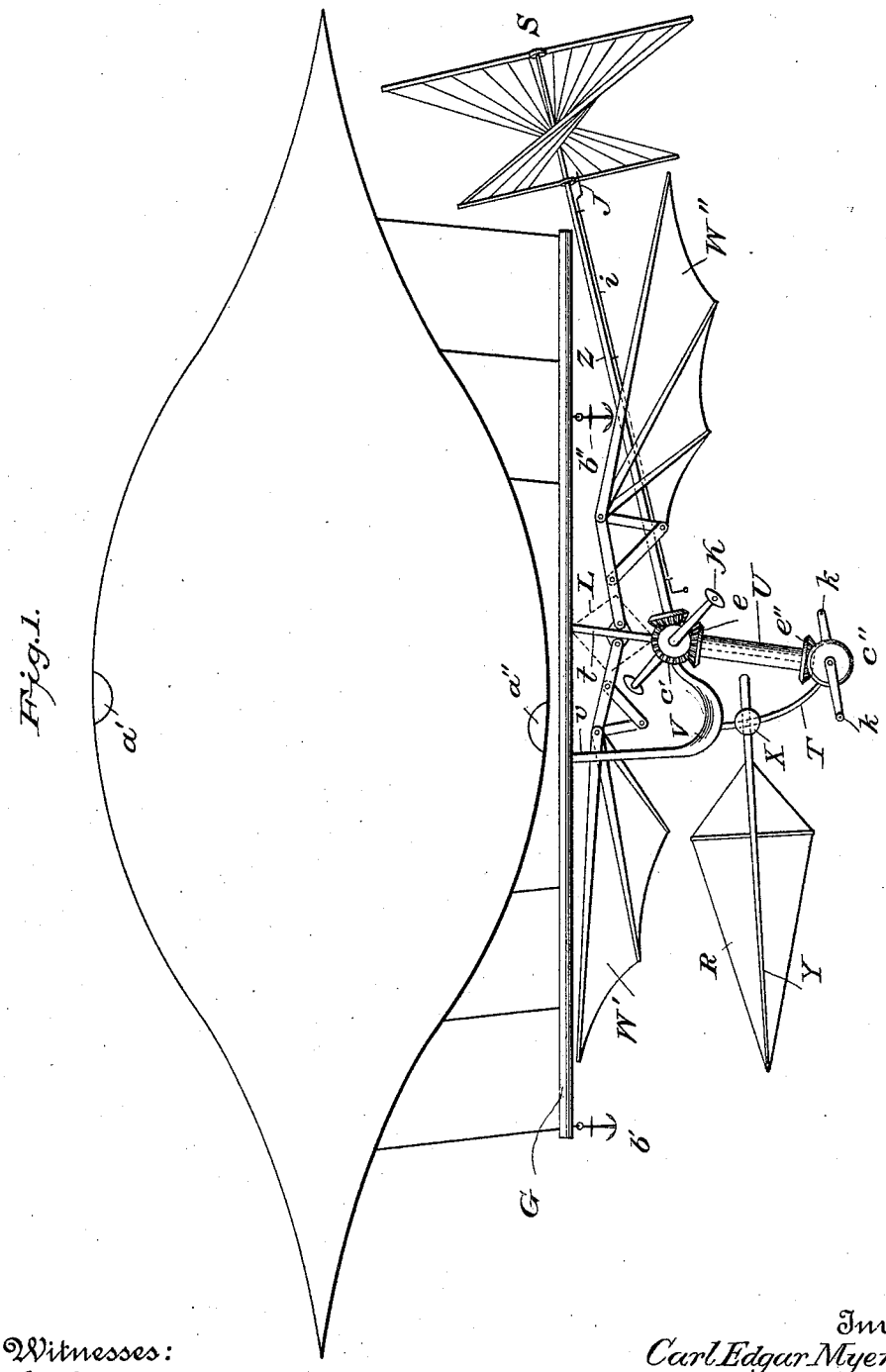
(No Model.) 2 Sheets—Sheet 1

C. E. MYERS.

SKY-CYCLE.

