T. A. SNYDER.

AEROSTRUCTURE.

APPLICATION FILED MAR. 29, 1910.

1,007,810. **Patented Nov. 7, 1911.**

4 SHEETS—SHEET 1.

Fig. 1.

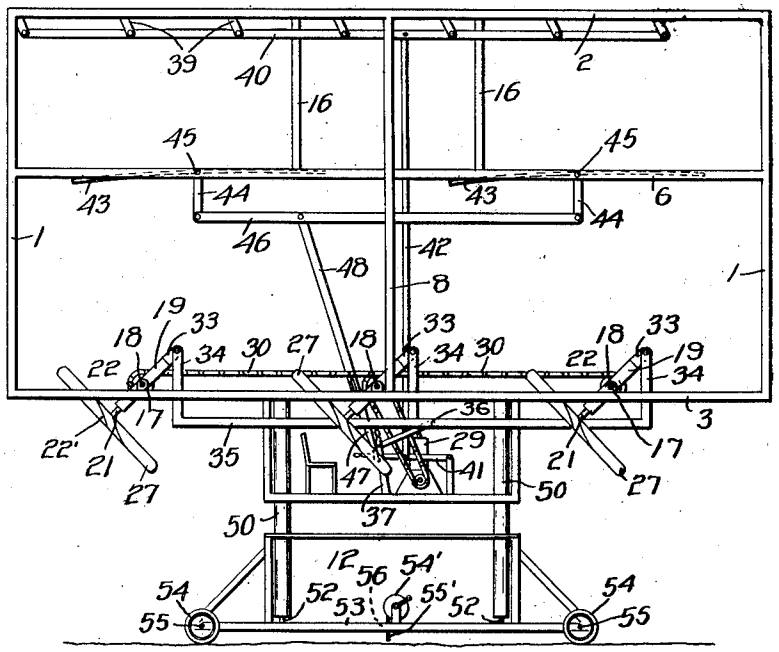
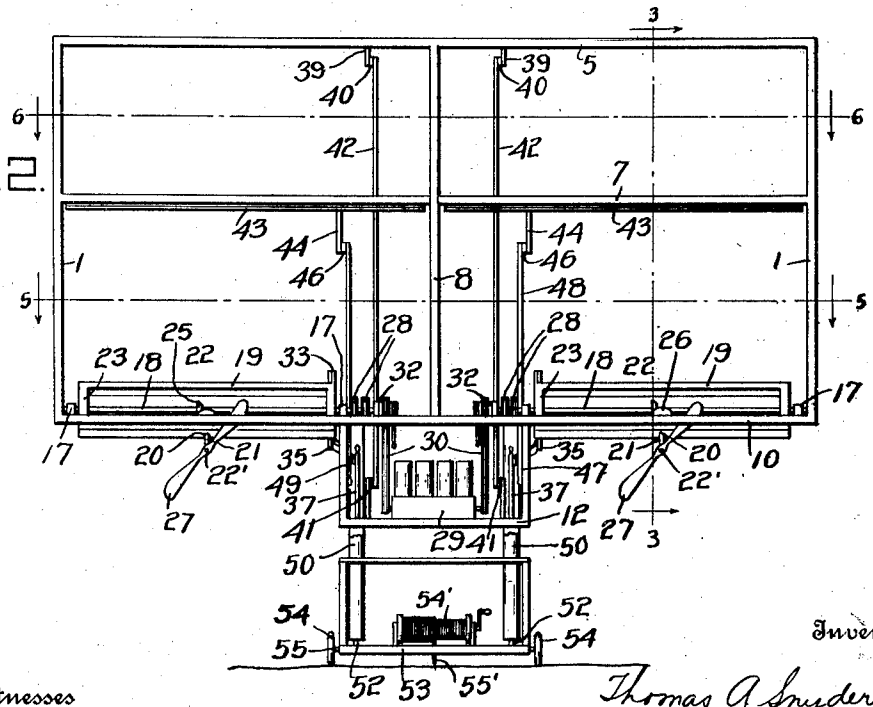


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3.

