H. J. FRENCH.

AEROPLANE.

APPLICATION FILED JUNE 9, 1910.

1,011,604.

Patented Dec. 12, 1911.

3 SHEETS—SHEET 1.

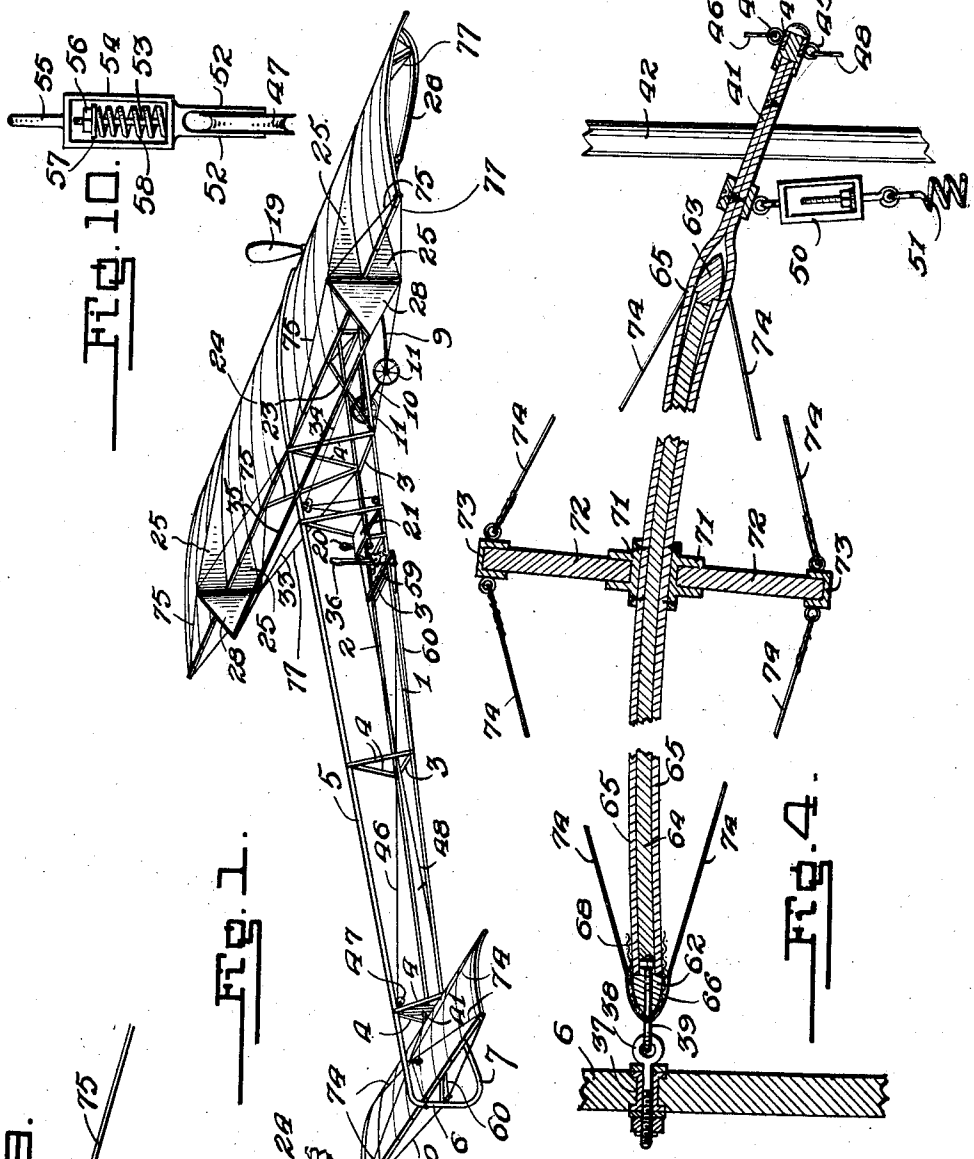

Fig. 1.

Fig. 10.

Fig. 2.

Fig. 4.