No. 581,218. Patented Apr. 20, 1897.

Fig. 1.



Witnesses:
L. S. Elliott
R. E. Mitchell

Inventor:
Carl Edgar Myers,
by R. S. Dyer & Son
his attorney.

(No Model.) 2 Sheets—Sheet 2.

C. E. MYERS.

SKY-CYCLE.

No. 581,218. Patented Apr. 20, 1897.

Fig. 2.

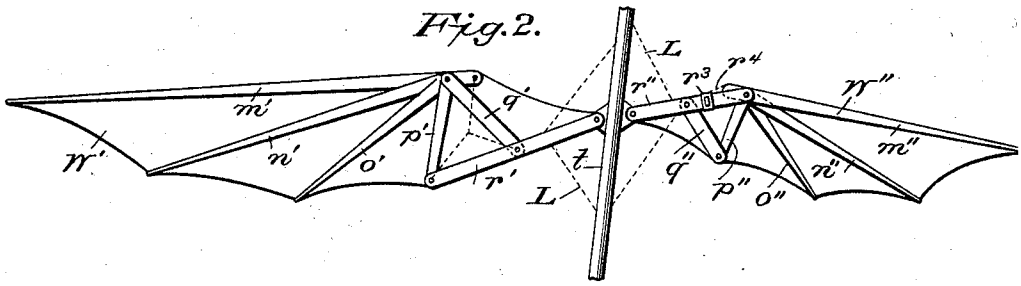


Fig. 3.

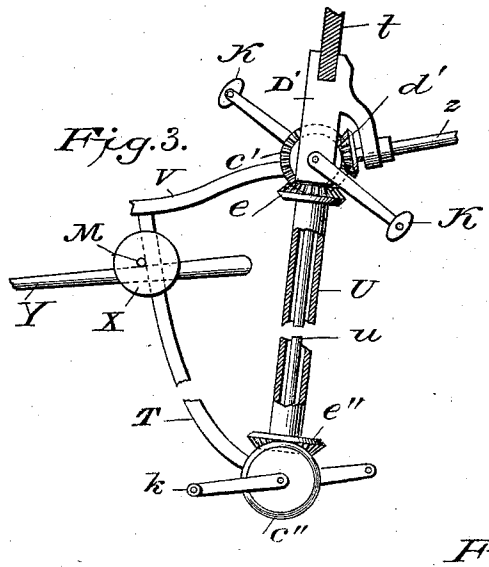


Fig. 4.

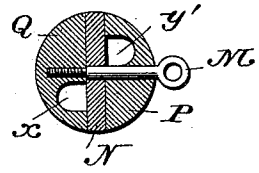


Fig. 5.

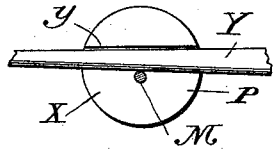


Fig. 6.

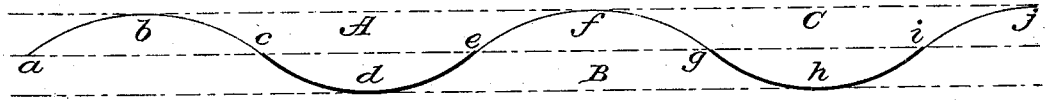


Fig. 7.

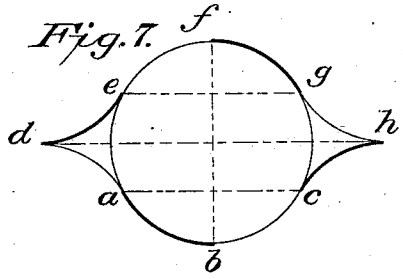
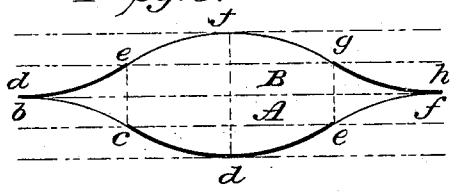


Fig. 8.