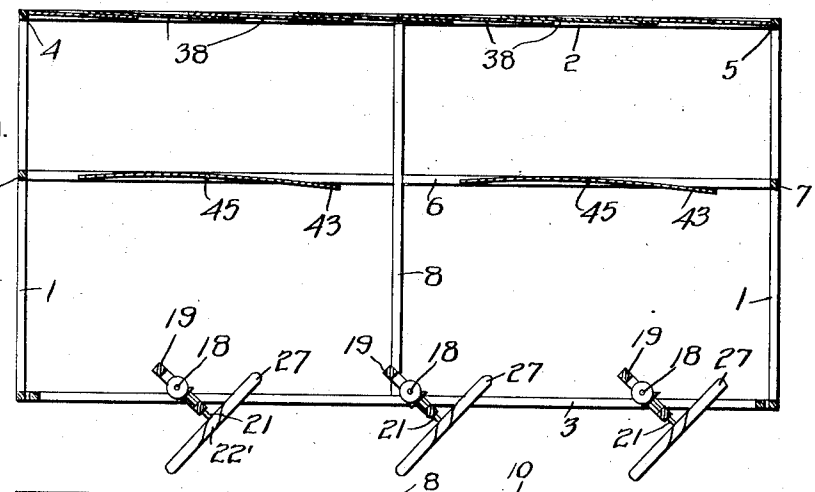
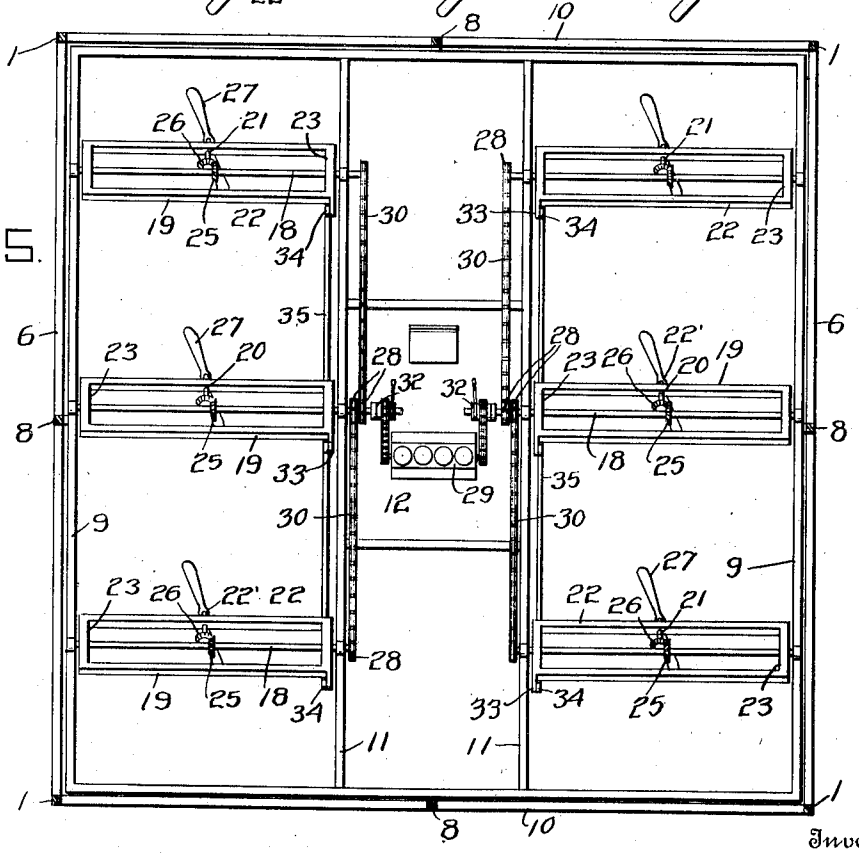


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 4.