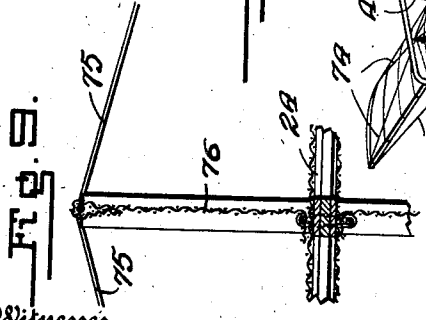

Fig. 9.

Witnesses

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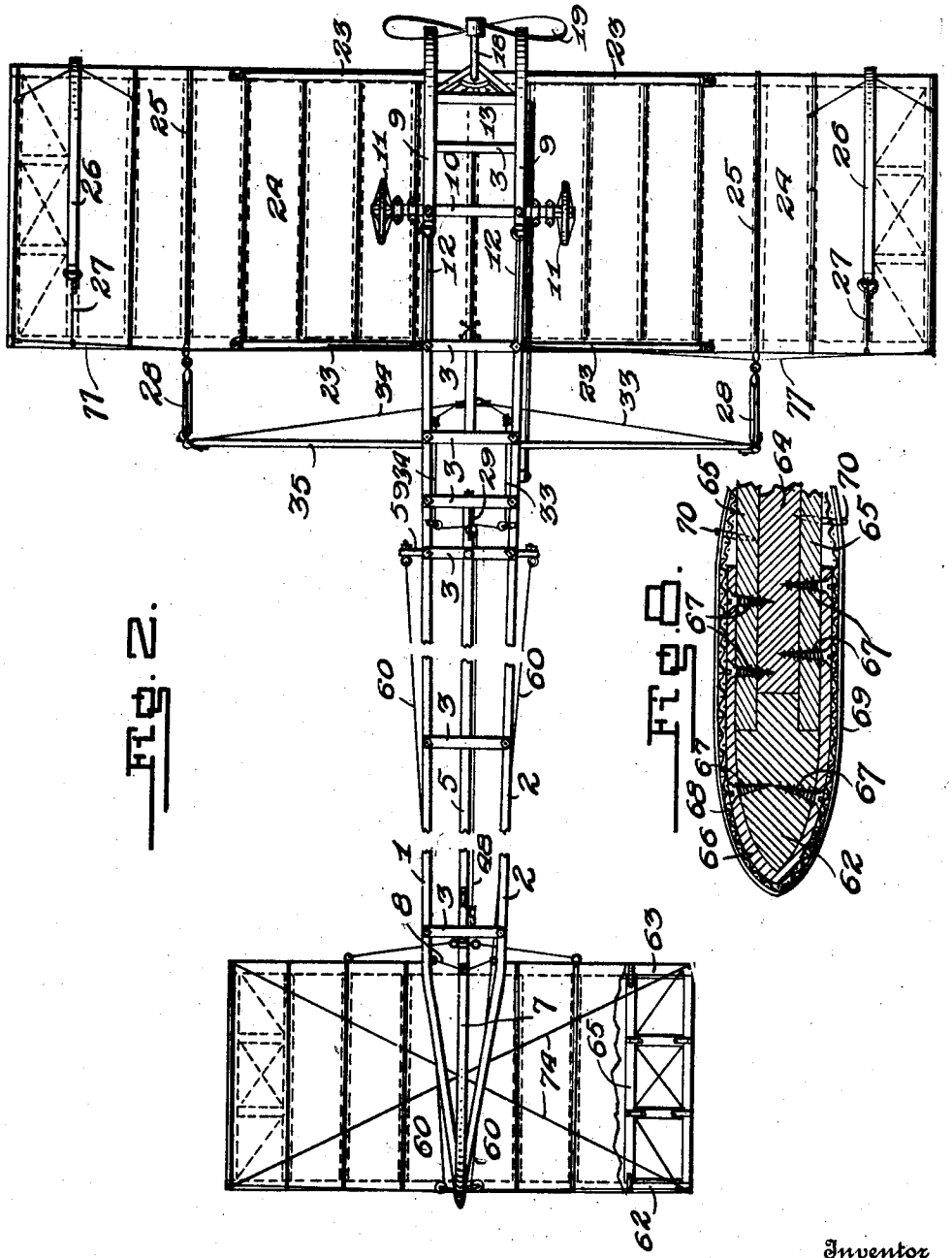

Fig. 2.