Witnesses:

L. S. Elliott.

Rollo Elliott.

Inventor:

Carl Edgar Myers,

by R. S. Dyer & Co.

his attorney.

UNITED STATES PATENT OFFICE.

CARL EDGAR MYERS, OF MOHAWK, NEW YORK.

SKY-CYCLE.

SPECIFICATION forming part of Letters Patent No. 581,218, dated April 20, 1897.

Application filed March 13, 1889. Serial No. 303,178. (No model.)

To all whom it may concern:

Be it known that I, CARL EDGAR MYERS, aeronautical engineer, a citizen of the United States, and a resident of Mohawk, in the county of Herkimer and State of New York, have invented an Improvement in Sky-Cycles, of which the following is a specification.

My invention consists, first, of a new form of body possessing greater bulk or capacity with less proportional exposed surface, combined with less resistance to projectile movement through air, than any other form yet discovered or in use, and which I term a "symmetrical wave-line spindle-shaped body," and, secondly, of certain connected devices for propulsion, more especially adapted to be operated in air, a special arrangement of which adapted to be operated by manual power I term the "aerial velocipede for flying."

Figure 1 exhibits such a combination consisting of the symmetrical wave-line spindle-shaped body B and the propelling and guiding apparatus composed of the revolving screw S, wings or oars W′ W″, rudder R, velocipede-seat V, and cranks K K and *k k*, adapted to operate the screw-propeller by hands or feet of the rider. G is a pole, keel, centerboard, or other horizontal support connecting the motor apparatus with the spindle-shaped body B and the rods *v t*, supporting the velocipede-seat and mechanism. The dotted lines L represent any elastic ligaments or springs aiding to support and retain in position the wings W′ W″. Z is a shaft connecting the propeller-screw S with the propelling mechanism of the velocipede. U is a hollow shaft connecting the gear-wheels, severally operated by the hand-cranks K and foot-cranks *k*. X is a universal joint connecting the staff Y of the rudder R with the supporting-rod T. Fig. 2 shows details of modifications in the construction of the wings W′ W″. Fig. 3 shows details of construction of the velocipede system of double-crank hand and foot system. Figs. 4 and 5 show details of construction of the universal joint X, permitting the rudder R to be operated by its staff Y at any inclination or angle, horizontal or vertical, and to remain clamped in position when desired; and Figs. 6, 7, and 8 show details in the formation or construction of a symmetrical wave-line spindle-shaped body.

The symmetrical wave-line spindle-shaped body B may be simply constructed by projecting from two diametrically opposite sides of a sphere concave-sided cones the longitudinal outlines of whose exposed sides are of the exact curve of the sphere from which they spring, but reversed, as shown in Fig. 6, exhibiting a symmetrically-undulating wave-line formed of the outward-curved line *e f* of the sphere, repeated and reversed to form the incurved line of the cone, and producing, if repeated, the entire wave-line *d e f g h*, outlining one-half of the symmetrical spindle-shaped body B. The cross-section of this figure is necessarily circular when thus produced. This projectile form may be of any suitable material and of any diameter. Its natural proportions depend upon two dimensions, length and diameter, the resulting figure being circular in cross-section, while perfectly symmetrical wave-line spindle-shaped longitudinally. Although it is practicable to vary this figure, as by cutting into two parts crosswise amidships and lengthening by insertion of cylindrical sections, or by bisecting lengthwise and applying additions or superstructures, or by various other changes or additions, such as shaping its cross-section oval instead of circular, such variations are of the nature of deformities and interfere with the advantages of the perfect figure.

Where solid contents or capacity or carrying power is desirable, a sphere may form the basis of the figure, as shown in Fig. 6. If speed with less resistance be desirable, the body may then have greater proportional length and the lines of its longitudinal section be constructed on the basis of a larger curve than the diameter of a spindle, as shown in Fig. 1.

