(No Model.) 3 Sheets—Sheet 1.

E. F. FALCONNET.

VESSEL FOR AERIAL NAVIGATION.

No. 312,344. Patented Feb. 17, 1885.

Fig. 1.

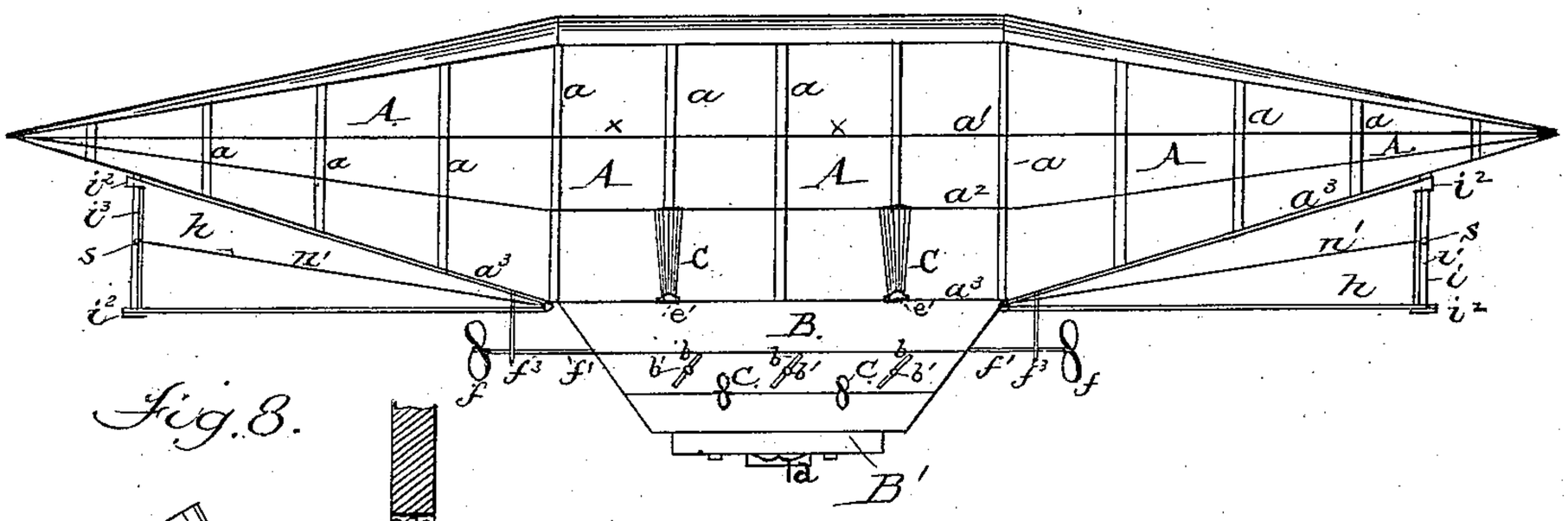


Fig. 8.

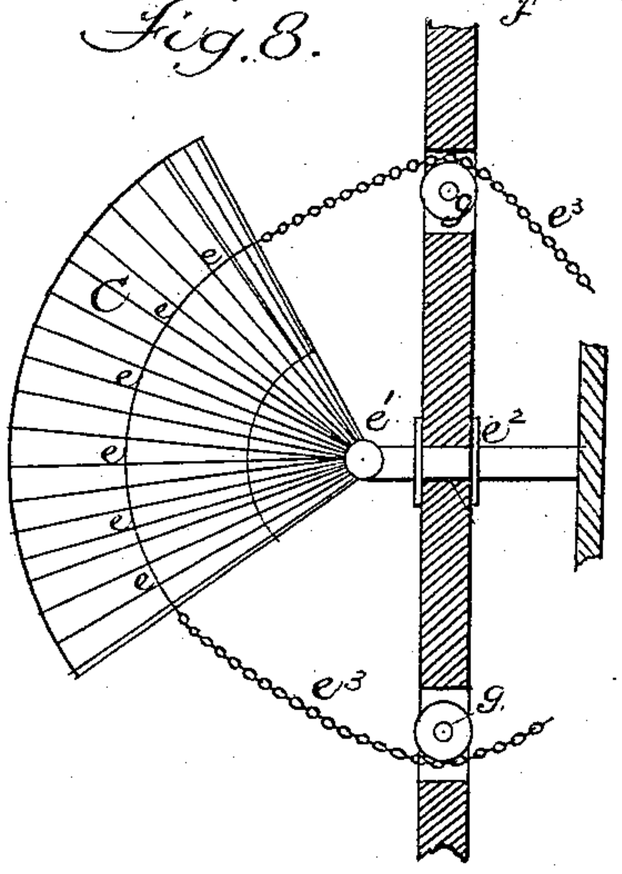


Fig. 10.

