F. L. SMITH.

FLYING MACHINE.

APPLICATION FILED SEPT. 12, 1911.

1,043,636.

Patented Nov. 5, 1912.

3 SHEETS—SHEET 1.

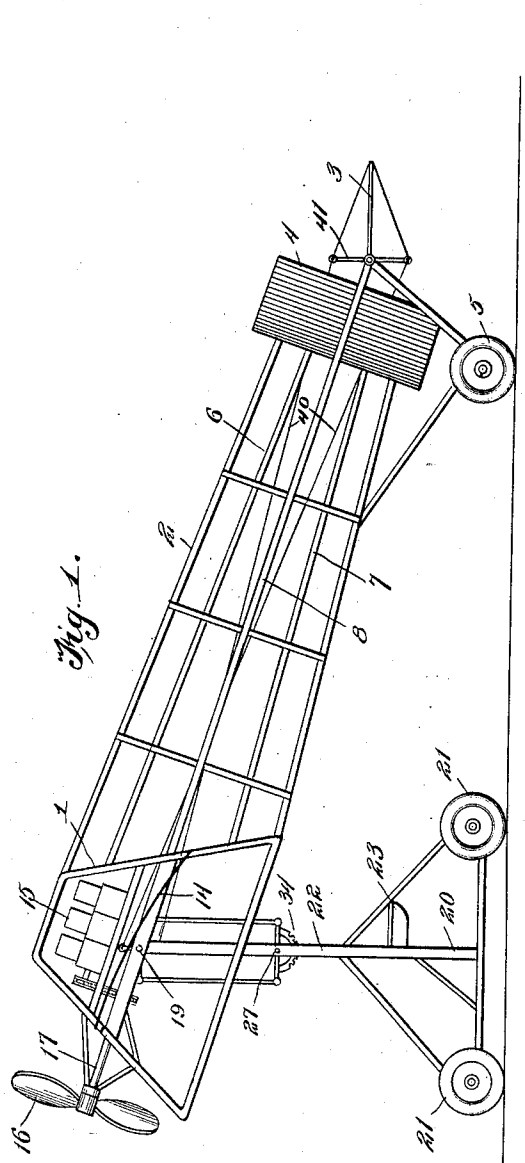

Fig. 1.

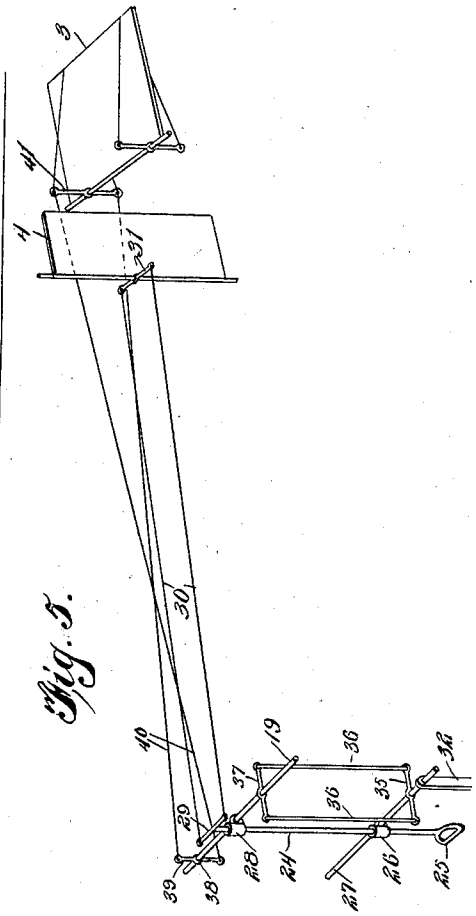

Fig. 5.

