mounted inside of each of the blades running substantially from tip to tip thereof and having an uninterrupted orifice therethrough, an auxiliary weight mounted in the member adjacent to each tip, a connection between the said weights running through the orifice, a second and adjustable weight mounted adjacent to each of the tips and in line with the first mentioned weights, means for adjusting the second mentioned weights to and from the tips, and means for swinging the blades on the said member and retaining the weights stationary after such adjustment.

17. A propeller having a plurality of pivotable blades, a tubular member mounted in each of the blades and on which the blades pivot, additional weights auxiliary to the inherent weight of each of the blades mounted in the tubular member on the inside thereof, and means for pivoting the blades reversely mounted on the outside thereof.

18. A propeller having a pair of blades with tips, a pair of weights mounted adjacent to the tips of each of the blades, and a flexible member comprising a plurality of strands passing through both of the weights, bent thereover, and securely fastened thereto.

19. A propeller having a plurality of blades provided with leading and trailing edges and a longitudinal axis mounted between the same but closer to the leading edge of each blade than to the trailing edge thereof, means for rotating the blades, and an auxiliary unitary nonstructural weight mounted in each blade between the leading edge thereof and the said axis but closer to the former than to the latter, the weight being stationary at its original forward position both when the blades are rotating or when stationary.

20. A propeller having a plurality of blades provided with tips, leading and trailing edges and a longitudinal axis mounted between the same but closer to the leading edge of each blade than to the trailing edge thereof, means for rotating the blades, a unitary nonstructural adjustable weight mounted in each blade between the leading edge thereof and the said axis but closer to

the former than to the latter, and means for adjusting the weight to and from the tip, the weight after any adjustment being stationary at its original forward position both when the blades are rotating or when stationary.

21. A propeller having a plurality of blades provided with tips, leading and trailing edges and a longitudinal axis mounted between the same but closer to the leading edge of each blade than to the trailing edge thereof, means for rotating the blades, a plurality of unitary nonstructural adjustable weights mounted on each blade between the leading edge thereof and the said axis but closer to the former than to the latter and adjacent to the tips, and means for adjusting the weights to and from the tips, the weights after any adjustment being stationary at their original forward positions both when the blades are rotating or when stationary.

22. A propeller having a plurality of blades with tips, a hub, an auxiliary unitary nonstructural weight mounted adjacent to the tip of each of the blades, and auxiliary means also nonstructural fastened to the weight and reaching toward the hub for counteracting centrifugal force.

23. A propeller having a plurality of built-up blades comprising rigid spars and separated ribs, an auxiliary nonstructural weight mounted adjacent to the tip of each of the blades, and flexible means comprising a plurality of wires attached to each of the weights running substantially parallel to the spars, by the ribs, and fixed adjacent to the central portion of the propeller.

24. A method of storing and using kinetic energy in a variable pitch propeller rotated by a source of power through a disconnectible drive, including setting the blades of the propeller at a non-lifting angle of incidence, driving the blades while at such incidence to a high number of revolutions per minute, then disconnecting the blades, and bringing them to a positive angle of incidence of such a nature that the energy stored in the same produces a high degree of thrust.

25. In combination with a variable pitch propeller having means for varying the pitch, means for driving said propeller including clutch mechanism, and means for operating the clutch mechanism so constructed and arranged that the propeller may be highly rotated at a non-lifting angle of incidence, the clutch mechanism then disengaged and the propeller brought to a positive angle of incidence adapted to cause the kinetic energy stored in said propeller to be utilized to produce a high initial thrust.

26. In combination with a variable pitch propeller having a plurality of blades with means for varying the pitch thereof and a unitary and nonstructural weight mounted adjacent to the tip of each of the blades, means for driving said propeller including clutch mechanism, and means for operating the clutch mechanism so constructed and arranged that the propeller may be highly rotated at a non-lifting angle of incidence, the clutch mechanism then disengaged and the blades brought to a positive angle of incidence adapted to cause the kinetic energy stored in said propeller with its added weights to be utilized to produce a high initial thrust.