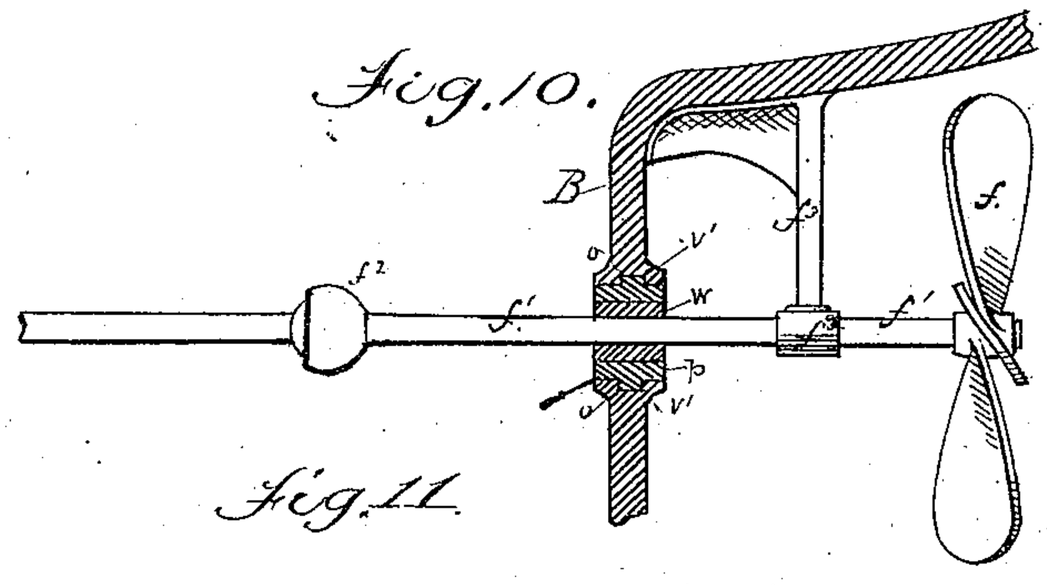
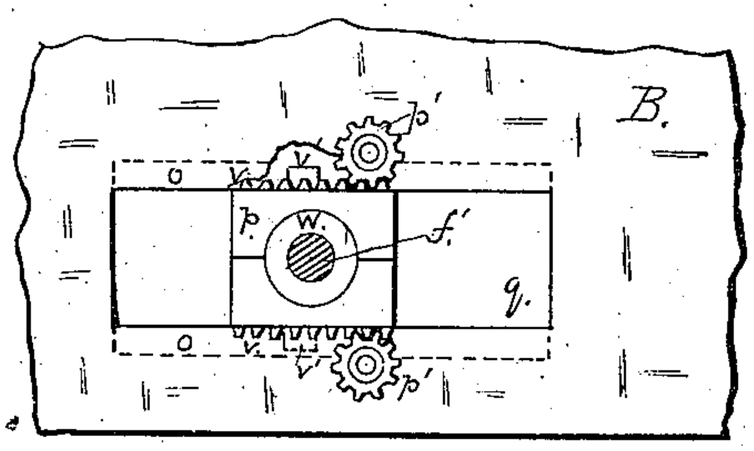
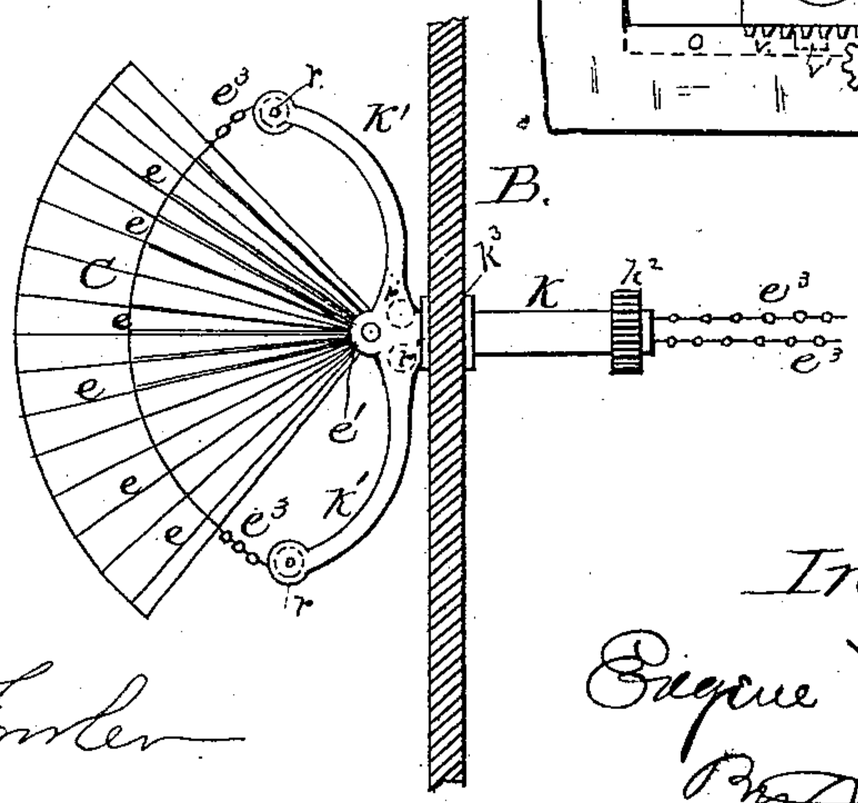


Fig. 11.

Fig. 9.





Attest:

S. Walter Foster

Henry Glassie

Inventor;

Eugene F. Falconnet

by Henry Glassie

his Atty

(No Model.) 3 Sheets—Sheet 2.

E. F. FALCONNET.

VESSEL FOR AERIAL NAVIGATION.

No. 312,344. Patented Feb. 17, 1885.

Fig. 2.