To conveniently build this form of vessel from sheets of metal or other suitable material, such as fabric used for balloons, a curved pattern may be used to form the basis of a perfectly symmetrical wave-line undulating from edge to edge of the fabric, as shown in Fig. 7, where *a b c* represent a portion of a

perfect circle, which only needs to be reversed and repeated, forming the lines *c d e*, *e f g*, and *g h i*, whose curves are identical. The plane surface or fabric is thus separated by a symmetrical wave-line into a series of half-segments A B C, any two of which form a complete segment by joining their straight edges, as shown in Fig. 8. As many of these complete segments as may be necessary are then united by joining the curved edges of one to another to produce a vessel of the wave-line-spindle form, a maximum number producing an approximately spherical body with incurved conical extremities, as shown in Fig. 6, possessing greater capacity than any other form of equal surface and speed, while an elongated type of less proportional diameter may have greater speed than any other known form possessing equal bulk and exposed surface, which qualities render the wave-line-spindle forms especially advantageous for bodies moving through air or water.

Any method of construction of any suitable material may be adopted which results in producing a form whose lines from front to rear flow in a symmetrical wave created by the reversal at its nodal points (as *a*, Fig. 6) of the curve producing it.

It will be noted that there is no waste material whatever in the construction of the wave-line-spindle form from any plane surface or fabric, which cannot be said of any other body having curved sides or of any other known symmetrical body constructed from rectangular plane surfaces, except the cube and equilateral pyramid.

Fig. 1 shows convenient methods for the application of motor-power applied externally to a vessel buoyed by contents lighter than air, with special reference to operation by manual power, though any motor-power will serve. The gas-reservoir may be provided with ingress and egress valves *a' a''* and anchors *b' b''*. The operator seated upon the velocipede-seat V grasps the hand-cranks K, attached to the gear-wheel *c'*, while his feet may operate the foot-cranks *k*, attached to gear-wheel *c''*, arranged to move simultaneously with *c'* by means of gear-wheels *e'* and *e''*, attached to the hollow connecting-shaft U, which revolves around the upright rod *u*. (Shown in detail in Fig. 3, similar letters referring to similar parts.) Gear-wheel *d'*, attached to propeller-shaft Z, is driven by gear *c'*, and the construction of the crank system thus permits the revolving of the screw S backward or forward by either one or both hands or feet, leaving one or both hands at liberty for other purposes when desirable.

The socket D' supports the propeller-shaft Z and gear *d'* and the hand-cranks K K and gear *c'* and serves to unite the forward end of the velocipede-seat V with the upper end of the concealed rod *u*, upon or around which the hollow shaft U revolves. Socket D' is in turn supported by the rod *t*, suspended from the keel G of the gas body or reservoir B or any other suitable support. The lower end of rod U and the rod or seat-support T both join and support a socket (not shown) through which passes the shaft of the foot-cranks *k k*. Rod T firmly joins the velocipede-seat V, so as to firmly unite the whole system. A rod or other support *v*, Fig. 1, may support the rear of the velocipede-seat by connection with the keel G of the spindle or any other suitable support.