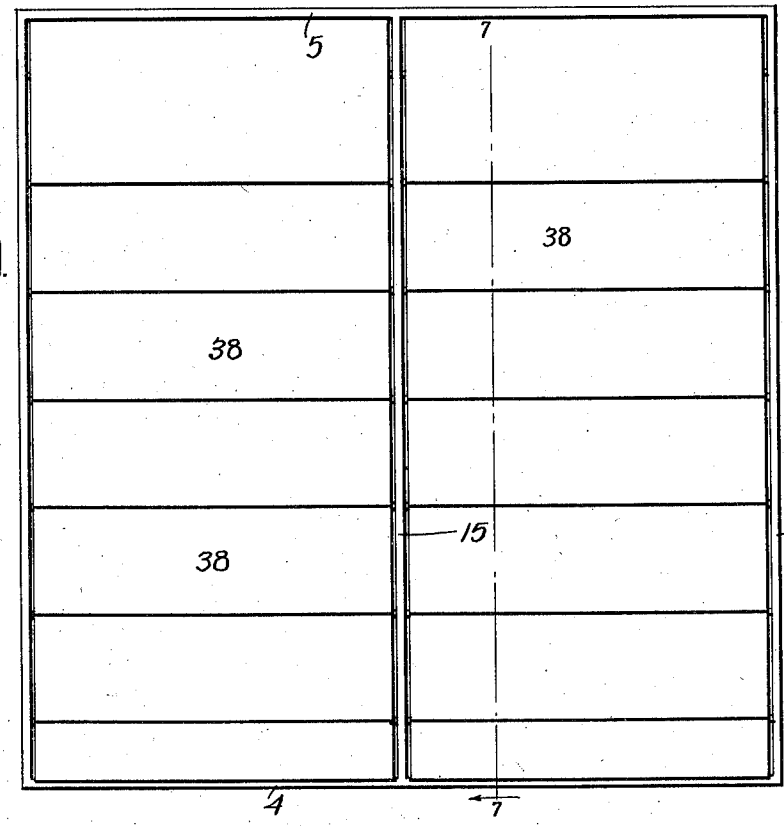
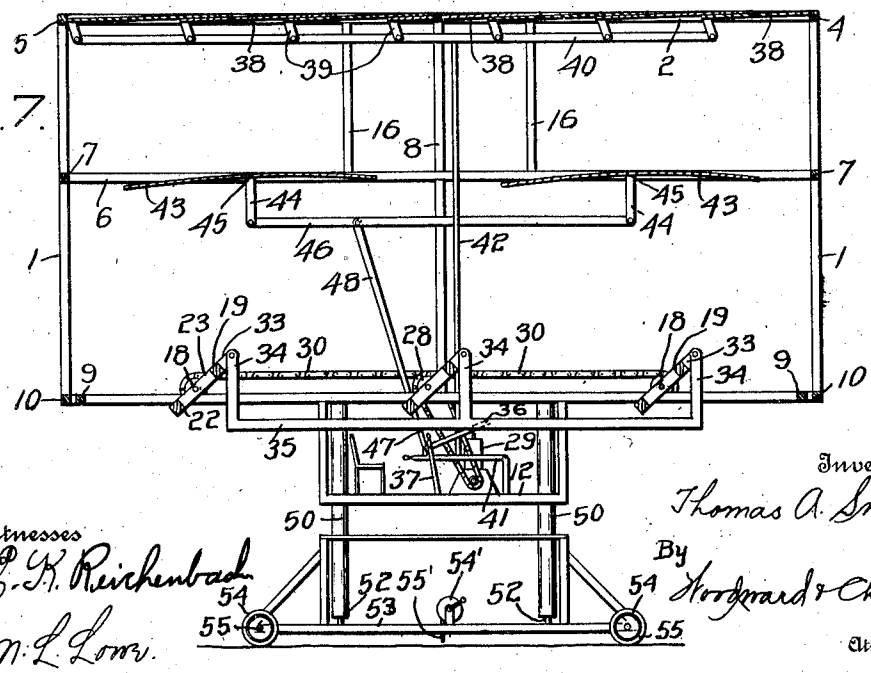


Fig. 7.



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4 SHEETS—SHEET 4.

Fig. 6.

