

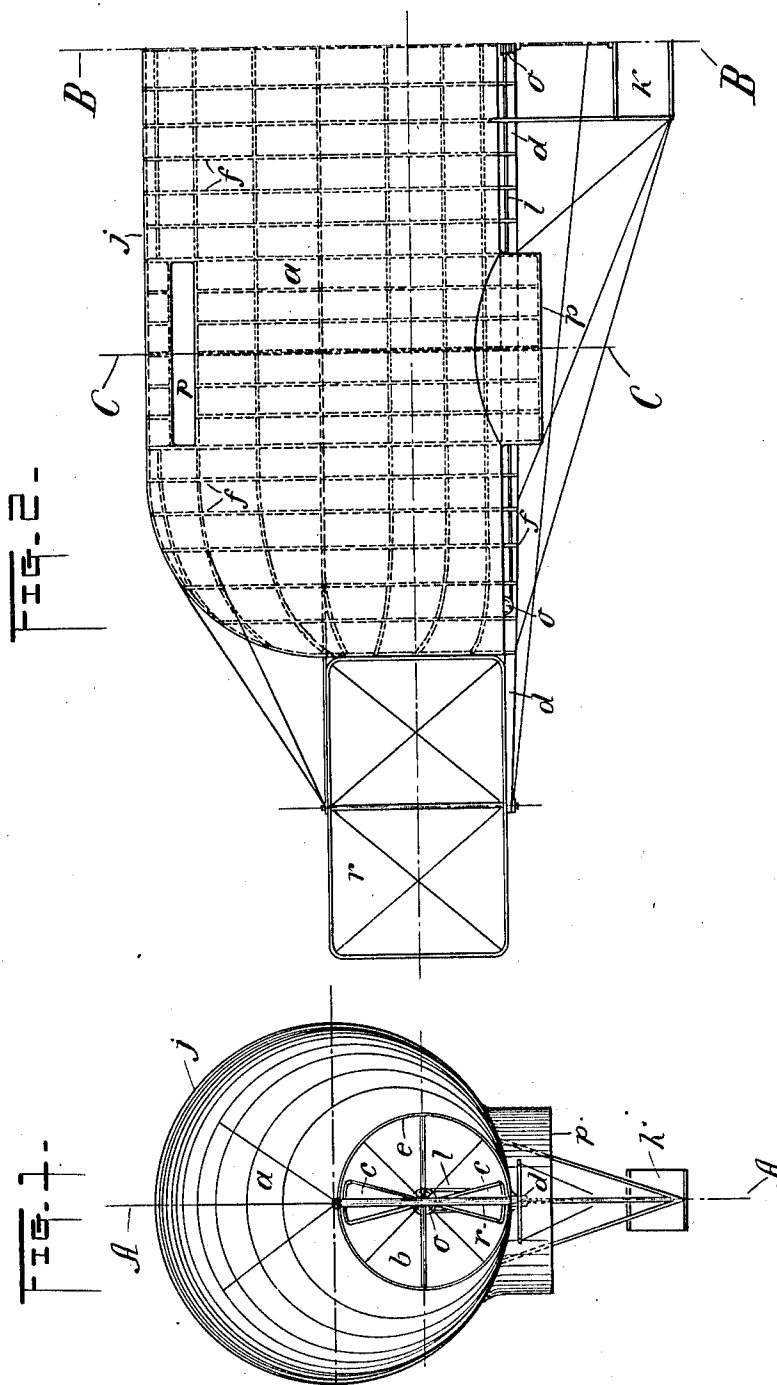
L. C. BADEAU.
AIRSHIP.

APPLICATION FILED SEPT. 28, 1908. RENEWED APR. 19, 1911.

1,020,015.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 1.



Witnesses:
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By his Attorney: *Alfred P. Olsen*

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3 SHEETS—SHEET 2.