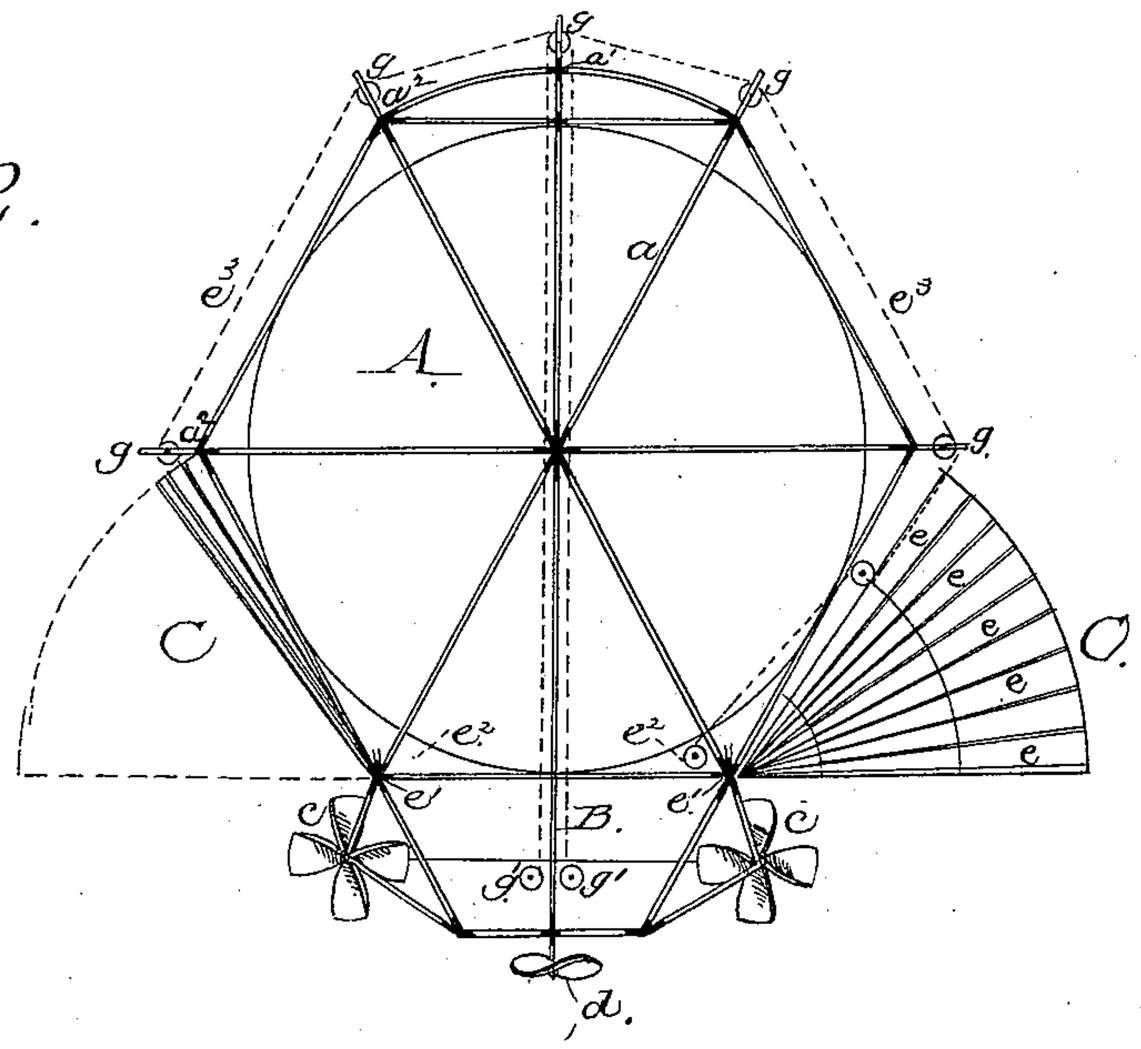
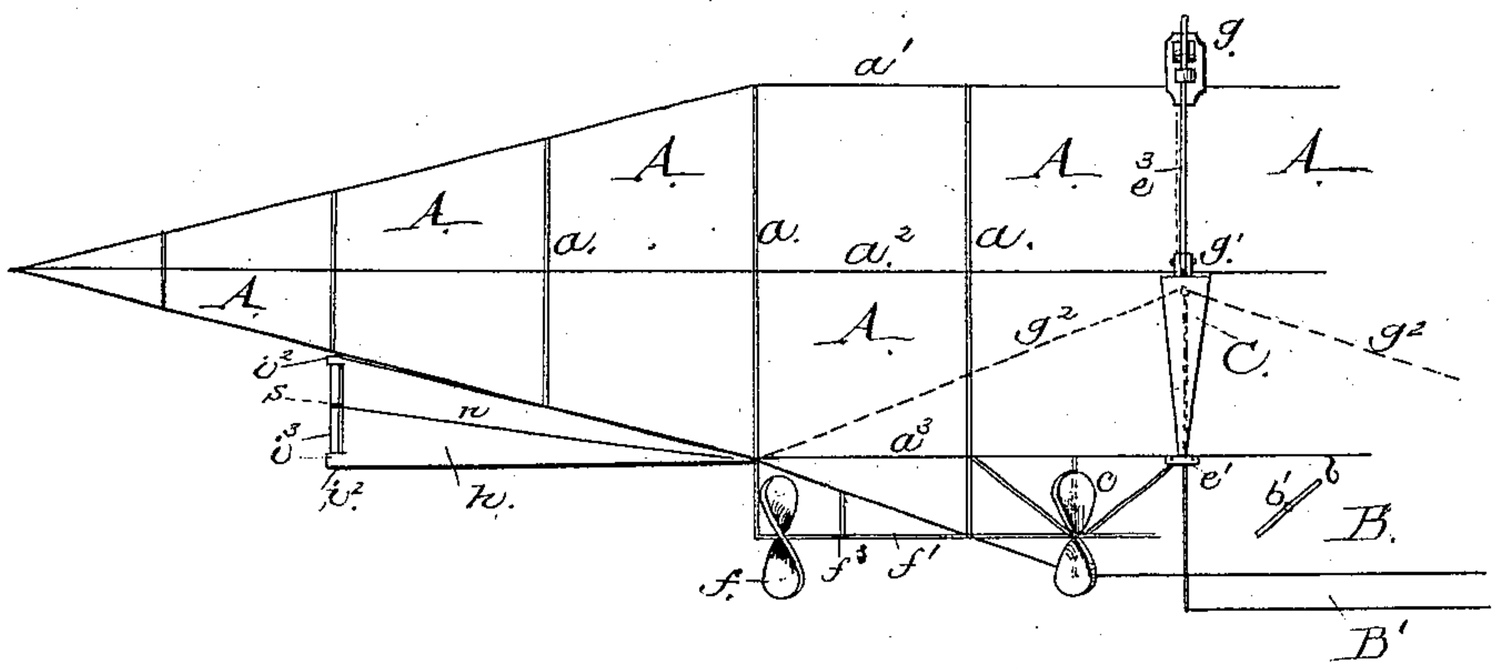