Fig. 3.

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3 SHEETS—SHEET 3.

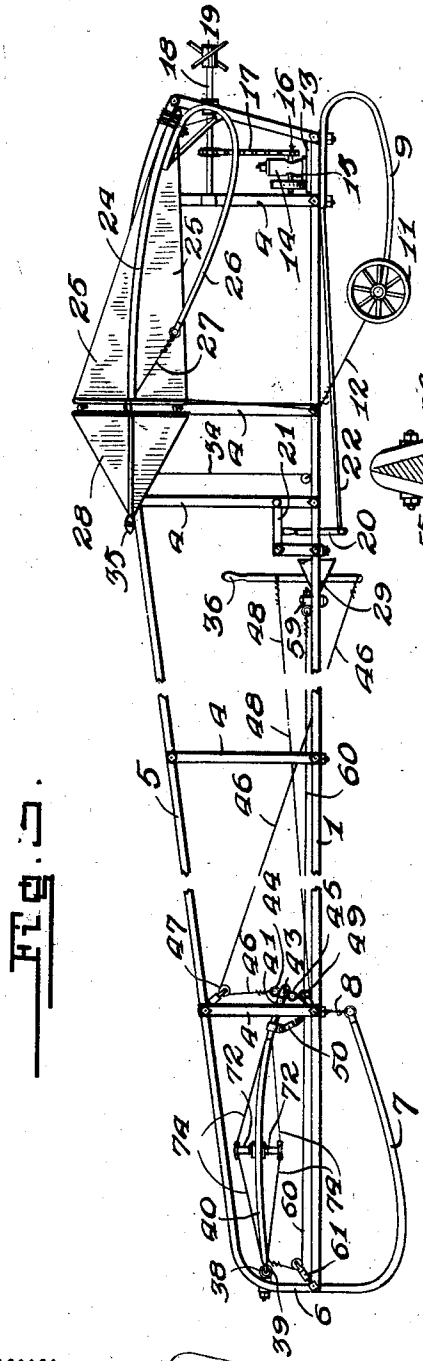

Fig. 5.

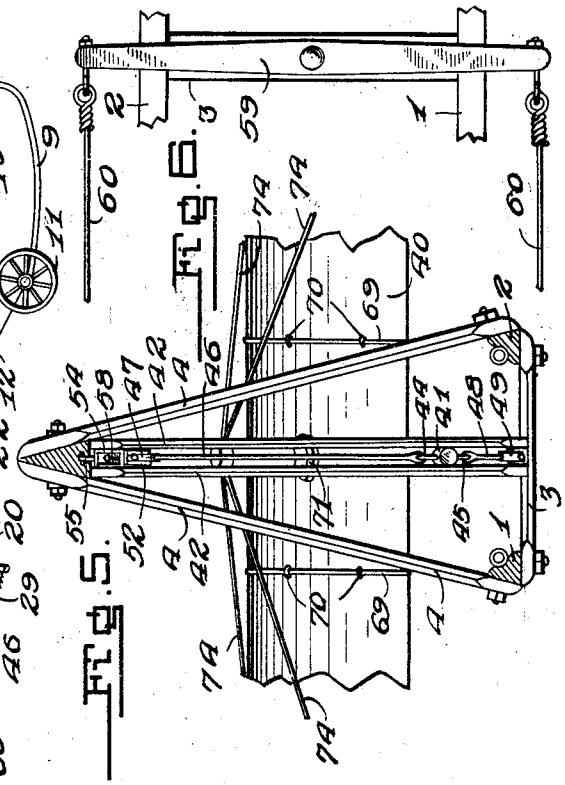

Fig. 6.