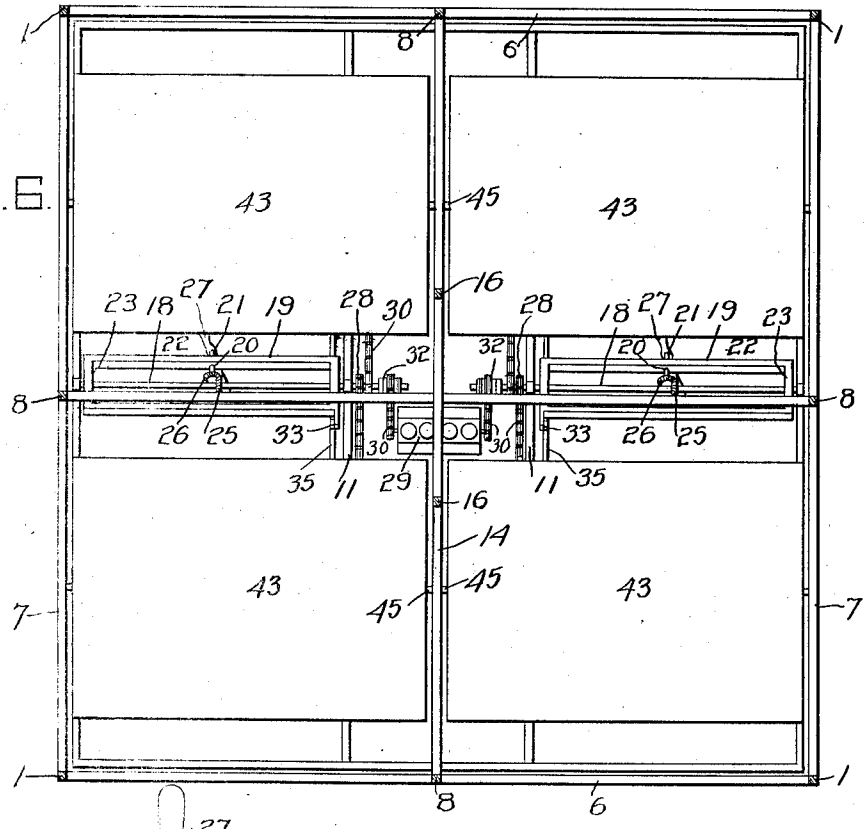


Fig. 8.

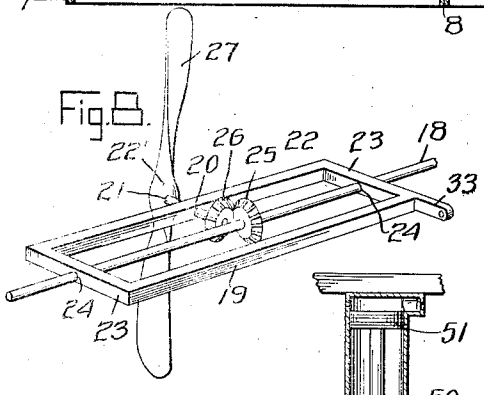


Fig. 9.

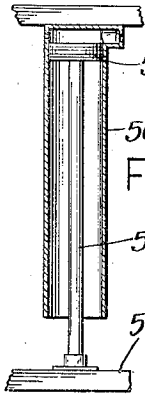
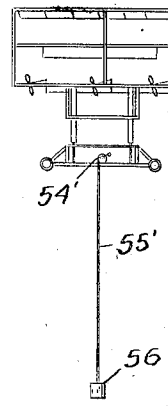


Fig. 10.



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UNITED STATES PATENT OFFICE.

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AEROSTRUCTURE.

1,007,810. Specification of Letters Patent. Patented Nov. 7, 1911.

Application filed March 29, 1910. Serial No. 552,141.

To all whom it may concern:

Be it known that I, THOMAS A. SNYDER, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Aerostructures, of which the following is a specification.

This invention relates to improvements in aerostructures, and has for one of its objects to provide a structure of this class, which combines the advantages of the aeroplane and the helicopter, and the principle of the parachute.

Another object of this invention is to provide an aerostructure, having a plurality of superimposed lifting planes, the superimposed planes to sustain the machine, and the subimposed planes to serve as the elevators.

A further object is to provide a machine of this class, having a set of jalouised or overlapping plane sections, which are adapted to be tilted to assist the upward glide of the machine, and tightly overlapped to form a solid or parachute surface. This is to prevent the too rapid descent of the machine, and supports the larger part of the weight of the aerostructure.

A still further object is to provide an aerostructure having a cushioning means thereon to take up the shock of landing.

A still further object is to provide a machine having a double series of helicopters, which are adapted to be driven backward or forward to steer the machine, and each series of which is controllable independently of the other.

Another object is to provide a balancing means suspended from the lower center of the aerostructure, which may be raised and lowered from the car to increase or diminish the distance of the weight below the car of the machine.

With these and other objects in view, the invention consists in the construction, combination and arrangement of parts, as will be more fully hereinafter described and particularly pointed out in the claims, but it will be understood that changes in the specific structure may be made within the scope of the claims, without departing from the spirit of the invention.

In the accompanying drawings, in which is illustrated an aerostructure formed in accordance with the preferred embodiment of my invention, Figure 1 is a side elevation of the aerostructure, Fig. 2 is an end elevation of the aerostructure, Fig. 3 is a section on the line 3—3 of Fig. 2, Fig. 4 is a top plan view of the aerostructure, showing the upper planes, Fig. 5 is a section on the line 5—5 of Fig. 2, Fig. 6 is a section on the line 6—6 of Fig. 2, Fig. 7 is a section on the line 7—7 of Fig. 4, Fig. 8 is a detached view in perspective of one of the helicopters and its hanger, Fig. 9 is a vertical sectional view of the cushioning means, and Fig. 10 is a detail view of the balancing device.