27. A sustaining rotor having variable pitch blades, means for varying the pitch of the rotor blades, an engine for driving the rotor blades, clutch mechanism operable while the rotor blades are rotating mounted between the engine and the blades, means for operating the clutch mechanism

nism during flight, and auxiliary weights mounted on the rotor blades, all so constructed and arranged that the rotor may be brought up to speed by the engine with the blades thereof at no lift prior to take-off thus storing up kinetic energy due to the weighted blades, the engine unclutched and the blades brought to positive lift, thus using the stored up kinetic energy to hop into the air.

28. A sustaining rotor having shanks and wind balanced variable pitch blades free from all connections to the machine itself except through the said shanks, means mounted adjacent to the shanks only, for varying the pitch of the rotor blades from no lift to positive lift, an engine for driving the rotor, clutch mechanism operable while the blades are rotating mounted between the engine and the blades, a lever for operating the clutch mechanism during flight, and auxiliary weights concentrated adjacent to the tips of the rotor blades, so constructed and arranged that the rotor may be brought up to speed by the engine with the blades at no lift prior to take-off thus storing up power due to the weighted blades, the engine unclutched and the blades brought to positive lift, thus using the stored up force to hop into the air.

29. The combination in a flying machine, of an engine, a tractor propeller driven by the engine, a variable pitch helicopter propeller having means for varying the pitch, means for driving the said helicopter propeller comprising said engine and including clutch mechanism, and means for operating the said clutch mechanism so constructed and arranged that the helicopter propeller may be highly rotated at a non-lifting angle of incidence, the clutch mechanism then disengaged and the helicopter propeller brought to a positive angle of incidence adapted to cause the kinetic energy stored in said helicopter propeller to be utilized to produce a jump off the ground into the air while the tractor propeller drives the machine forward in horizontal flight.

30. In a flying machine having a fuselage, an engine mounted on the fuselage, a rotor shaft driven by the engine, a plurality of pivoted blades mounted on the said shaft, means for pivoting the blades, clutch mechanism for connecting and disconnecting the engine from the said shaft while the shaft is rotating, means for operating the clutch mechanism during flight, and a plurality of blades for driving the machine forward; the elements cooperating one with the other, when the first mentioned blades are given a non-lifting angle of incidence and rotated rapidly with the clutch mechanism in engagement, the clutch mechanism thrown out of engagement and the angle of incidence made positive, to jump the machine off the ground without torque on account of the first mentioned blades turning free; and due to the initial rapid rotation of the first mentioned blades the lifting effect thereof will continue for a sufficient period of time during which the second mentioned blades will drive the machine forward in horizontal flight.

31. In a flying machine, an engine, tractor blades rotated by the engine, lifting blades also rotated by the engine, clutch mechanism mounted between the engine and the lifting blades and operable while the blades are rotating, means for operating the clutch mechanism during flight, auxiliary weights mounted on the lifting blades, pitch changing mechanism for the lifting blades, means for first giving the lifting blades a substantially zero angle of incidence with the clutch mechanism in engagement storing up kinetic en-

ergy due to the rotating weights, and then giving the blades a lifting angle of incidence with the engine declutched therefrom, causing the machine to jump substantially vertically directly off the ground and into the air with great force, and means for operating the tractor blades to give forward motion.

32. In a flying machine, an engine, forward propulsion blades rotated by the engine, lifting blades also rotated by the engine, having shanks and free from all connection to the machine itself except through the shanks, clutch mechanism mounted between the engine and the lifting blades and operable while the same is rotating, a lever for operating the clutch mechanism during flight, auxiliary weights mounted adjacent to the tips of the lifting blades, pitch changing mechanism for the lifting blades mounted adjacent to the shanks thereof, means for first giving the lifting blades adjacent to the weights a non-lifting angle of incidence with the clutch mechanism in, storing up energy due to the weights, and then giving the said blades a lifting angle of incidence with the engine declutched therefrom, causing the machine to jump substantially vertically directly off the ground and into the air with great force, and means for operating the forward propulsion blades to give forward motion.