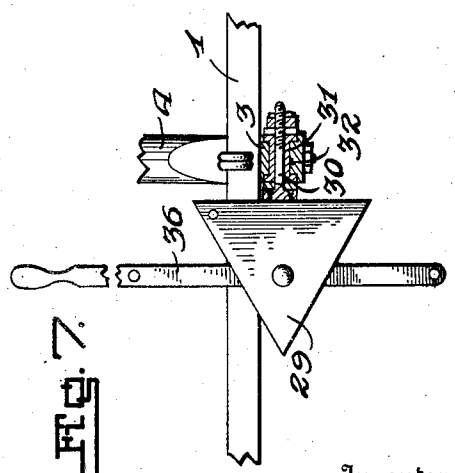

Fig. 7.

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UNITED STATES PATENT OFFICE.

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AEROPLANE.

1,011,604. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed June 9, 1910. Serial No. 565,927.

To all whom it may concern:

Be it known that I, HERBERT J. FRENCH, a citizen of the United States of America, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to heavier-than air flying machines and the principal object of the same is to produce a flying machine of the aeroplane type in which a novel combined supporting plane and rudder is provided and arranged at the forward end of the machine so that it is always in position to be seen by the aviator.

The invention also contemplates a novel main plane which is provided with balancing fins provided with movable sections adapted to be manipulated to deflect the air beneath the lowered end of the main plane to check tilting of the machine, the movable and stationary portions of the fins opposing "skidding" of the machine.

In addition to the foregoing prominent features, the invention contemplates the employment of propelling means which project beyond the rear of the machine, and novel supporting means for the machine when on the ground which also absorbs shocks and jars incidental to landing.

In carrying out the objects of the invention generally stated above it will be understood, of course, that the essential features thereof are necessarily susceptible of changes in details and structural arrangements, one preferred and practical embodiment of which is shown in the accompanying drawings, wherein:—

Figure 1 is a perspective view of the improved aeroplane. Fig. 2 is a bottom plan view. Fig. 3 is a view in side elevation. Fig. 4 is a transverse sectional view of the combined supporting plane and rudder. Fig. 5 is a fragmentary view in elevation showing the guiding means for the rear of the supporting plane and rudder. Fig. 6 is a plan view of a foot lever for controlling the tilting movements of the supporting plane and rudder. Fig. 7 is a fragmentary view showing a plate that controls the balancing fins, and a hand lever that controls the vertical movements of the supporting plane and rudder. Fig. 8 is a fragmentary sectional view showing the construction of the supporting plane and rudder. Fig. 9 is a detail fragmentary sectional view of the main plane and the fins carried thereby. Fig. 10 is a detail view of a yieldable pulley used in connection with the leads of controlling lines or cables.

Referring to the accompanying drawings by numerals, it will be seen that the improved aeroplane comprises an elongated frame formed of the spaced base members 1—2 which converge and have their forward ends fastened together. Said base members are connected at intervals by the transverse brace bars 3, and carry uprights 4 which are arranged in pairs the members of which converge and support the upper centrally located longitudinal frame member 5. The frame member 5 is in the form of an arch and the forward end 6 extends down to and is rigidly fastened to the forward ends of the base members 1 and 2. A resilient skid or runner 7 extends beneath the forward portion of the frame, the free end of said skid having a wire or other suitable connection 8 with one of the forward braces 3. Said skid serves as a support for the forward end of the frame when on the ground and the connection 8 permits resiliency thereto so that the shocks and jars incidental to traveling over the ground or when landing from a flight, are absorbed. The rear end of the plane is provided with similar skids or runners 9 the free ends of which are connected by an axle 10 that carries the wheels or rollers 11. Each skid or runner 9 has a wire or other suitable connection 12 with the base of the frame. The rear skids absorb the shocks and jars in the manner described in connection with the forward skid and when on the ground the wheels or rollers carry all the weight, but when landing heavily, the wheels rise or give, and the skids themselves come in contact with the ground and support all the weight, thus taking a too heavy strain off the wheels or rollers. The frame is made of light but strong material, such as bamboo, and the runners or skids are made of strong, but resilient material, such as hickory.