Fig. 3.



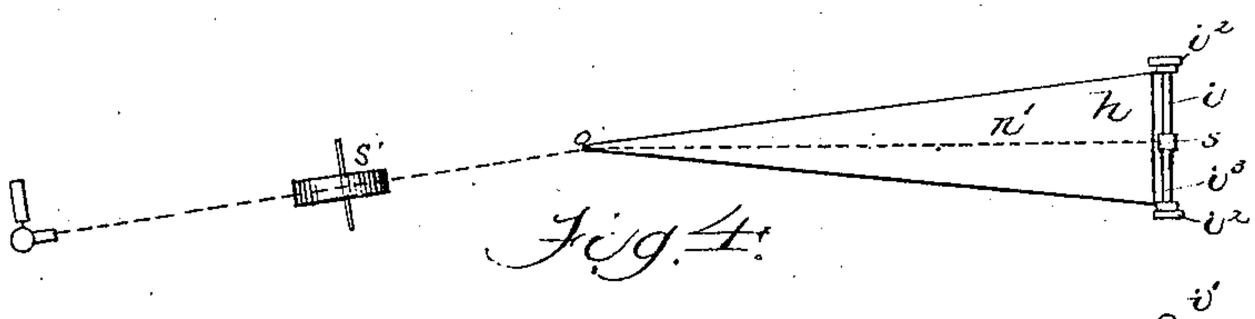
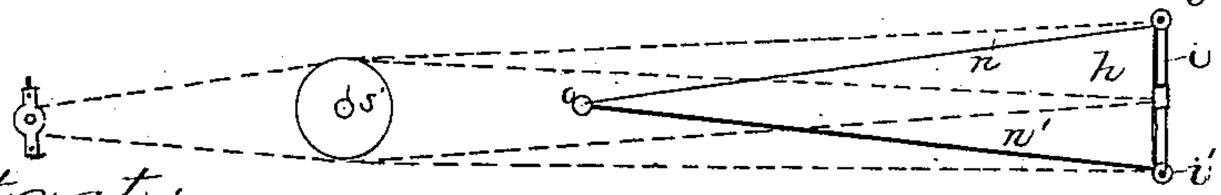


Fig. 4.



Attest;
J. Walter Fowler
Henry Glassie

Inventor;
Eugene F. Falconnet
By Glassie
his atty.

(No Model.) 3 Sheets—Sheet 3.

E. F. FALCONNET.

VESSEL FOR AERIAL NAVIGATION.

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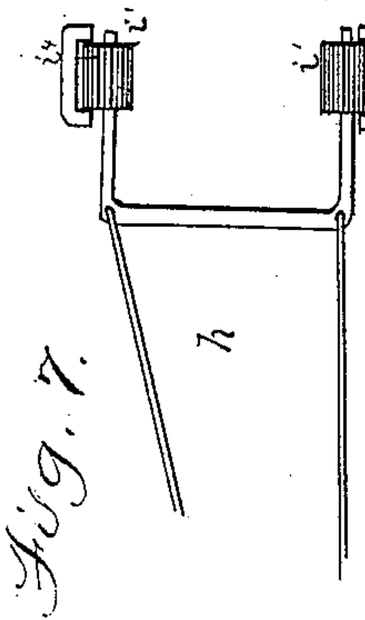

Fig. 7.

