

J. A. ARMSTRONG.
 DIRIGIBLE AIRSHIP AND THE LIKE.
 APPLICATION FILED NOV. 22, 1913.

1,109,502.

Patented Sept. 1, 1914.

3 SHEETS—SHEET 1.

Fig. 1.

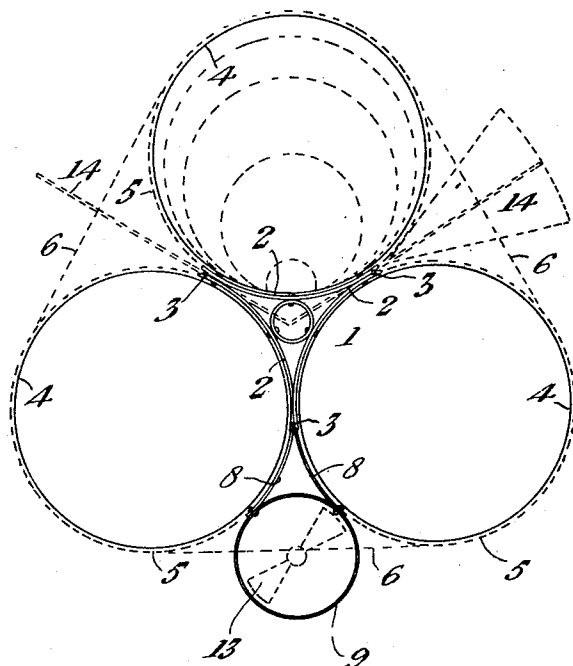


Fig. 2.

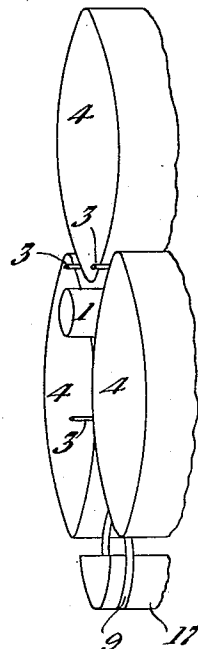
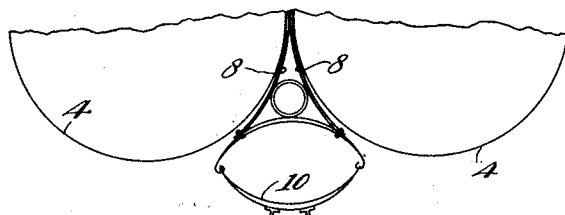


Fig. 4.



Witnesses

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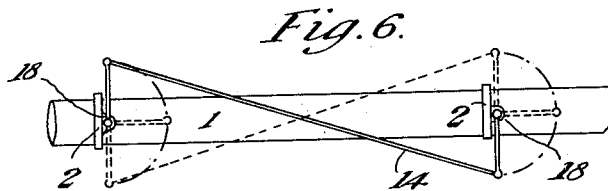
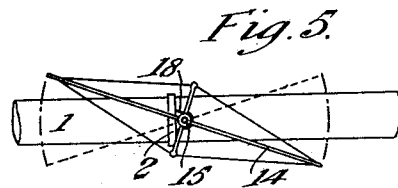
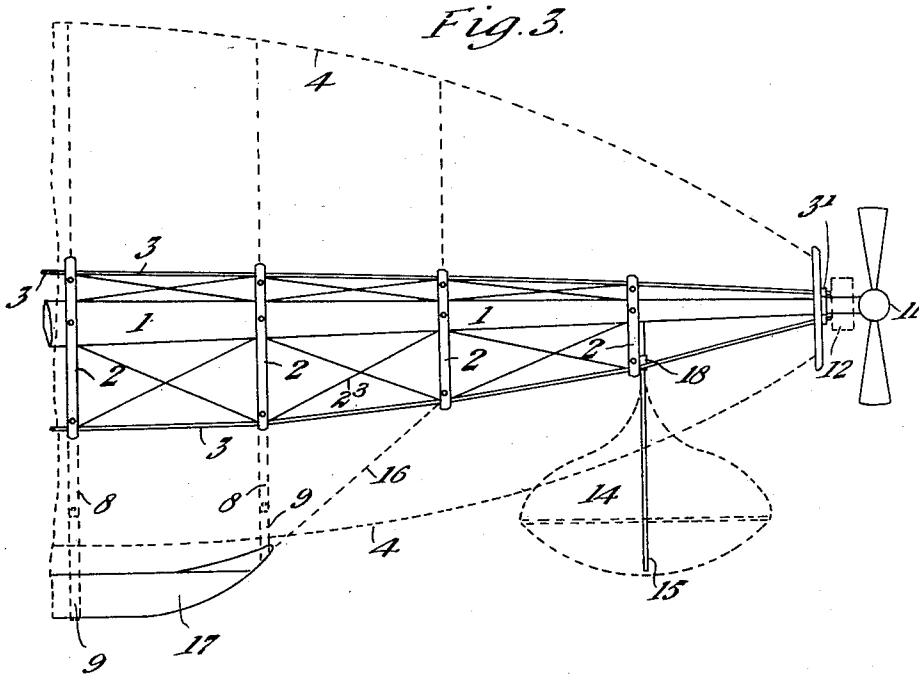
by *James L. Norris*
 Attorney

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3 SHEETS-SHEET 2.