A peculiar feature of the hand-gear system, Fig. 3, *c' e' d'*, is the elevation of the shaft Z at such an angle that gear *d'* is only connected with gear *c'* and not with gear *e*, which would lock it or prevent motion. Any convenient form of screw may be used attached to the propeller-shaft Z, but I prefer the "aerial screw-sail" shown, described, and claimed in United States Patent No. 318,575, granted to myself and Carlotta Myers, aeronauts, May 26, 1885, consisting of a cloth screw arranged to reverse its inclinations simply by reversal of the revolution of its crank-shaft, the spar carrying the forward or advancing edge of the screw-sail being fixed to the front end of the screw-shaft while the spar carrying the rear edge of the screw-sail remains free to swing or revolve upon the screw-shaft in either direction till restrained by the tension of the cloth sail, as set forth. In addition to the screw-sail which I have adopted in this instance I combine with the screw-shaft Z a sliding stop, bolt, or catch J, adjacent to the rear of the screw, arranged to be simply operated by an attached rod or cord *i*, extending along the driving-shaft Z till within reach of the operator, the object of which stop is to prevent movement or reversal of the rear spar of the screw on the shaft Z when not desirable, so that when the rear spar of the screw is stopped or fixed by the bolt a reversed movement of the cranks K K may act to turn the whole screw backward and make the movement of the air-ship retrograde, as with any vessel when it "backs water" or reverses its screw, which movement the screw-sail referred to was not originally designed to accomplish.

J, Fig. 1, shows the restraining-bolt slid along by movement of the rod *i* till its forward movement interferes with the freedom of the rear edge of the screw-sail.

The advantage of this improvement is that its use permits screwing the air-ship backward when the rear of the screw-sail is thus fastened to the screw-shaft Z by the coupling-bolt J, while when not coupled or stopped the sail admits of being used as a pair of flapping wings by a partial revolution of the screw-shaft followed by immediate reversal of the crank movement, the right wing or extension of the screw-sail thus striking upward or downward, while the left wing of the screw-sail strikes contrarywise, the result being an alternate flapping of the arms of the screw-sail up and down and a progressive motion

of the air-ship for actual propulsion or for experimental comparison of efficiency with other means of locomotion.

Fig. 4 is a sectional view of a joint X (shown attached to rod T in Figs. 1 and 3) for the purpose of supporting the rudder or sculling-oar R by attachment to the principal shaft Y and arranged to permit movement of the rudder-surface and immediate fixture in any desirable position in horizontal, vertical, or inclined plane.

In Fig. 4 the parts Q N P represent a section of the joint, which may outwardly be of spherical form for symmetry. P and Q each constitute nearly one-half of such a sphere, of any suitable material, separated by the circular washer N, preferably of rubber or some substance possessing an adhesive surface for increasing friction between the parts in contact.

M is a screw uniting the parts and serving to adjust pressure or friction between them. X, Fig. 4, designates a gutter extending directly across the inner face of the half-sphere Q as near its center as practicable without interfering with the screw M and adapted to receive and clasp any round rod or shaft, as T, Figs. 1 and 3.

y' is a tapering or slightly-conical gutter extending across the inner face of the half-sphere P as close to the screw M as practicable without interference and adapted to fit and clasp around tapering rod Y, as shown in Figs. 3 and 5. The rudder-staff Y being tapering, its partial withdrawal from the tapering gutter y' releases it and the joint from the constraint of attached parts and permits free movement or twisting of the rudder-shaft and its revolution in any plane or at any angle by the revolution of the entire system on or about the supporting-rod T and revolution of half-sphere P upon or about the pivot-screw M. By thrusting the tapering rudder-shaft Y within the tapering gutter y' all the parts become wedged together and remain fixed in any position. An attached surface of suitable form may thus serve as a rudder, an oar, paddle, or wing, having perfectly free movement, and remain fixed in position when required to act constantly as an inclined plane. The inner surfaces of the parts of the joint Q N P and rods T and Y may advantageously be roughened to assist adhesion, and the washer N may be dispensed with without wholly preventing the action of the joint, though its loss would be disadvantageous.

Fig. 2 exhibits in detail the wing mechanism attached to the rod t, supporting the velocipede-crank system, as shown in Fig. 1. The wing-frame may be of any suitable material. The principal wing-arm r' may be attached by one extremity to the supporting-rod t by any link or ligament or by the universal-joint mechanism X used with the rudder, or in any other manner permitting a movement approximately universal. The middle of the principal wing-arm r' is pivoted to one end of the secondary wing-arm q', and its outer extremity fits onto the extremity of pinion p'. All the pinions m' n' o' p' and arm q' are joined by one pivot at their butts and are intended to extend a flexible wing-surface W′ or to close together like a fan when the pivot connecting them is drawn inward toward the supporting-rod t, which action may be prevented by constraint of the elastic ligature shown by dotted lines connecting the butt of pinion m', tip of pinion p', and the pivot midway of principal wing-arm r', which restraint retains the wing extended for use.