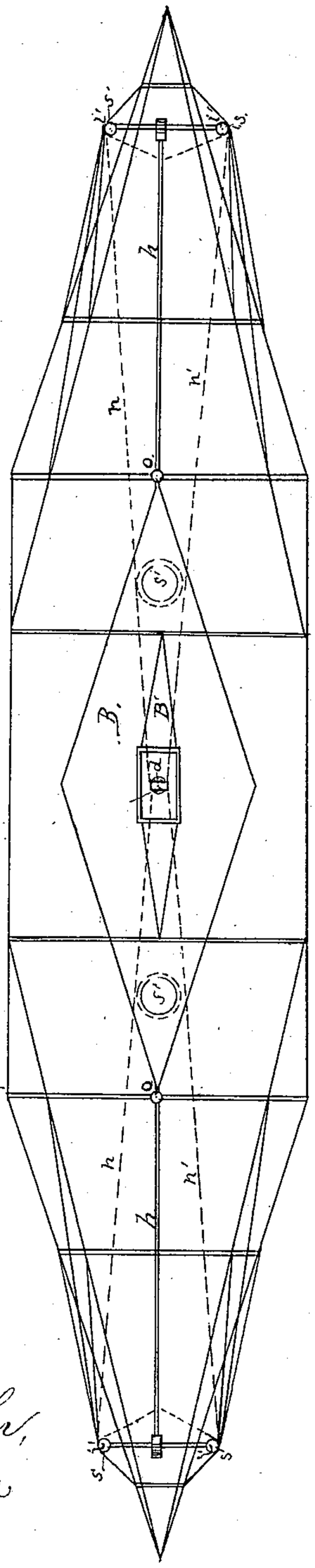

Fig. 5.

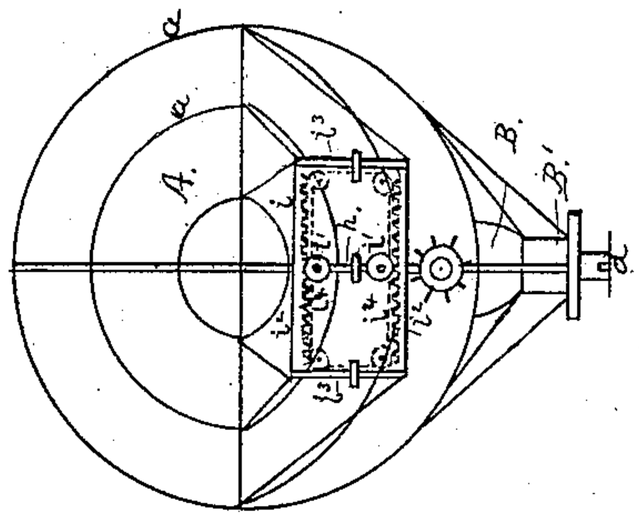

Fig. 6.

Attest;

Walter Fowler,
Henry Glassie

Inventor;

Eugene F. Falconnet.
By Henry Glassie
his attorney

UNITED STATES PATENT OFFICE.

EUGENE F. FALCONNÉT, OF NASHVILLE, TENNESSEE.

VESSEL FOR AERIAL NAVIGATION.

SPECIFICATION forming part of Letters Patent No. 312,344, dated February 17, 1885.

Application filed November 8, 1883. Renewed November 19, 1884. (No model.)

To all whom it may concern:

Be it known that I, EUGENE F. FALCONNET, a citizen of the United States, residing at Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Vessels for Aerial Navigation, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain new and useful improvements in handling and steering that class of vessels for aerial navigation that are designed to be propelled, steered, and handled by propulsive machinery arranged within the vessel through appliances externally adjusted; and it consists in securing at intervals to the sides of such vessels, fore and aft, sets of adjustable fans arranged opposite to each other, and constructed to be opened and closed, like a fan, by mechanical appliances arranged within the hull; also, in attaching such fans to protuberances formed on the bulk-heads or frame of the vessel or to the ends of shafts or beams extending from within out through the sides of the vessel, and in connecting the movable blades of the fan with machinery within the vessel by cables or chains employed for opening and closing the fans; also, in the employment of adjustable fans which open and close like a fan and protrude from the sides of aerial vessels to assist in steering and guiding such vessels in their lateral course; also, in adapting such fans to the purposes of sails when the wind-currents are fair; also, in the method of connecting and handling such fans.

It also consists in attaching to aerial vessels long fin-shaped rudders secured fore and aft or at one end only, for steering such vessels; also, in the manner of mounting and handling such steering-fins; also, the method of laterally steering such vessels by fin-shaped rudders secured at the ends on the under side.

It also consists in the method of steering aerial vessels through the combined action of steering-fins adjusted under the vessel, and adjustable fans arranged and secured along its sides.

Figure 1 is the side elevation of a complete aerial ship, showing the gas-field, vertical and lateral supporting bulk-heads, longitudinal supporting-chords, hull, protruding cabin, side propelling-screws, end propelling and steering screws, fins for deflecting the flight vertically, central raising and lowering screw, side adjustable fans, and under steering-fins. Fig. 2 is a vertical cross-section of the same, showing the bulk-heads and bracings, the opposite protruding fans—one open and the other closed—and one mode of connecting and handling the same; also, side propelling-screws carried at the intersections of a projecting frame, the raising and lowering central screw protruded. Fig. 3 is the elevation of a fragment of the same ship, showing a portion of the gas-field and of the hull, one end screw, the bearings for and mountings of one side propelling-screw, the side fan closed in elevation, longitudinal supporting-cables, pulleys, and cables for handling the same. Fig. 4 is a side elevation and plan of the fin-shaped rudder and steering device, showing the supporting frame and ways, the trucks or trundlers on the end of the fin, the cable or steering-chains, pulleys, drum, and wheel. Fig. 5 is a plan of a vessel, looking up from the bottom, showing the fin-shaped rudder, its supporting-frame, pulleys, and steering-cables. Fig. 6 is an end elevation of the ship, showing the protruding frame for supporting the fin-shaped rudder. Fig. 7 is a fragment of the frame of the fin-shaped rudder, showing wheels on the ends thereof. Fig. 8 is an enlarged detail of a modification of a side fan mounted on a protruding shaft, showing the fan and its shaft, the knuckle-joint by which it is secured, and the cables by which it is handled. Fig. 9 is a modification of the same, carried on a revolving shaft having branching arms through which the cable is carried to the interior of the vessel. Fig. 10 is a longitudinal fragment of the hull, showing an end screw mounted in a bracket and movable carriage, showing also the impelling shaft and universal joint. Fig. 11 is an elevation of a fragment, showing the movable carriage for the end screw, its ways, and gear for changing its position.

