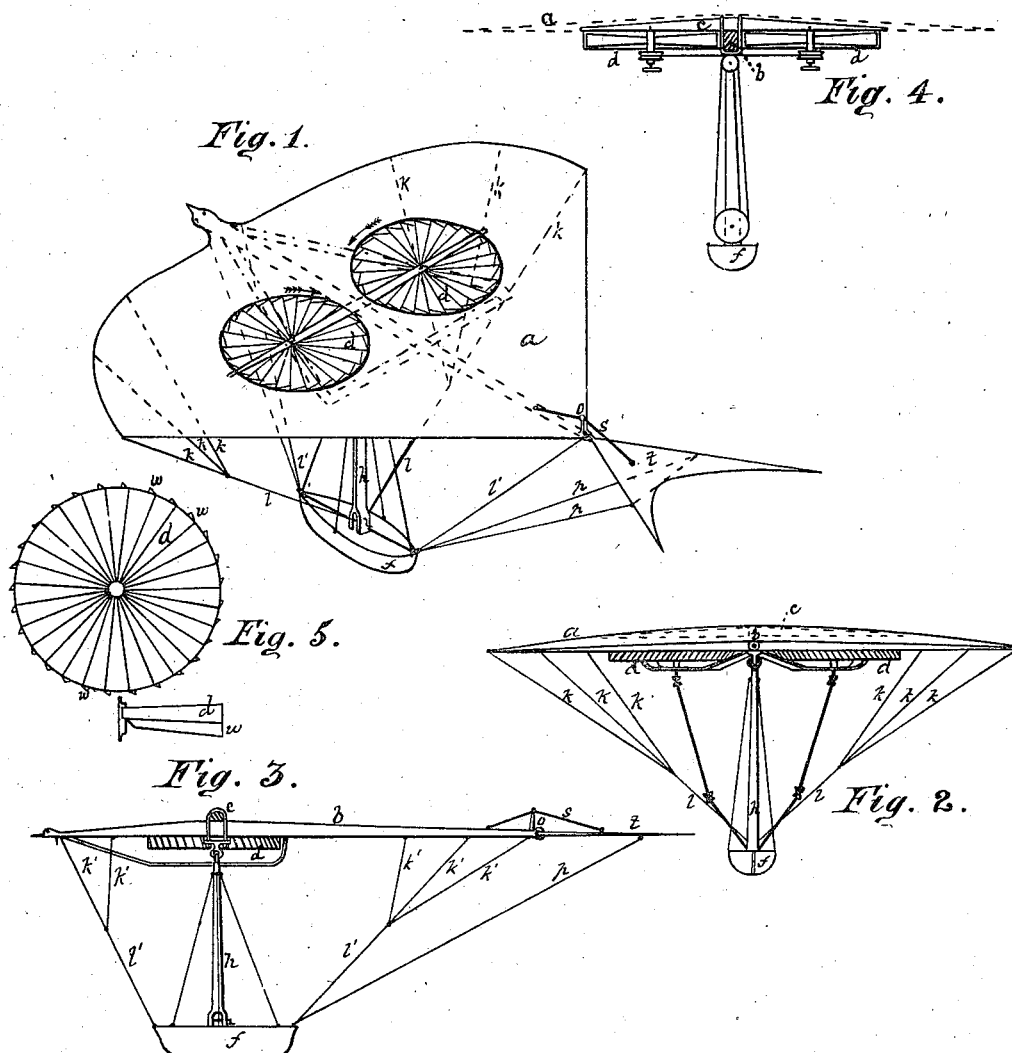


J. J. GREENOUGH.

Aerob at.

No. 220,473.

Patented Oct. 14, 1879.



Witnesses :

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JOHN J. GREENOUGH, OF SYRACUSE, NEW YORK.

IMPROVEMENT IN AEROBATS.

Specification forming part of Letters Patent No. **220,473**, dated October 14, 1879; application filed September 16, 1879.

To all whom it may concern:

Be it known that I, JOHN JAMES GREENOUGH, of Syracuse, New York, have invented a new and Improved Device for Navigating the Air, which I denominate an "Aerobat," of which the following is a specification.

With my device no balloon is used of any form, the load being carried by mechanical force, a light rigid extended plane being used as a sustaining-surface to support the load, with the least attainable surface opposed to the ordinary horizontal currents.

It has been the practice to connect aerostats and their loads by means of nets and cords or other flexible connections, and an attempt has been made to hold balloons of peculiar form at varied angles to the horizon, and in one instance a horizontal rectangular sail has been suspended to a balloon, between it and the basket, with cords to cant it into various angles to act as a sail in guiding the balloon, but not intended to sustain the load. None of these devices are mine, or for the same purpose as my aerobat. None of them have a rigid articulation between the supporter and the load, so as to keep the two points at all times equidistant, or brace the guys securely that strengthen and sustain the poiser at all times without regard to the weight of the load—a matter of great importance in supporting the light material of which the poiser is made against injury or rupture.