The entire weight of the wings is at all times supported and balanced by the elastic ligaments L L, whose restraint is only sufficient for this purpose without interfering with freedom of movement. The springs are attached to the wings at any convenient point and join the supporting-rod t or any other socket or pivot connecting the wing-arms and at a point above and below the wing-sockets, as shown.

On the right of Fig. 2 is shown a modification of the wing mechanism, in which the principal wing-arm r'' extends directly to the pivot joining the butts of all the pinions m'' n'' o'' p'', while pinion p'' and secondary wing-arm q'' are pivoted at the junction of their outer extremities. The inner extremity of secondary wing-arm q'' may be provided with a simple band, ligature, or any suitable screw-bolt or clamp r^3, which slides along the outer half of principal wing-arm r'', and from this bolt may extend an elastic ligament r^4, (shown by a dotted line,) joining the butt of pinion m'', which when in tension extends the pinions by means of the connecting wing-surface W″, which may be of any fabric. Movement of arm q'' and attached clamp toward the butt of the pinion p'' removes the tension and permits the wing to be folded.

To work the wings, the operator grasps the principal or secondary wing-arm at any point serving to give him proper control, the position varying advantageously by the special movement to be made. The wing-shaft may be rotated like a crank or operated like a feathering-oar or simply move backward and forward or up and down. If extended horizontally and the principal arm r'' and pinion m'' be vibrated vertically up and down, the movement of the attached body will be a forward progressive one. If the same movement of the wing be executed with the flexible edge of the wing toward the front, the flight will be rearward. If the plane of the wing be vertical and with the flexible portion downward, the flight will be upward.

Each of the parts, screw-propeller S, rudder Y, and wings W′ W″, has versatile capacities besides the single feature for which it may be best designed. The position of the rudder R and joint X may be changed to the front support t, where it may be separately

used or with a duplicate act as a pair of wings, or it may be attached to the rear support *v* of the seat V or any practicable point affording attachment. It is of itself sufficient to guide the air-ship in any direction. Likewise the wings W' W'' may be wholly depended upon for propulsion or guidance in any direction, or they may be spread and fixed in any position, as inclined planes. The screw S is of itself capable of moving the air-ship in any direction, forward or backward, upward or downward, or to right or left, by inclinations given the air-ship through changes of its center of gravity or by varying the operator's position. To this end the velocipede-seat is made comparatively broad and long. If the operator leans forward, the bow of the air-ship tips downward, or if he leans backward the bow tips upward, and if to the right or left the cant of the vessel inclines its course toward that side, as in the case of an ordinary bicycle, which movements right or left may be somewhat facilitated by revolving the screw right or left.

The propelling apparatus described and shown is not necessarily restricted to operation with the wave-line-spindle form of vessel to which it is best adapted, but it may be applied to any suitable aerial vessel, to an ordinary balloon, or to any aerial support adapted to permit comparatively free movement in various directions for experimental comparison.

The special arrangement of air-ship termed the "aerial velocipede flying-machine" shown in Fig. 1 may be modified by forming the gas-reservoir as if composed of a half-spindle resulting from splitting a symmetrical wave-line spindle in two halves from end to end, (as referred to with relation to water navigation.) The plane surface of the half-spindle may float horizontally with its round part uppermost, like a capsized boat, and clasped by netting, thus forming a gas-filled parachute whose lower plane surface acts as a plane which at a slight angle upward may be drawn forward like a kite by the pull of the revolving screw or other propeller, thus raising a very considerable weight added after the whole machine has been balanced by gas inflation. The weight raised serves a useful purpose in subsequently driving the air-ship downward and forward from the elevation attained and without the necessity of other propulsion, which maneuver repeated will produce an undulatory flight.