Similar letters of reference indicate corresponding parts.

A is a number of gas-receptacles, called by me the "gas-field," which gives buoyancy to the ship.

a a, &c., are upright bulk-heads, rising from the hull to the diameter of the gas-field at

intervals from stem to stern, furnishing the vertical and lateral supports of the vessel as well as seats for the gas-field.

a' a^2 a^3 are longitudinal bracing-chords, secured by the ends in the nodes, fore and aft, and which, passing longitudinally over the vessel, are fastened at their intersections with the bulk-heads a.

B is the vessel's hull, built sharp fore and aft, constructed on one general metal frame, and internally divided into decks and compartments for business and living, and inclosed with suitable material.

B′ is a cabin forming part of, but protruding part of its depth below, the hull, where it is supported by a suitable metal frame, and inclosed with suitable material, and provided with doors, windows, and other means of lighting and ventilating, as well as outlooks. The cabin is divided internally into the usual living-apartments.

b b are fins arranged at intervals along the side of the vessel on both sides of the hull. The fins b may be made to open and shut like a fan, or be made rigid like an open fan, and may be constructed of ribs secured at one end by a knuckle-joint, or in any other feasible manner to a revolving shaft, b', which is journaled in the side of the vessel, and geared to suitable machinery within the hull, and covered with any suitable flexible material. The fins b may be set at any desired angle for deflecting the course of the vessel upward or downward at an incline.

c are side screws for impelling the vessel longitudinally, mounted in suitable projections protruding at intervals from the side of the hull, and actuated on their axis by machinery arranged within the vessel through connecting-gear.

d is a vertical screw, mounted in a movable carriage adjusted in a well passing upward through the bottom into the hull, and connected by suitable gearings with propulsive machinery within the vessel. The central screw, d, and its connecting machinery is designed for raising and lowering the vessel vertically, and may be housed by drawing it up into a well provided in the vessel for the purpose, or by lowering down about it a sheltering-box handled by machinery within the hull.

f are end screws, mounted on longitudinal shafts f', secured in brackets f^3, and carried through the end into within the hull, where it is geared with propulsive machinery. The screws f are employed to propel the vessel forward, and, when obdurate and it fails to obey the tiller, to aid in steering. To this end the end screws are mounted in sliding ways or carriage p, in the ends of the hull and connected by universal joints, through which means, by throwing the carriage to the right or left the end screws are made to travel in that direction and throw that end of the vessel around, so by throwing the end screws in opposite directions and causing them to revolve in a course opposite to each other, the vessel can be turned as on a pivot. See Figs. 10 and 11, in which B is the hull, f is the end screw, and f' the impelling-shaft; f^2, the universal joint. f^3 is a supporting-bracket, and p is a movable carriage, provided on the edges with a racked gear, v v, by which, through pinions p' p', it is moved in its seat, also provided with tongues v' v', by which it is adjusted and supported in its ways o o, in a suitable aperture, q, in the end of the hull. Within the movable carriage p is a journal-boxing, w, in which the axle-shaft f' takes bearing and revolves. The pinions p' may be actuated by any suitable mechanical contrivance.

The several screws c, d, and f, are constructed with the most efficient wind for rapid travel, on a light substantial frame covered with any suitable material, and of dimensions best suited to serve the purpose for which they are employed.

C is an adjustable fan, constructed on a frame of flat ribs, e, secured at one end by a knuckle or other suitable joint, e', to a shaft, e^2, passing out through the side of the hull, or to stationary protuberances on the side of the hull or the vertical ribs or peripery of the bulk-heads a. The ribs e of the fan C are covered by any suitable material to resemble a web, and are secured together by chains, cables, or other suitable ties passing through the same. The fan C, moving on the knuckle-joint e', opens and closes like a fan, and is handled by cables or chains e^3, carried over pulley-wheels g to within the vessel to winches g', operated by any suitable mechanical contrivance.

In lieu of the fan secured to stationary points, it is obvious that fan C may be secured by knuckle, multiple, or other suitable joint, to a revolving shaft, k, passing from within the vessel out through the hull B, having seats in journal-boxings k^3 therein, and provided with branching arms k' k', having pulley-wheels r r therein internally arranged.

In the modification of the fan-connection shown in Fig. 9, the cable or chain e^3, by which the fan is operated, is carried over pulleys r in the outer end or mouth of each branching arm k' and a pulley r arranged within at the juncture of the two arms k' with the main shaft k, which latter is preferably a cylinder through which the cable or chain e^3 is carried, to within the vessel, where it is handled by winches. The shaft k has on its inner end gear or toothed wheel k^2, by which, through machinery within the vessel, it is revolved on its axis, so that the fan may be set at any desired angle, and made to serve for vertical as well as lateral steering and for other purposes.

The shaft e^2 of the fan C is preferably cylindrical and hollow, to reduce its weight, is provided with suitable bearings on which it is mounted on a collar or muff to prevent its being displaced, and is connected with proper machinery within the vessel, and passes out through the side of the hull, where the fan C is secured in place.