At the rear of the frame, a platform 13 is provided for the motor 14, the shaft 15 of which carries a sprocket wheel 16 that has a chain connection 17 with a propeller shaft 18 journaled in the rear uprights of the frame. Said shaft projects well beyond the rear end of the frame and has a pro-

peller 19 fast thereon. The motor 14 is controlled by means of a hand lever 20 pivotally mounted in the frame within easy reach of an aviator occupying the seat 21. Said lever 20 has a pivotal connection with the operating rod 22 of the motor 14. The rear end portion of the supporting frame carries standards 23 which support the transversely arranged main plane 24. Said main plane is preferably of a rectangular shape and projects well beyond each side of the supporting frame. Said plane is flat for a portion of its width and the rear thereof terminates in a downwardly curved edge. Adjacent each end, the main frame is provided with vertical fins 25 which project above and below the plane. The forward portions of the fins are flush with the forward edge of the plane and project above and below the same. Said fins have their outer edges on an incline, and their rear ends merge into the plane. Said fins are stationary, and obviously oppose lateral, or skidding movements of the aeroplane.

The plane 24 is provided with end skids or runners 26, which are the same as the described forward and rear skids or runners of the supporting frame and have a wire or other suitable connection 27 with the forward portion of the plane. Said skids or runners 26 are for the purpose of preventing the plane coming in contact with the ground in the event of the aeroplane landing while listed to either side.

The forward ends of the stationary fins 25 have an extension 28 hinged thereto that is preferably triangular in shape. Said extensions are primarily used to deflect air beneath the lowered end of the plane 24 so that a greater amount of air will strike the outer portion of the plane 24 and thereby right the aeroplane. To accomplish this, the extensions are simultaneously actuated in opposite direction so that the extension on the lower side of the plane will cause the air to flow beneath the lower portion of the plane and exert a lifting pressure thereon, while the extension at the opposite end of the plane causes the air to be deflected away from the other end of the plane. The extensions are operated by a plate 29 provided with a supporting bolt 30 that is detachably clamped to a bearing sleeve 31 rotatably mounted in a bearing 32 formed through one of the braces 3 that is adjacent the aviator's seat 21. Said sleeve is freely rotatable in the bearing 32 and the plate 29 that is carried thereby is normally retained in a vertical position. Said plate has a cable 33 extending therefrom which passes over idler pulleys carried by the supporting frame and connects with the extension at the right hand portion of the plane. A second cable 34 extends from the plate 29 and passes over idler pulleys and connects with the extension at the left hand portion of the plane. Said cables are arranged so that the pulls exerted on the extensions will swing said extensions simultaneously in opposite directions, and in addition to said cables, a coupling rod 35 connects said extensions. A hand lever 36 is pivotally connected to plate 29 and is used to retain said plate in a vertical position when the aeroplane tilts so that the cables 33 and 34 will rock the extension to positions that will right the aeroplane. The described manner of connecting the plate 29 to the sleeve that is freely rotatable in the transverse brace, obviously permits the plate to be retained in a vertical position irrespective of the angle at which the aeroplane is tilted.

The upright at the forward end of the supporting frame has a sleeve 37 rotatably mounted therein in which an eye-bolt 38 is clamped. The eye of said bolt is linked to the eye of a similar bolt 39 that is clamped to the central portion of the forward edge of a combined supporting plane and rudder 40. The described connection of the bolts 38 and 39 universally connects the plane 40 to the forward end of the supporting frame so that said plane can be rocked to steer the aeroplane in all directions. The center of the rear edge has a rearwardly projecting arm 41 that extends between two parallel guiding standards 42 carried by one of the forward braces 3 and the top member of the supporting frame. The outer end of said arm is capped by a rotatable ferrule 43 provided with oppositely located eyes 44 and 45. Eye 44 has one end of a cable 46 connected thereto, said cable passing over a pulley 47 carried by the upper member of the supporting frame and from said pulley extends to and is connected with the lower end of hand lever 36. Eye 45 has one end of a cable 48 fastened thereto, said cable passing over a pulley 49 fastened in the base of the supporting frame and extends to and is connected with the upper portion of hand lever 36. A turnbuckle 50 is swiveled to arm 41, said turnbuckle having a spring connection 51 with the base of the supporting frame. Said spring connection opposes the vertical movements of the plane upward and obviously the tension of said connection can be regulated by adjusting the turnbuckle. As will be understood from the foregoing, the rear of the plane 40 is adjusted vertically by rocking hand lever 36, the said plane being guided in the vertical movement by the standards 42.