FIG-4-

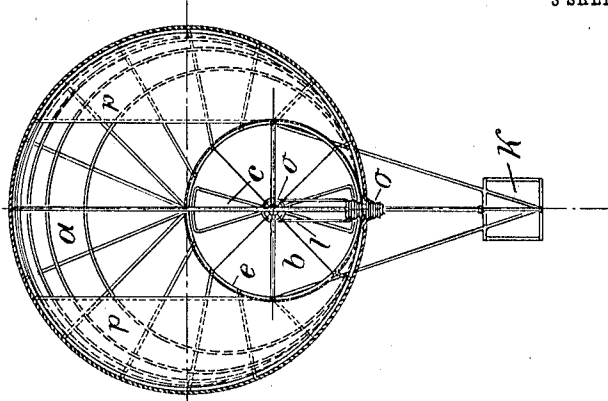
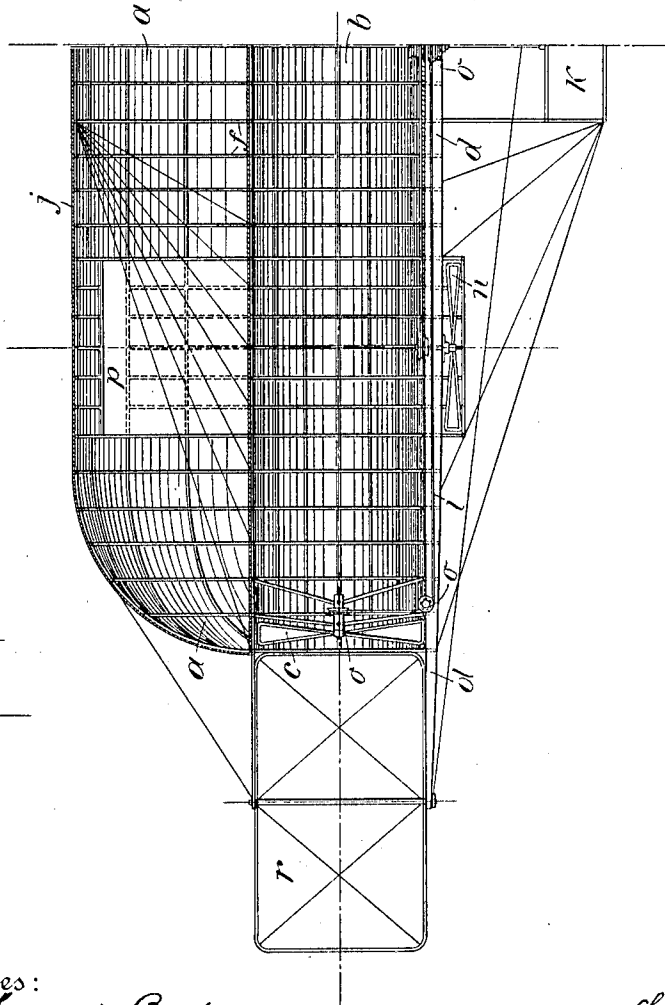


FIG-3-



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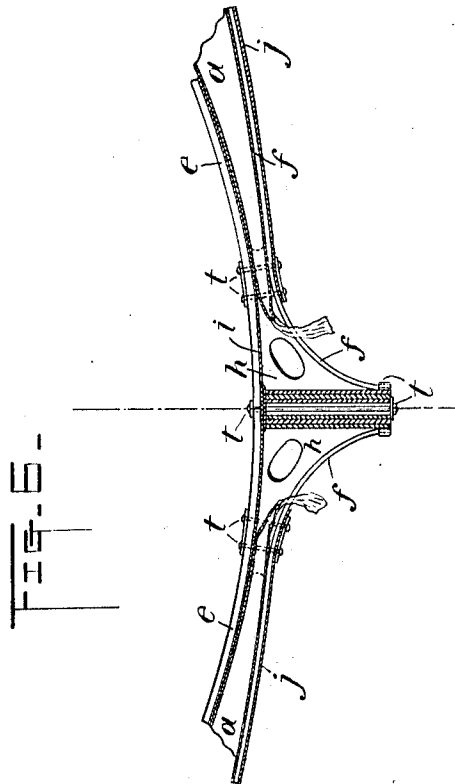
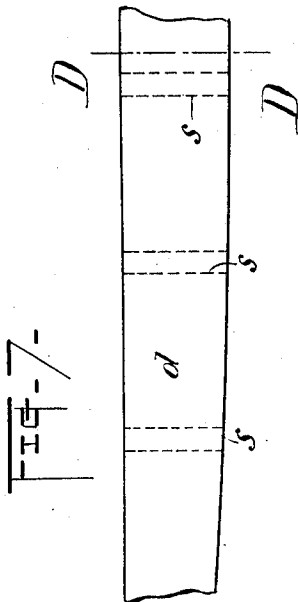
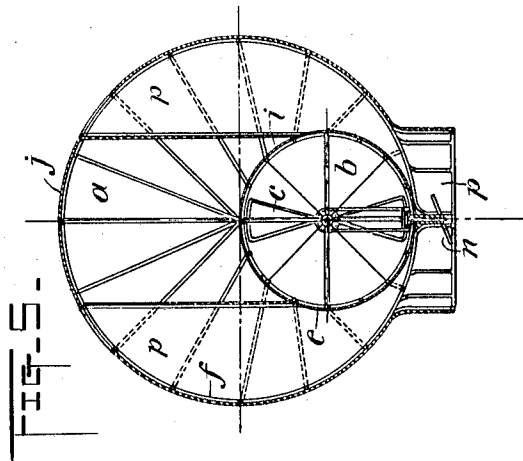
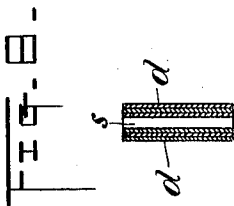
AIRSHIP.