In lieu of the simple shaft e^2 and the cable passing over pulleys arranged within the side of the hull, as shown in Figs. 2, 3, and 8, the fan C may be mounted on a shaft, *k*, having a yoke or branching arms, *k' k'*, in which are secured pulley-wheels *r* and idlers *r'*, for carrying the cable e^3, by which the fan is operated. By this latter arrangement the cable e^3 is not carried over the vessel nor through the hull, but back through the shaft *k*, as shown, to the winches which handle the fan. The fans C are arranged on both sides of the vessel, opposite to each other fore and aft within the extreme ends of the hull, and the fan-shaft *k* carries on its inner side a connecting gear by which it is revolved on its axis, and the entire series on both sides may be arranged and connected by shafting having endless screws thereon at intervals, or by any other train of mechanism, to be removed simultaneously.

In conjunction with the rudder-blades *h*, the fan C is employed for steering the vessel laterally, laterally deflecting its course. They may also be used as sails for impelling the vessel forward, or they may be used for checking the speed of the vessel as well as for turning it around, as on a pivot.

h is a long light fin-shaped rudder-blade, larger at one end than at the other, secured by the smaller end through a pivot-joint, *o'*, near the waist, amidships, to the under side of the vessel, ranging along thence on the under side of the hull, conforming thereto, to a vertically transverse projecting frame, *i*, where the larger end, carrying gear or other wheels, *i'*, is mounted in ways secured in horizontal beams i^2, forming the top and bottom of frame *i*. The rudder-blade *h* is a light metal frame, preferably of tubing, made sufficiently stout by bracing, covered with any light flexible material fire and water proof, the frame terminating at the smaller end in a journal, and at the broader end terminating in bearings for wheels *i'*, one at each corner.

n n' are steering cables or chains, made fast by one end to the outer end of the steering-rudder *h*, and passing over pulleys *s s* in the perpendicular beams i^3 of the frame *i*, from whence it passes inboard, being directed over other pulley-wheels properly located at intervals along on the under side of the ship, as well as over the drum *s'* to the steering-wheel or lever by which it is handled. The ways in the horizontal beams i^2 form the segment of an arc, and are provided with trucks, either cogged or otherwise, or with ways i^4, on or in which the wheels *i'* on the upper and lower corner of the rudder-blade *h* move, so that the rudder-blade *h*, moving on its pivoted center, *o*, from side to side in the process of steering, may not be displaced, nor be thrown out of gear by high winds and adverse currents of air.

In the vertical sides of the frame *i* are placed suitable pulley or grooved wheels, *s s*, over which the tiller or steering cables *n n'*, that extend inboard, pass and work. The frame *i* is braced longitudinally as well as laterally, and is made a substantial part of the vessel's frame, and should it be necessary to do so, the rudder may be intermediately supported by other projecting intervening frames nearer inboard.

A steering device may be adjusted at each end of the vessel; but a description of one will serve for both.

In conjunction with the side fans the rudder-blade is employed for steering aerial vessels laterally, and for ordinary use the rudder will serve all purposes.

It will be observed that the upper edge of the rudder-blade is made to conform with the outline of the under side of the hull, so that air-currents acting upon the blade *h* are concentrated in the angle formed by the two, and made to exert more direct influence on the course of the ship.

The idea of steering aerial vessels with external attached rudder-blades is not wholly new with me, nor do I propose to claim the same broadly, merely claiming my device and arrangement as shown. The question that first suggests itself to the inquiring mind is, can vessels be successfully steered to the right and left through the air? So, too, this has been the subject of serious consideration by inventors and aeronauts who have endeavored to direct the course of their unruly crafts through the air, and experience has abundantly demonstrated that as the ship, the sails, the screws, and rudders in aerial vessels all operate on one element, it will require the exertion of a more positive force to cause a deviation than when two or more elements, like air and water, are involved. To steer the aerial vessel there must be direct impact by force, or such a positive diverging line formed (and possibly both) that the vessel will be forced to obey, otherwise the aeronaut will have no control of his craft. To overcome these embarrassments and get my ship under suitable control, I have multiplied my facilities for steering. By ranging the long fin-shaped rudder along on the under side of the tapering ends of the vessel at both ends, and making the rudder conform to the outline of the vessel, throwing both to the starboard or the port side, (the curvature being so positive,) forming the arc of a circle, the cabin being the pivot, the tendency of the vessel will be to take that course. Should, however, the vessel refuse to obey the rudders (for instance, the rudders *h*) when they are thrown to the starboard side by throwing out a fan, C, or a number of them, on the starboard side, the vessel will naturally be thrown in that direction. If, however, the vessel still disobeys, by adjusting the rear end screw to travel to the port side and the forward screw to travel to the starboard side the vessel will be forced around. Thus it will be seen the rudders, the side fans, and the end screws all contribute to deflect the course of the vessel laterally, while, in the

process of sailing, the fins *b* deflect the course of the vessel vertically, while the side screws *c* carry it forward on its course.

While I show in my drawings, and set out somewhat in detail in my specification herewith, the general form, construction, and arrangement of the body of an aerial ship, the method of mounting and operating side propelling screws, the construction, mode of mounting, and method of operating "side fins" for deflecting the lateral course of an aerial ship, and the construction and mode of mounting and operating vertical central screws for raising and lowering the vessel vertically, having heretofore—to wit, November 8, 1883—filed, and I now have pending under Serial Nos. 111,236, 111,237, 111,239, and 111,240, respectively, applications for patents covering these specific features, I do so merely to show the relations of these several parts to each other in making up a common whole, but with no purpose of claiming here specifically and in detail those features.