In Fig. 10, a detail view of one of the pulleys used in connection with the manipulations of the plane 40 and the fins 28 is shown, said pulleys being preferably supported by the arms 52 which project from a

shank 53 that is slidable in a casing 54, said casing being provided with an end hook 55 or other suitable suspending means. The inner end of shank 53 is threaded for the reception of a nut 56 which holds an abutment washer 57 in position to receive one end of a spring 58 that is coiled about shank 53. Said spring, obviously yieldably opposes sliding movement of the shank 53 in one direction. The described type of pulleys are especially desirable for the reason that they will yield in the event of unusual pressure being exerted upon the plane such as might damage the same, and also for the fact that the springs will cause the pulleys to keep the cables taut.

A foot lever 59 is pivotally mounted on one of the braces 3 adjacent the aviator's seat 21. The ends of said lever project beyond the sides of the supporting frame. Cables 60 connect the ends of levers 59 with portions of the forward edge of the plane 40 on opposite sides of the universally connected center thereof. Said cables pass over pulleys 61 which are preferably the same as the pulleys at the rear of the plane, and are carried by the base of the supporting frame. It will be seen that by rocking lever 59, the plane may be readily tilted to steer the aeroplane horizontally, the necessary rotation being permitted through the rotary sleeve 30, and the rotary ferrule 43 carried by an arm 41.

From the foregoing description it will be apparent that this aeroplane provides means whereby the aviator can control the steering, propulsion, balance, and the means that prevent skidding from the seat 21, these parts of the invention being so arranged that but two hand levers and one foot lever are necessary.

In Fig. 4, a detail view of the combined rudder and supporting plane is shown to illustrate a preferred method of constructing the plane. Referring thereto it will be seen that the plane is composed of forward and rear edge bars 62 and 63 and connecting ribs 64 that are overlapped by sheets of veneer 65. The rearwardly projecting arm 41 may be formed by extending two of the veneer sheets and clamping them together intermediate their lengths, and at their ends by the rotary ferrule. The described frame is held assembled by the edge strap 66 which is fastened in position by screws 67, and is covered by suitable fabric 68 that is held in position by the wires 69 and staples 70. Said plane 40 is provided with centrally located upper and lower socket plates 71 in which the standards 72 are mounted. Said standards are provided with caps 73 from which the stays 74 radiate and connect with the edges of the plane.

The fins of the main plane are braced by the stays 75, and, as shown, in Fig. 9, they are preferably formed of fabric 76 which is stitched or otherwise fastened to the fabric covering of the main plane. Said main plane is preferably similar in construction to the combined supporting plane and rudder, and has the ends connected to the base members of the frame by the brace wires 77.

The wings of the aeroplane are generally called "planes", but in reality they are not plane surfaces since they are curved or arched so that the surface underneath is concave, and on top convex. This curvature is necessary in order to utilize more fully the air currents which are deflected downward by the forward part of the wing. The efficiency of the wings depends on two things: (1) the "angle of attack" (angle at which the wing is set as viewed from the side) and (2) the curvature. The angle of attack is obtained by so attaching the wing to the supporting frame; the curvature is obtained by so constructing the ribs.

In my invention I undertake to combine the angle of attack and the curvature as follows: The front part ($\frac{1}{6}$ say) of the wing is flat, then the curvature begins, curving back and down throughout the remainder of the wing. The curvature may be either circular or parabolic but it is so regulated that the rear beam is brought down well below the front beam. Then the line through both beams is the "angle of attack."

By the word "aeroplane" herein used, I desire to include all types of flying machines wherein these principles may be embodied.

What I claim as my invention is:—

1. An aeroplane comprising a supporting frame, a main plane arranged transversely of the rear portion thereof, vertical fins arranged transversely of the end portions of said plane, righting extensions hinged to said fins, a propeller projecting beyond the rear of said plane, and a combined supporting plane and rudder carried by the forward portion of said frame.