APPLICATION FILED SEPT. 28, 1908. RENEWED APR. 19, 1911.

1,020,015.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

LOUIS C. BADEAU, OF NEW YORK, N. Y.

AIRSHIP.

1,020,015.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Application filed September 28, 1908, Serial No. 455,144. Renewed April 19, 1911. Serial No. 622,135.

To all whom it may concern:

Be it known that I, LOUIS C. BADEAU, a citizen of the United States, and resident of Greater New York, State of New York, have invented certain new and useful Improvements in Airships, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to apparatus for navigating the atmosphere, and more particularly to such air-vessels in which the buoyancy of a balloon or container filled with, or confining, a quantity of a gas lighter than air at atmospheric temperature, is relied upon to counteract or balance gravitation of the parts which are heavier than air sufficiently to secure a suitable degree of flotation and thereby avoid too sudden and disastrous descensions and landings.

The object of this invention is, primarily, to provide a construction for the framework or skeleton of air-ships that will successfully meet the exacting demands made upon the latter as to their ability to not only resist the troublesome tendencies of powerful eddy-currents and of sudden changes in the direction of a strong wind, but also will reduce, to a minimum, the chances of such air-ships becoming wrecked or suffering damage, during their evolutions, through fouling trees, buildings or elevations of the ground.

A substantially spherical or pear-shaped balloon, though possessing a very small outer surface for a given capacity or volume, offers a very large mean effective resistance to air in motion, compared to balloons of elongated or fish-like form, whose longest plane is in the direction of the air current; I therefore contemplate, generally, the use of elongated balloons in connection with my present invention of an improved frame-construction, and more particularly elongated balloons of the tubular type as disclosed in my application for Letters Patent filed January 28th, 1908, under Serial No. 413,103, entitled "Airships."

To effectively employ such balloons, it is most essential that proper provision is made to maintain their form in such a manner as to afford a high degree of flexibility or resiliency, more especially in a horizontal plane, to withstand buffeting and colliding without being put *hors de combat*; which

purpose I accomplish, in the main, by providing a yielding keel, preferably extending under, and fastened to, the balloon its entire length in a manner to avoid, as much as possible, undue strains.

With the foregoing and additional, minor objects in view, I have shown in the accompanying drawings one of a series of constructions which I deem mechanical equivalents, illustrating one way in which my invention may be carried into practice.

In these drawings, in which like characters of reference designate like parts in all of the views, Figure 1 is an end-view of my air-ship. Fig. 2 is a side-elevation of the air-ship, showing one-half of the same. Fig. 3 is a vertical longitudinal, central section of one-half of the air-ship, on line A A of Fig. 1. Fig. 4 is a vertical, transversal section through the middle of the air-ship, on line B B of Fig. 2. Fig. 5 is a vertical, transversal section on line C C of Fig. 2. Fig. 6 is an enlarged cross-section of the keel of the air-ship, also showing its connection with the balloon rings. Fig. 7 is an enlarged side-elevation of a section of the keel, and, Fig. 8 is a vertical cross-section of the keel on line D D of Fig. 7.

The balloon or gas-container, as *a*, is elongated, with more or less pointed ends, and is seen to be cigar-shaped as to external appearance. Longitudinally projecting, preferably, through its lowest part, is a tubular passage or tunnel, as *b*, in which may be placed the propellers *c*, *c*, employed to give a forward movement to the air-ship by reason of the re-active force of the column of the air which enters said air-tunnel in front to be ejected by the propeller at the stern or rearward end, at a velocity greater than that of the air against which it is thus caused to impinge in a direction the opposite to that in which the air-ship is intended to fly. The gas-container is, preferably, of crescent-shaped cross-section, the two points of the crescent converging downwardly and toward the keel *d* which I provide below the air-tunnel its entire length, and to which I prefer to fasten the frame-work of the balloon and of the air-tunnel arranged and formed therethrough as stated.