Having now fully described my invention, what I esteem as new, and desire to protect by Letters Patent, is—

1. In vessels for aerial navigation, adjustable fans secured in the sides of the vessel at fixed points by knuckle-joints, and opened, closed, and otherwise handled through cables or chains passing to within the vessel by internally-arranged machinery, substantially as and for the purpose described.

2. In vessels for aerial navigation, adjustable fans secured by knuckle-joints on the sides of the vessel, in combination with long fin-shaped rudder-blades arranged on the under side of the tapering ends of the hull, and secured in ways, and operated by tiller chains or cables for the purpose of lateral steering, substantially as and for the purpose shown.

3. In vessels for aerial navigation, adjustable fans arranged at intervals along the sides of the ship, and attached by suitable joints to a suitable fixed base, in combination with a laterally-adjustable end screw for laterally deflecting and changing the course of such vessel, substantially as shown and described.

4. A fan or sail consisting of a frame of thin blades severally jointed or hinged to a suitable frame at common points on the sides of the vessel, and covered with thin flexible material, in combination with cables or chains attached to the fan and passing into the vessel and with rudders at the bow and stern, substantially as shown and described.

5. In vessels for aerial navigation, long fin-shaped rudder-blades secured at the smaller ends by pivotal joints amidships to and ranged along and made to conform to the under side of the tapering ends of the vessel, the outer and larger ends extending to and resting in frames secured to, forming part of, and protruding from, the under side of the vessel, where they are secured and operated in ways for steering the vessel laterally, substantially as shown and described.

6. In vessels for aerial navigation, long fin-like rudder-blades secured and made to conform to the tapering body, and extending along the under side toward the ends of the vessel, their outer ends arranged to move laterally between or upon suitable guideways secured to the ship's body, in combination with adjustable fans secured to the sides of the vessel for the purpose of steering the latter, substantially as described.

7. In vessels for aerial navigation, long fin-shaped rudder-blades arranged and by pivotal joints secured amidships to and ranged along and conforming to the under side of the tapering ends fore and aft, in combination with adjustable end screws employed for laterally deflecting and changing the course of the vessel, substantially as shown and described.

8. In vessels for aerial navigation, long fin-shaped rudder-blades arranged and by pivotal joints secured amidships to and ranged along and conforming to the under side of the tapering ends fore and aft to a frame protruding from the vessel, in combination with projecting frame *i*, carrying horizontal ways at top and bottom in which the wheels on the outer end of the rudder have seats and move, vertical stanchions carrying pulley-wheels arranged for supporting the rudders employed in steering the vessel's course laterally, and cables or chains attached to the rudders passing over said pulleys to steering gear, substantially as shown and described.

9. Long fin-shaped tapering rudder-blades provided with a journal-joint at one end, and carrying in suitable journals at the opposite end gearing-wheels, by which they are moved in their ways for steering vessels for aerial navigation, arranged substantially as shown and described.

10. Long fin-shaped tapering rudder-blades *h*, provided at one end with a pivotal journal-joint, *o*, by which they are secured in place, and at the other with suitable wheels, *i'*, by which they are moved in ways i^4, forming the segment of an arc in frame *i*, in combination with frame *i*, ways i^4, stanchions i^3, pulley-wheels *s*, steering-cables *n n'*, and drum *s'*, for laterally steering vessels for aerial navigation, substantially as shown and described.

11. In vessels for aerial navigation, end propelling and steering screws mounted between the end of the hull and a supporting-bracket on and actuated by a longitudinally-adjusted shaft intersected by a universal joint, and secured in bearings in an adjustable carriage arranged in ways in the end of the vessel's hull, and a pendent bracket with swivel bearings, as shown, the whole constructed and arranged to be operated by mechanical power for propelling and laterally changing the course of such vessels, substantially as shown and described.

12. In vessels for aerial navigation, the combination of end screws, *f*, longitudinally-arranged horizontal shaft *f'*, universal joints f^2, journal *w*, movable carriage *p*, the latter hav-

ing racked gear-bands *v v*, and tongues *v' v'*, pinions *p'*, and ways *o'* in aperture *q*, and bracket-supports f^3, for propelling and laterally steering vessels for aerial navigation, substantially as shown and described.

13. In vessels for aerial navigation, the combination of laterally-adjustable end screw, *f*, mounted in shifting ways, side fans, C, and adjustable side screw, *c*, for propelling and laterally deflecting and changing the course of the vessel, substantially as and in the manner described.

14. In vessels for aerial navigation, the combination of side fans, C, fin-shaped rudder-blades *h*, and laterally-adjustable end screws secured and operated, as shown, for laterally deflecting and changing the course of vessels for aerial navigation, substantially as and in the manner described.

15. In vessels for aerial navigation, the combination of adjustable side fans for laterally deflecting, and side adjustable fins, *b*, for vertically deflecting, the course of vessels for aerial navigation, substantially as shown and described.

16. In combination, in vessels for aerial navigation, side fans, C, fin-shaped rudder *h*, and laterally-adjustable end screw, *f*, for changing the vessel's course laterally, side propelling and end screws for propelling the vessel forward, and adjustable side fins, *b*, for deflecting the vessel's course vertically in the process of navigating and handling vessels for aerial navigation, substantially as shown and described.

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

EUGENE F. FALCONNET.

Witnesses:
GEO. M. FLETCHER,
W. D. TALBOT.