2. An aeroplane comprising a frame, a rear plane carried thereby, fins carried thereby for lessening skidding, means carried by said fins for righting the aeroplane when tilted, steering means carried by the frame, and propelling means also carried by the frame.

3. An aeroplane comprising a frame, a main plane carried by the rear thereof, vertical fins carried by the end portions of said plane, extensions carried by said fins for righting the aeroplane when tilted, combined steering and supporting means carried by the frame, and propelling means also carried by the frame.

4. An aeroplane comprising a frame, a main plane carried thereby, righting fins carried by the main plane, fin extensions hinged to said fins, means connecting said

extensions to cause the same to operate simultaneously, combined steering and supporting means carried by said frame, and propelling means also carried by said frame.

5. An aeroplane comprising a frame, a main plane therefor, vertical fins carried by said plane, deflecting extensions hinged to said fins, a coupling for said extensions, means controlled from the frame for operating said extensions, steering means carried by said frame, and propelling means also carried by said frame.

6. An aeroplane comprising a frame, a main plane therefor, skidding reducing fins carried by said plane, righting extensions hinged to said fins, a plate rotatably connected to said frame, cable connections between said plate and said extensions, a lever for holding said plate in a vertical position while the frame is tilted, steering means carried by said frame, and propellng means also carried by said frame.

7. An aeroplane comprising a frame, a main plane carried thereby, fins carried by said plane, righting extensions carried by said fins, a hand lever controlling the operation of said extensions, a combined plane and rudder carried by said frame, means operated by said lever for controlling the vertical steering of said plane, independent means for controlling the horizontal steering of said plane, and propelling means carried by said frame.

8. A flying machine comprising a supporting frame including upper and lower longitudinally arranged members, a steering plane having its forward edge universally connected to the forward end of said supporting frame, a resilient connection between the rear edge of said plane and the lower members of said supporting frame to normally retain the plane at right angles to the supporting frame, means for manually operating said plane, fixed sustaining means at the rear end of said supporting frame, and propelling means at the rear end of said frame.

9. An aeroplane comprising a frame formed of spaced parallel base members, an upper member, brace connections between the base and the upper members, a vertical standard at the front of said frame, and vertically arranged parallel guiding standards at the front portion of said frame; a steering plane extending transversely of said frame between the front and the guide standards, means for universally connecting the front edge of said plane to the front standard, an arm carried by the rear edge of said plane and projecting between the guiding standards, means for adjustably and yieldably connecting the rear of said plane to said frame, means for operating said plane for vertical steering, independent means for operating said plane for horizontal steering, and fixed sustaining means carried by said frame.

10. An aeroplane comprising a supporting frame, a steering plane universally connected to the forward portion thereof, means for operating said plane for vertical steering, means for independently operating said plane for horizontal steering, a fixed plane at the rear of said frame, vertically arranged fins extending transversely across said fixed plane, righting extensions hinged to the forward ends of said fins, a coupling connecting said fins, and means operable from said frame for simultaneously actuating said extensions.

11. An aeroplane comprising a supporting frame having a vertical standard at the front thereof and guide standards adjacent said front standard; a bearing sleeve rotatable in said front standard, an eye clamped to said sleeve, a steering plane extending across said frame between the front and the guide standards, an eye carried by the front edge of said plane and linked to the eye of said bearing sleeve, an arm projecting from the rear of said plane and extending between the guide standards, yieldable means for adjustably connecting said arm to said frame, means operable from the frame for adjusting said plane for vertical steering, means operable from said frame for adjusting said plane for horizontal steering, and fixed sustaining means carried by said frame.

12. An aeroplane comprising a supporting frame including a vertical front standard, a laterally projecting eye rotatably connected to said standard, spaced parallel vertical guiding standards carried by the front portion of said frame, a steering plane extending transversely of said frame between said front and guiding standards, an eye carried by the central portion of the front edge of said plane and linked to the eye of the front standard, an arm projecting centrally from the rear edge of said plane and movable between the guiding standards, yieldable means for adjustably connecting said arm to said frame, means for operating said plane for vertical steering, means for operating said plane for horizontal steering, and fixed sustaining means carried by said frame.

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

HERBERT J. FRENCH.

Witnesses:

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