Conceiving that my system of construction is entirely novel, I claim, broadly—

1. The combination with a body or balloon, of a rod suspended therefrom, a hollow shaft arranged in said rod, a gear carried respectively by the upper and the lower end of the shaft, a crank-shaft located at the upper and the lower end of the shaft and carrying gears meshing with the gears of the said hollow shaft, and a shaft carrying at one end a screw-sail and at the other end a gear meshing with one of the crank-shaft gears, substantially as described.

2. The combination with a body or balloon, of a rod suspended therefrom, a hollow shaft arranged in said rod, a gear-wheel carried respectively by the upper and the lower end of the shaft, crank-shafts located at the upper and the lower end of the shaft and carrying each a gear meshing with the gears of the hollow shaft, an inclined shaft carrying at one end a screw-sail and at the other end a gear meshing with one of the crank-shaft gears, and a rudder adapted to be adjusted to any angle, substantially as described.

3. The combination with a body or balloon, of a shaft carrying a gear-wheel at its upper end and its lower end, a crank-shaft located at the upper and the lower end of the shaft and carrying each a gear meshing with the gears of the shaft, a shaft carrying a screw-sail at one end and at the other end a gear meshing with one of the crank-shaft gears, a seat, a rod supporting the seat, and a rudder adjustably secured on the rod, substantially as described.

4. The combination with a body or balloon, of a shaft carrying a gear-wheel at its upper and at its lower end, a crank-shaft located at the upper and the lower end of the shaft and carrying each a gear meshing with the gears of the shaft, a shaft carrying at one end a screw-sail and at the other end a gear meshing with one of the crank-shaft gears, a rudder adjustable to any angle, and wings arranged below the said body, substantially as described.

5. In combination with any suitable support, the described joint consisting of the parts Q, P, M, Y, *y*, *x*, and rod T, and rudder R, arranged and adapted by this connection to be used as a rudder, oar, paddle, or wing, and as an inclined plane adjustable at any angle and capable of being fixed in any desirable position, horizontal, vertical, or inclined, substantially as described.

6. The combination of the wing apparatus shown and described, consisting of the parts *m'*, *n'*, *o'*, *p'*, *q'*, *r'* and attachments L' and *t*, suspended from any suitable support by means of any elastic cable or ligaments permitting comparatively free movement in all directions, as set forth.

7. The wing apparatus consisting of parts L', L'', *m'*, *m''*, *n'*, *n''*, *o'*, *o''*, *p'*, *p''*, *q'*, *q''*, *r'*, *r''*, and *t*, constructed and operated substantially as described and shown, and attached to any suitable fulcrum at their base by any link, ligament, or universal joint, and supported and restrained in a poised position, when at rest, by any elastic ligaments permitting comparatively free movement, and adapted to be operated by manual power, as described and shown.

8. A propeller for air-ships, comprising a shaft, two arms, one rigid and the other movable with relation to the shaft, a piece of flexible material connecting the two arms, and

means for rotating the shaft to cause the material to assume the shape of a screw having its helices pitched in the opposite direction to the rotation of the shaft, substantially as described.

9. In combination with a screw-sail composed substantially of a propeller-shaft and a cloth-screw supported at one extremity by a yard-arm permanently fixed to said propeller-shaft to revolve with it, and a loose or movable yard-arm supporting the other extremity of the screw-sail and capable of revolving around said propeller-shaft in either direction till the sail forms a helix and restrains said loose yard-arm, a bolt, stop, catch or clasp adapted to bind, fix the loose yard-arm to the propeller-shaft and retain the cloth screw-sail at a right or left hand helix, as desired, substantially as and for the purpose set forth.

CARL EDGAR MYERS.

Witnesses:
GEO. E. CASLER,
CARLOTTA MYERS.