Referring now more particularly to the drawings, in which is illustrated my invention, it will be seen that the aerostructure comprises a frame-work, which is composed of any suitable, but light and durable material. The frame-work has the corner standards 1, connected near their upper and lower ends by the stringers 2 and 3, disposed at the side thereof, and the end stringers 4 and 5. Midway between the stringers aforesaid, are the stringers 6 and 7, and parallel to and intermediate of the standards 1 are the additional standards 8. Suitably secured to and spaced away from the lower stringers 3 are the helicopter supporting strips or stringers 9, secured at their front and rear ends to the stringers 10.

Secured to the front and rear stringers 6 are the supporting strips 11, to which is secured and suspended therebelow, the motor carrying car 12. Immediately above the strips 11, and secured to the front and rear stringers 6 is a longitudinally disposed strip 14, which is parallel to and directly beneath another similar strip 15, and spaced apart from said strip 14 by the supports 16. At equal distances along the side stringers 9, and at corresponding points on the outer of the strips 11, are located the shaft carrying supports 17. Rotatably mounted in the supports 17, and extending laterally of the frame of the aerostructure, are the helicopter driving shafts 18.

Mounted to swing on the shafts 18, are the helicopter carrying frames 19, on one side of which is positioned the boxings 20 for the stub shafts 21 of the helicopters, 22, which are arranged in two longitudinal series. The frames 19, are provided with the hangers 23 at opposite ends thereof, and said hangers are perforated as at 24, for the accommodation of the shafts 18.

Keyed to each of the shafts 18, about midway between the side members of the frames

19, are the beveled pinions 25, adapted to mesh with the beveled pinions 26, on the stub shafts 21 of the helicopters. On the outer end of the shaft 21, is a hub 22′, carrying the propeller blades 27 of the helicopters, and also keyed to the shafts 18 are the sprockets 28, geared to the engine 29, located in the car 12, by means of the chains 30. Either one or all of the shafts 18 is divided, and has mounted at the junction thereof, clutches 32, by means of which the set of helicopters on one side of the machine may be thrown out of gear, when it is intended to make a turn. Each of the frames 19 has a crank arm 33, extending forwardly therefrom, and pivotally connected to the free member 34 thereof is a connecting rod 35, which runs fore and aft of the machine. Each set of helicopter frames is connected in the same way, and at a point 36, on each of the connecting rods is pivotally connected an operating hand lever 37, by means of which the aviator may swing the frames 19, up or down, between the horizontal and the depending vertical. Thus the helicopters are adapted to be swung so as to exert a lifting force to the machine, or when the machine has attained a sufficient height, may be swung to horizontal position for driving.

Journaled in the upper stringers 2 and 3, are the overlapping planes 38, which are each provided with a vertically depending link 39, which is pivotally connected to a longitudinally arranged connecting rod 40. These planes are in two sets, one on each side of the top of the frame of the machine, and each connecting rod is suitably connected to a controlling lever 41, by a link 42, which lever is mounted on the frame-work above the car 12. These planes 38 overlap approximately half of each other, and when closed form a parachute surface. When rising from the ground, these planes are tilted at an angle to provide a series of lifting plane surfaces. Also journaled in a like manner to the stringers 6, and on either side of the center of the machine frame-work, are the lifting planes 43, which have the depending arms 44, keyed to their shafts 45 at their inner ends. These arms are pivotally secured to a fore and aft connecting rod 46, which is connected to a controlling lever 47, by the link 48. The fore and aft planes on the one side of the machine are controllable from the lever 47, and those on the other side are controllable from the lever 49. This makes it possible to tilt one set of planes up and the other down when regaining the balance of the machine.

To take up the shock of alighting, I have provided a plurality of upright cylinders 50, in which are positioned the pistons 51, the rods of which extend downward below the frame-work of the machine. The rods 52 of the pistons have secured to their lower ends, the frame of a second car 53. This car is adapted to carry passengers, or freight, and is provided with the wheels 54, by means of which the machine is moved along the ground. The wheels are mounted on the axle 55, secured to the car in any suitable manner. When the aerostructure rises from the ground, the weight of the car 53 will cause the pistons to slide out and suspend the car the length of said piston rods, below the car 12. When the car alights, the wheels of the car 53 will engage the ground, and telescope the pistons within the cylinders 50, thus bringing the car 53 up to the car 12. The air in the cylinders is allowed to escape, gradually, so as to take up the shock of the contact. As seen in the drawings, I have provided four of these cylinders, or cushioning means, disposed at the four corners of the car 12. It will of course, be understood that I can use more or less than this number, if I so desire, the present number being shown for simplicity.