33. A flying machine having a sustaining rotor provided with variable pitch blades, means for varying the pitch of the rotor blades, tractor propeller blades, motive power for driving both sets of blades, clutch mechanism mounted between the motive power and the rotor blades operable while the said blades are rotating, means for operating the clutch mechanism during flight, and auxiliary weights mounted on the rotor blades, all so constructed and arranged that the rotor may be brought up to speed by the motive power with its blades at substantially zero pitch prior to take-off thus storing up kinetic energy in the weighted blades, the motive power unclutched, and the blades brought to positive lift, thus using the stored up kinetic energy to hop the machine into the air; and due to this stored up kinetic energy the lifting effect of the rotor blades will continue for a sufficient period of time during which the tractor propeller blades will drive the machine forward.

34. In a flying machine having an engine, an upright shaft driven by the engine, a plurality of rotor blades driven by the shaft and free of all connections to the machine itself except through their shanks and having changeable pitch mechanism, auxiliary weights mounted adjacent to the tips of the blades, clutch mechanism for connecting and disconnecting the engine from the shaft while the same is rotating, means for operating the clutch mechanism during flight, and a plurality of blades for driving the machine forward; the elements cooperating one with the other when the blades with the added weights are given a non-lifting angle of incidence with the clutch mechanism in engagement and are rotated rapidly while on the ground, the clutch mechanism thrown out of engagement and the angle of incidence turns to a positive angle, to jump the machine off the ground with great force, without torque due to the first mentioned blades running free, and with good stabilization due to the gyroscopic effect of the weighted blades; and on account of the high and controlled jump assisted by the presence of the auxiliary weights the lifting effect of the first mentioned

blades will continue for a sufficient period of time during which the second mentioned blades will drive the machine forward in horizontal flight before the machine sinks to earth again.

5 35. In a flying machine having three-dimensional control, a wing surface, an engine, a single upright rotor shaft driven by the engine, a plurality of wing balanced rotor blades having shanks mounted on the single upright rotor shaft
10 free of all connections to the machine itself except through the said shanks and having controllable pitch mechanism during flight, auxiliary weights concentrated adjacent to the tips of the said blades, clutch mechanism for connecting and
15 disconnecting the engine from the single upright shaft while the same is rotating, means for operating the clutch mechanism during flight, and a plurality of blades for driving the machine forward; the elements cooperating one with the
20 other when the angle of incidence of the first mentioned blades is positive and the clutch mechanism is in engagement, to lift the machine off the ground in an unsatisfactory manner due to torque and instability; but when the first mentioned
25 blades with the added weights are given a non-lifting angle of incidence on the ground with the clutch in engagement and are rotated rapidly, the clutch mechanism thrown out of engagement, and the angle of incidence turned
30 to a positive angle, the elements then cooperating to jump the machine off the ground with great force, without torque due to the first mentioned blades running free, and with good stabilization due to the gyroscopic effect of the weighted first
35 mentioned blades; and on account of the high and controlled jump with the auxiliary weights the lifting effect of the first mentioned blades will continue for a sufficient period of time during which the second mentioned blades will drive the

machine forward, the wing surface will take up the load, and the lift of the first mentioned blades will be entirely discontinued.

36. A flying machine as claimed in claim 27, in which the auxiliary weights are tied adjacent to the shanks of the blades by suitable means for preventing the weights from yielding to centrifugal force.

37. A flying machine as claimed in claim 32, in which the auxiliary weights have rods wires or the like attached thereto and extending therefrom toward the shanks thereof for keeping the weights from flying off tangentially.

38. A flying machine as claimed in claim 34, in which the auxiliary weights are kept from flying off tangentially, when rotated rapidly, by means attached to the weights and extending toward the upright rotor shaft.

39. The combination in a flying machine, of propeller blades normally at a non-lifting angle of incidence, and loaded adjacent to their extremities for the purpose of storing up a considerable quantity of kinetic energy to be given out when the said blades are brought quickly to a positive angle of incidence, means for bringing the said blades to the said angle, and means for driving the said blades after the same have been brought to the said angle.

40. The combination in a helicopter, of propeller blades normally at a zero angle of incidence, and loaded heavily adjacent to their extremities for the purpose of storing up a large quantity of kinetic energy to be given out when the said blades are brought suddenly to a positive angle of incidence, means for bringing the said blades to the said angle, and means for driving the said blades after the same have been brought to the said angle.

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