Witnesses

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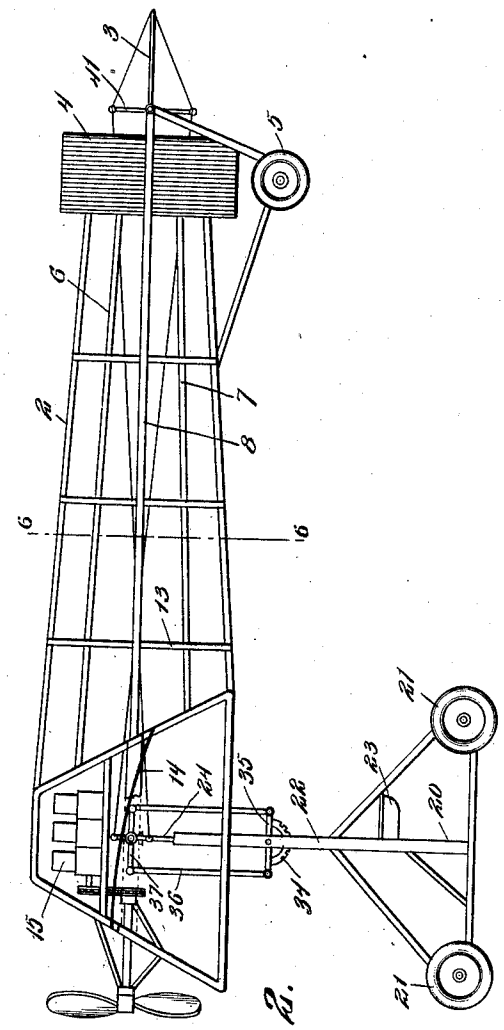

Fig. 2.

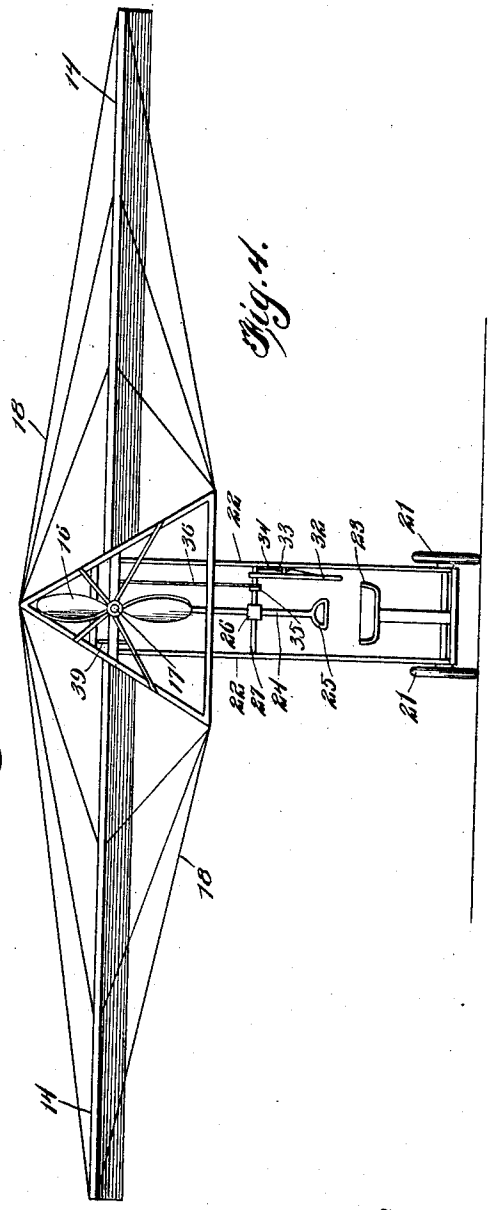

Fig. 4.

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3 SHEETS—SHEET 3.

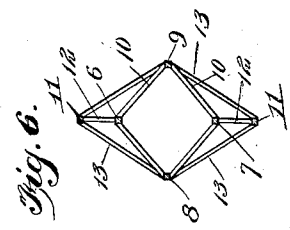

Fig. 6.



Fig. 3.

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# UNITED STATES PATENT OFFICE.

FRED L. SMITH, OF SALT LAKE CITY, UTAH.

## FLYING-MACHINE.

1,043,636. Specification of Letters Patent. Patented Nov. 5, 1912.

Application filed September 12, 1911. Serial No. 648,860.

*To all whom it may concern:*

Be it known that I, FRED L. SMITH, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to flying machines of the monoplane type, and particularly to a novel construction of frame for such machines and novel means for automatically balancing the same longitudinally or in a fore and aft direction, the object of the invention being to provide a flying machine of the aforesaid type which embodies a strong and durable construction of frame and in which the weight of the carriage and pilot operates as a pendulum controlling the horizontal rudder, whereby when the machine tilts in one direction or other the rudder will be automatically adjusted to bring the machine back to a normally balancing position.

A further object of the invention is to provide simple and effective means for manually controlling the horizontal and vertical rudders.

The invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings in which:—

Figure 1 is a side elevation of the machine in its standing attitude. Fig. 2 is a similar view of the machine in its flying attitude. Fig. 3 is a top plan view of the machine. Fig. 4 is a front elevation of the same. Fig. 5 is a diagrammatic perspective view of the steering and stabilizing mechanism. Fig. 6 is a vertical transverse section on line 6—6 of Fig. 2.

Referring to the drawings, 1 designates the main frame of the machine, and 2 the tail frame thereof, at the rear end of which latter are arranged the horizontal rudder 3, a vertical rudder 4 and a trail wheel or equivalent support 5 which rests upon the ground and supports the weight of the tail frame when the machine is at rest or in a standing attitude. The rudders 3 and 4 may be of any ordinary form or construction, and as shown are respectively mounted to swing vertically and laterally. The main frame is approximately of frusto-pyramidal form and the tail frames are approximately of diamond form in cross section, the tail frame preferably consisting of a continuation of the body of the main frame. As shown, the tail frame consists of upper, lower and side bars 6, 7 8 and 9, connected at intervals by inclined bars 10, forming a skeleton or open work diamond-shaped structure. Above and below the body of the frame extend longitudinal reinforcing bars 11 connected at intervals with the bars 6 and 7 by uprights 12 and with the bars 8 and 9 by inclined rods 13. A frame structure is thus provided which is of great inherent strength, and in which the parts are so connected as to mutually stay and reinforce each other.

The main frame supports the wings of the supporting plane or surface 14, the motor 15, the driving propeller 16, and the propeller shaft 17, which latter may be either directly or indirectly driven from the motor. The wings 14 may be of any suitable construction and are reinforced from the main frame by suitable guy wires or stays 18. These wings may embody any desired or conventional fore and aft curvature. A transverse rod or shaft 19 is carried by the main frame and is arranged approximately in line with the longitudinal centers of the wings 14, and at or about the point where the centers of gravity and pressure coincide when the machine is in flight.

Arranged below the front portion of the body of the main frame is a chassis or carriage 20, of any suitable construction, which is provided with front launching and landing wheels 21 arranged to coöperate with the trail wheel 5 to support the machine when at rest, as shown in Fig. 1. In this standing position or attitude of the machine, the main frame and planes are arranged at an angle of 30°, more or less, to the horizontal for ascent after making the usual preliminary run. When the machine is in flight, it takes the position or attitude shown in Fig. 2, in which the body of the machine travels horizontally and the chassis or carriage vertically, or perpendicular thereto, at all times when the machine is longitudinally balanced. In landing, the wheels 21 first come in contact with the ground and sustain the shock of impact, after which the main frame tilts to the position shown in Fig. 1, bringing the wheel 5 in contact with the ground to sustain a portion of the weight. The wheels are suitably cushioned in practice to effectually cushion and withstand all

vibrations, shocks and jars to which they are subjected in the launching and landing operations. The chassis or frame includes suspending rods 22 which pivotally engage the rod or shaft 19, permitting the carriage to have fore and aft movement relative to the gliding structure formed by the main frame, planes, etc., and vertical tilting motion of the gliding structure relative to the carriage, which latter is normally maintained in a vertical position by gravity. The carriage supports the aviator's seat 23, whereby the weight of the aviator is added to that of the carriage to prevent swinging motion of said carriage beyond the perpendicular under the action of gusts of air. The carriage also supports a vertical rod or shaft 24 provided at its lower end with a grip or operating member 25, said rod or shaft being journaled in a bearing sleeve 26 loose on a cross rod 27 secured to the frame of the carriage, and at its upper end in a bearing collar 28 loosely engaging the rod or shaft 19, whereby the gliding structure is adapted to swing without interference from the said vertical shaft 24, and the latter is adapted to be turned laterally in either direction. Laterally extending crank arms 29 are secured to the upper end of the shaft 24, and these arms are connected by wires or cables 30 with crank arms 31 on the vertical rudder 4, so that by turning the operating member 25 in one direction or the other said rudder may be shifted to steer the machine to the right or left horizontally.

Fixed to the rod 27 is a controlling lever 32 movable in a fore and aft direction and provided with a spring actuated pawl or dog 33 to engage a rack 34 on the carriage frame, whereby said lever may be locked in adjusted position and held normally fixed against pivotal movement.