Suitably mounted in the floor of the car 53, and in the exact center thereof, is a windlass 54′, around which is wound a cable 55′, of any suitable construction, or material. This cable is let down through an opening 56 in the bottom of the car 53, and has a weight secured at its lower end as at 56.

It is well known that in the ordinary parachute, that the supporting element is a simple flexible silk or other suitable plane, below which is suspended the seat on which the aviator sits. Further, the farther below the plane that the weight of the aviator is placed the better is the balance of the craft. This principle is applied in the construction of the machine of the present application. The planes 38, when closely overlapped, form the supporting plane of the parachute, and the weight 56 corresponds to the aviator of the parachute. The weight is raised or lowered from the car by means of the windlass, and when in flight, it becomes necessary to lower the weight, 56 for instance, when the aerostructure is tossed by counter currents of air, the structure will be more evenly balanced and less likely to tip in any direction, or turn over.

The entire framework of the aerostructure is suitably braced and guyed.

The operation of the aerostructure may be stated as follows: When it is desired to raise the machine from the ground, the helicopters are tilted downward, and the planes 38 and the lifting planes 43, also tilted, and the motor started. The helicopters will rapidly revolve, and by means of the slant of the planes, the aerostructure will rise from the ground, and continue to rise, until the planes are brought to the horizontal, and the helicopters turned with their frames to the level. In this position the helicopters are then converted into driving propellers,

and drive the aerostructure forward. As the machine leaves the ground the car 53 will fall with the pistons until it is clear of the ground and suspended from the car 12, or motor car. When the car 53 has left the ground, the cable 55′ is unwound from the drum of the windlass 54′, to provide the proper balance to the structure, and the more unsteady the machine seems to be, the lower the weight 56 is dropped. The weight being suspended from the exact center of the car, will form, with the entire aerostructure, a parachute.

The steering is effected in the following manner: When it is desired to turn in one direction, the helicopters on the near side of the machine are thrown out of gear by the clutches of their shafts, and those on the out side of the machine are left in operation. Thus the aerostructure will swing around on the silent propellers or helicopters, and change the course of the machine.

Should anything happen to the motor or to any of the mechanism on the machine which would cause a precipitate drop, the planes 38 are tightly closed to present a parachute surface, and the weight 56 let out to its full length. This will exert a greater pull on the center of the structure, and consequently change the balance, bringing the machine to a center.

From the foregoing, it will readily be seen that I have provided an aerostructure, on a very simple principle, and which combines the helicopter, and the supporting plane features. By means of the helicopters, I am enabled to rise from the ground without using a launching apparatus, and make use of them for propelling the machine. Also efficient means are provided for steering and balancing the machine.

What is claimed is:

1. In an aerostructure, the combination with a frame having parallel series of overlapping planes, in the upper portion thereof, elevating planes below the overlapping planes, shafts mounted on the frame of the aerostructure, frames mounted to swing on said shafts, and helicopters on said frames and driven by said shafts.

2. In an aerostructure, the combination with a frame having parallel series of overlapping planes forming a parachute surface, independently controlled lifting planes below the overlapping planes, shafts mounted in the frame of the aerostructure, pinions on the shafts, said shafts arranged in independent series, supporting frames mounted to swing on said shafts, stub shafts journaled in the frames, and propellers on the stub shafts adapted to be driven by the first-named shafts.

3. An aerostructure comprising a frame, parallel series of overlapping planes rotatably mounted in the upper portion of the frame, lifting planes inferior in relative position with the overlapping planes and arranged in parallel series and independently controllable, a plurality of series of helicopters mounted in the frame and adapted to swing on shafts mounted in the frame, and cushioning means positioned in the center of the frame of the aerostructure, said cushioning means being provided with means for engaging the ground.

4. An aerostructure comprising a frame, overlapping planes, links on the planes, a rod connecting the links, a lever for simultaneously controlling all of the said overlapping planes, a plurality of series of inferiorly arranged lifting planes, connections between the planes, levers pivoted to said connections whereby the planes of one series are controllable independently of the others, and independently controllable series of swinging helicopter carrying frames mounted in the lower portion of the aerostructure.

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

THOMAS A. SNYDER.

Witnesses:
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M. L. LOWE.