The keel *d* is shown placed with the longer sides of its cross-section vertically, the upper, longitudinal edge forming a horizontal, straight line, while the lower, longitudinal edge inclines upwardly from

the middle to the two ends, the keel being deepest (or widest) at its middle part and narrowing upwardly and outwardly toward the openings of the air-tunnel. Rings, as *e*, are fastened at their lowest part to the upper edge of the keel at right angles to the same, vertically and equi-distant, while larger rings, as *f*, are fastened, at their lowest part to the lower part of the keel, also vertically and equi-distant, and in such a manner that each of the larger rings *f* is in the same plane with one of the smaller rings *e* and placed eccentrically thereof. Webs *h* serve to stiffen the connection of the two sets of rings to the keel. A suitable covering *i* is placed around the series of smaller or inner rings *e*, while a similar covering, as *j*, is placed over and around the series of larger or outer rings *f*, leaving, however, the openings of the air-tunnel *b* free.

The space between the two series of rings *e* and *f*, and their coverings *i* and *j*, respectively, is intended to receive the balloon or gas-container, which may consist of a number of smaller balloons, or balloonets; or, the said coverings may be arranged to receive and confine the gas direct.

At *k* is shown the seat of the aviator or operator, where also may be placed the motors (not shown) to actuate the vertical propellers *c* and the horizontal propellers *n*, which propellers may be driven through a rope *l* and sheaves *o*. Vertical rudders, as *r*, are shown mounted at their middle in front of the openings of the air-tunnel.

The vertical propellers *c* serve to move the air-ship forwardly by accelerating the flow of the column of air passing through the air-tunnel, while the horizontal propellers *n* have the office to raise or lower the air-ship by forcing air through the vertical flues *p*, of which I, preferably, provide two.

The essential part of the present invention consists in providing a keel as a foundation for the frame-work of a flying-machine or an air-ship, of whatever description or size, to which may be secured all the important parts of the same, and which keel is constructed in such a way that it will successfully withstand all, except, perhaps, the very unusual and extraordinarily severe strains, to which air-ships are subject. To attain this end, I construct my keel, as well as the rings secured thereto between which the gas-container is placed and held by the same, of a material of a yielding nature, preferably of wood that is light in weight but tough and fibrous, which may be cut into suitably thin strips of veneer. Such strips of veneer of maximum length and the

proper width (or depth), are then used to "build up" a keel by being glued or cemented together under pressure; and by laying the strips "staggering" a keel of this nature of practically any length that may be required can be obtained which will be very strong, yet sufficiently flexible sidewise (in the direction of its smallest dimension) to bend considerably without breaking. Thus, with a keel built-up as described, the gas-container may be prevented from buckling in a vertical plane, and be able to support and hold up, in alinement, the whole of the air-ship structure without there being any gas in the bag, while being able to yield in case of a collision or accident in a horizontal plane.

As shown in Figs. 6, 7 and 8, a double keel may be used, consisting of two keels placed with their sides facing and held a certain distance apart by struts or blocks, as *s*. Or, I may prefer to use a double keel for the middle section of the air-ship and single keels extending therefrom to the ends which support the rudders; I, therefore, do not wish to be confined to any particular form or arrangement of a built-up keel.

Fig. 6 shows one of a number of ways of joining the balloon rings to the keel with the aid of webs *h* and bolts *t*, to which latter also may be secured the ends of the crescent-shaped balloonets *a*.

I have omitted to show the means for actuating the propellers and for manipulating the rudders, as well as numerous details of construction and arrangement, as not being essential.

What I claim as new and desire to secure by Letters Patent is:—

1. A frame-work for an air-ship, comprising a keel, a series of upwardly projecting rings secured thereto substantially at right angles, a second series of upwardly projecting rings of larger diameter secured to said keel eccentrically of the said other rings, whereby a space is formed within the larger rings but outside of the smaller rings to receive the gas-container.

2. In an air-ship of the nature described, the combination of a propeller-tunnel formed by a laminated keel and a plurality of upwardly projecting, substantially parallel rings secured thereto and joined at their periphery by a covering, with a gas container inclosing said tunnel.

In testimony whereof, I have affixed my signature to this specification in the presence of two subscribing witnesses.

LOUIS C. BADEAU.

Witnesses:

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ARTHUR HOPPER.