The purposes of my invention are to give great stability and strength to the poiser or wings that sustain the load, and to furnish a ready means to transfer the air in which it floats from above to below said poiser; also, to readily change the relative angle of the plane of the poiser or wings to the weight or body suspended thereto in any direction, with ease and rapidity, by so uniting them as to effect this purpose; also, to so articulate the tail or rudder with the end of the backbone or rear point of the poiser by a single point of support as to have a free movement in all directions required, guided and braced from the body or car containing the aeronaut.

The description of my aerobat refers to the accompanying drawings by figures and letters, in which—

Figure 1 is a perspective view of the device.

Fig. 2 is a front elevation; Fig. 3, a side elevation in section; Figs. 4 and 5, details of parts.

The wings or poiser *a* is a rigid plane of thin light material, formed in outline as found most efficient and convenient, that shown in the drawings being like a broad-bow kite. The frame-work should be as light as is consistent with strength, and may be made of bamboo, thin tubular metal, or such other material as may be found efficient for the required purpose. The anterior margin of this poiser *a*, I prefer to make quite rigid, and the posterior margin flexible. This is effected by the stiff bow in front, to the ends of which are attached cords or wires, that extend at an angle rearward to the end of the backbone *b*, as in ordinary bow-kites. Any convenient number of other braces may be introduced, connecting with the bow or backbone at or near the head, and extending backward to the posterior margin between the tips of the bow and the backbone, similar to the ribs of an ordinary Japanese fan, or otherwise. This frame is covered with some strong light tissue, that should be made, as far as is practicable, air, water, and fire proof, for safety. The parts on each side of the backbone should be carefully and equally balanced in area and weight.

Through the poiser a circular aperture is made on each side of the backbone, over the center of which a stiff cross-bar, *c*, extends, that is firmly affixed to the backbone. This bar *c* is the upper bearing of the axes of the wind-wheels *d*, that fill the openings in the poiser, just above or below which they revolve. The lower bearings of the axes are in braces *e*, projecting from the frame-work below.

The arms or blades of the wind-wheels are inclined, and revolve in opposite directions, driven by band-wheels (see Fig. 4) or gearing, by which motion is communicated from the motor in the body below. The blades of the wind-wheels may be so constructed as to close up to prevent an upward current of wind through them when the pressure upward is greater than the downward current made by the wheels. This is shown in Fig. 5 by the lower portion folding inward, as *w*.

The body or car *f*, containing the load, should be oblong, presenting the narrowest

convenient cross-section, and as small a lateral area to horizontal currents as possible. From the center of body *f* a rigid brace, strut, or mast, *h*, firmly affixed to the body *f*, projects up to the backbone, to which it is securely attached by a universal joint at or near the center of the area of the poiser *a*. This holds the body *f* the proper distance below its point of attachment to give stability and steadiness to the poisers. Stays or shrouds of light wire or cord extend down from a point just below the joint to the stem and stern and the sides of the body *f*, to brace and hold the parts firmly.

At the extreme tip, and at other points on the margin or elsewhere of the poiser *a*, guys *k*, of fine wire or other proper material, exposing as small an area to air-currents as is consistent with sufficient strength, are attached, that unite with a halyard, *l*, on each side, projecting inboard to a capstan or other device, and so rigged as that when one end is drawn in the other shall be paid out, and the slack properly taken up, all by one movement. Such devices are so common I need not describe details here.

By this arrangement it will be seen that the spread of wing, however great the surface or light the material, is securely braced in all parts of its surface to support the weight it carries, and that it can be readily inclined to the body *f* at will. Similar guys and halyards *l'* are connected with the backbone fore and aft, and worked in like manner, to elevate or depress the head or tail.

Fig. 4 shows the pulleys and gearing to drive the fans; but shafts and bevel-gearing may be substituted therefor.

The tail *t* should be triangular in form, and jointed with a universal joint to the rear end of the backbone. Its lateral edges should be stiff and its rear margin flexible. It is drawn upward and supported by an elastic spring, *s*,

or some other sufficient device, and a stop or bar, *o*, prevents its too great elevation. A halyard, *p*, is attached on each side near the end, that, extending inboard to the aeronaut, enables him to turn it into any desired position. A similar halyard, affixed to the stop *o* or upper side of the tail, can be used to elevate the tail instead of the spring *s* if preferred.

No particular size or relative proportions are here given for the different parts, or the exact form and construction of the poisers determined, which must depend upon the amount of weight to be carried and the purpose intended, as well as the skill and experience of the aeronaut and constructor.

Having thus fully described my new and improved aerobat, I claim—

1. An aerobat consisting of rigid wings or poiser *a* and wind wheel or wheels *d*, combined on or near the same plane, substantially as and for the purposes specified.

2. The body *f*, united with the rigid frame of the poiser by means of a mast or strut, *h*, the upper end of which is connected with the frame of the poiser by a universal joint, and its lower end immovably joined to the body *f*, substantially as and for the purposes specified.

3. The combination of the tail *t* with the poiser *a* by a universal joint, substantially as herein described, sustained and guided substantially in the manner and for the purposes specified.

4. The combination of the supporting-guys *k*, poiser *a*, having a universal movement, as described, and constructed substantially as herein described, and the body *f*, by which the poiser *a* is strengthened, guided, and held in position, substantially as and for the purpose specified.

JOHN JAMES GREENOUGH.

Witnesses:

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