On the rod or shaft 27 are forwardly and rearwardly extending crank arms 35 which are connected by wires or cables 36 with corresponding crank arms 37 on the rod or shaft 19. Said rod or shaft 19 is also provided with vertical arms 39 connected by crossed rods or wires 40 with crank arms 41 on the horizontal rudder 3, whereby through reverse shifting movement of the lever the horizontal rudder may be adjusted upward or downward to steer the machine in a vertical plane.

It will be understood from the foregoing description that when the lever is arranged in normal position the rudder 3 will be set horizontally to maintain flight in a straight line, but that by shifting said lever forwardly or rearwardly the rudder may be adjusted to steer the machine either upward or downward, the operator thus having complete manual control over the tilting motion of the gliding structure in a vertical plane at all times, so that the machine may be caused to ascend or descend and said gliding structure adjusted relative to the carriage to maintain the longitudinal balance, irrespective of the automatic action of the balancing mechanism. It will also be seen that under normal flying conditions the gliding structure is free to tilt vertically about the rod or shaft 19 as an axis relative to the carriage, which maintains a perpendicular position, so that through the relative movements thus set up the horizontal rudder will be tilted upward or downward to a degree commensurate with the tilting motion of the gliding structure to restore the latter, when unbalanced, to a balanced position. By these means the longitudinal balance of the machine is automatically maintained in an effective manner, while at the same time, and through the same set of connections, the operator is enabled to manually control the motion of the gliding structure in a fore and aft direction for vertical steering or to temporarily hold said gliding structure in a non-balanced position, as circumstances may require in the operation of the machine.

Having thus described my invention, what I claim as new is:

1. In a flying machine, a main frame, a tail frame of diamond form in cross section and composed of top, bottom and side bars, connected at intervals by angularly disposed cross bars, longitudinal brace bars arranged above and below said top and bottom bars, inclined braces connecting the same with the side bars, and vertical braces connecting the same with the top and bottom bars.

2. In a flying machine, a main frame of approximately pyramidal form, a tail frame extending from said main frame, said tail frame being of diamond-form in cross section and composed of top, bottom and side bars, connected at intervals by angularly disposed cross bars, longitudinal brace bars arranged above and below said top and bottom bars, inclined braces connecting the same with the side bars, and vertical braces connecting the same with the top and bottom bars.

3. In a flying machine, the combination of a carriage, a pair of superposed transverse shafts mounted upon the carriage, a gliding structure pivotally mounted to tilt vertically relative to said carriage on the upper transverse shaft, a horizontal rudder carried by the gliding structure, means influenced by a rocking motion of the upper transverse shaft or a pivotal motion of the gliding structure thereon for adjusting said horizontal rudder, and manually operable means for rocking said upper shaft.

4. In a flying machine, a carriage, upper and lower transverse shafts mounted thereon, a gliding structure mounted to tilt vertically upon the upper transverse shaft, a horizontal rudder carried by the gliding

structure, connections between the rudder and upper transverse shaft whereby a rocking motion of said shaft or pivotal motion of the gliding structure thereon will adjust said rudder, crank arms upon the respective transverse shafts, connections between said crank arms, and means for rocking the lower shaft for manually transmitting rocking motion to the upper shaft.

5. In a flying machine, a carriage, upper and lower transverse shafts mounted on the carriage, a gliding structure pivotally mounted upon the upper shaft, a horizontal rudder carried by the gliding structure, connections between the rudder and upper transverse shaft whereby a rocking motion of the shaft or pivotal movement of the gliding structure thereon will adjust said rudder, bearings supported by said shaft, a vertical shaft journaled in said bearings, a vertical rudder upon the gliding structure, and means operated by said vertical shaft for adjusting said vertical rudder.

6. In a flying machine, a carriage, a pair of superposed transverse rock shafts mounted on the carriage, a gliding structure pivotally supported by the upper transverse shaft, vertical and horizontal rudders carried by said gliding structure, connections between the horizontal rudder and upper transverse shaft, whereby a rocking motion of said shaft or pivotal motion of the gliding structure thereon will adjust said horizontal rudder, means for manually rocking the lower transverse shaft, means for communicating rocking motion therefrom to the upper transverse shaft, bearings supported by said shafts, a vertical shaft journaled in said bearings, and connections between said vertical shaft and the vertical rudder.

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

FRED L. SMITH.

Witnesses:
WM. R. HALL,
ERNEST RIDD.