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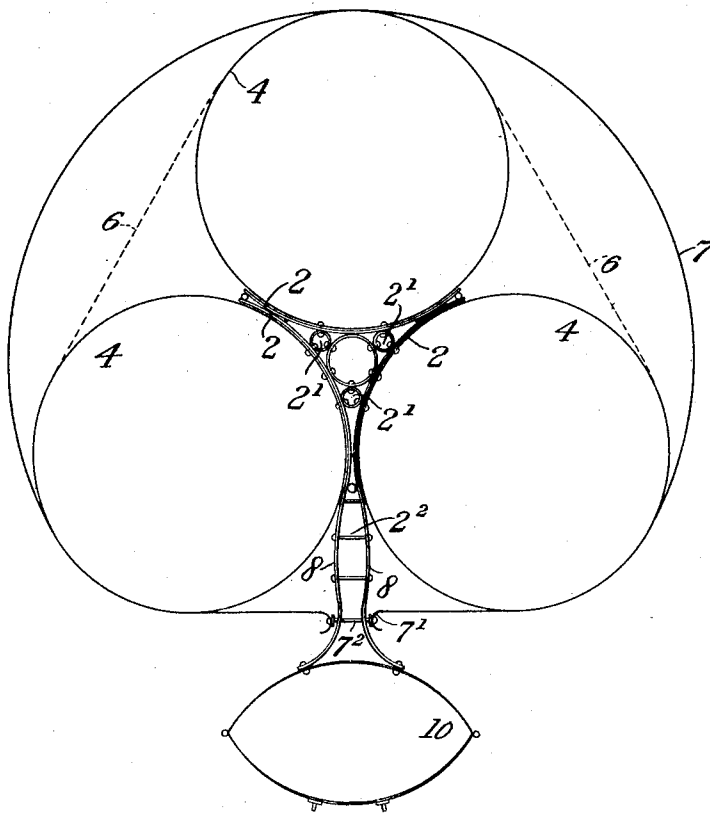
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3 SHEETS—SHEET 3.

Fig. 7



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UNITED STATES PATENT OFFICE.

JOHN ARTHUR ARMSTRONG, OF LONDON, ENGLAND.

DIRIGIBLE AIRSHIP AND THE LIKE.

1,109,502.

Specification of Letters Patent.

Patented Sept. 1, 1914.

Application filed November 22, 1913. Serial No. 302,485.

To all whom it may concern:

Be it known that I, JOHN ARTHUR ARMSTRONG, a subject of the King of Great Britain, residing in London, England, and whose post-office address is Gilnockie, Westcombe Park, in the county of London, England, have invented certain new and useful Improvements in Dirigible Airships and the like, of which the following is a specification.

This invention relates to dirigible air ships and the like and consists of an improved construction and arrangement of parts having for their object a rigidity and stiffness in the chassis or framing, as well as in the parts associated with the motive and guiding devices, greater than has been the case heretofore with a corresponding amount of material.

The improved air ship comprises a compound arrangement of a number of elongated cigar or other shaped gas envelopes or balloons arranged around and longitudinally to a central rigidly constructed frame or back-bone. To a great extent the proposed structure follows nature's design of the vertebrate skeleton with its back-bone and ribs, for I propose to employ three or more sets of ribs surrounding one back-bone, to substitute balloons in the place of the animal's body and to form the ribs into a star-like section with pairs of adjacent ribs connected together to form struts which would carry ties to the extremities of the back-bone in place of the ligaments and skin in the case of the animal.

The invention will be described with reference to the accompanying diagrammatic drawings in which—

Figure 1 is a transverse section of an air ship with the invention applied and with certain auxiliary parts depicted in broken lines; Fig. 2 is an oblique cross section of the ship; Fig. 3 is a part longitudinal section, the gas envelopes being indicated in broken lines; Fig. 4 is a part cross section of an air ship showing a modification; Figs. 5 and 6 are details relating to rudders or fins, and Fig. 7 is a transverse section of a modification.

On referring to the drawings it will be seen that the framework consists of a central member 1 which carries a series of sets of ribs 2, the sets being spaced apart and the ribs themselves preferably concave out-

wardly so as to form cradles for the reception of the gas envelopes or balloons 4. The ribs of each set are connected near their ends to form struts or posts encircling the center member, while tension members or tie rods 3 rest on and connect one set of these posts with the adjacent set or sets, the tie rods converging to and being strained on the end of the said central member which is thus converted into an all round trussed column or girder as shown in Figs. 1, 2 and 3.

The central member itself may be a spar, bamboo, or of metal, it may be tubular or built up of star section or have the character of a cluster column or other suitable form.

Each of the ribs 2 is connected near its middle to the central member and the ribs of a set are joined together in pairs with or without intermediate bracing. Such intermediate bracing is shown at 2' and 2² in Fig. 7.

The sets may be braced in the longitudinal direction of the structure, any one set to the adjacent set or sets as indicated at 2³, Fig. 3.

The tie rods 3 are adjustably connected to the ends of the central member 1, they may be alternatively or in addition, provided with suitable devices, such as the nuts 3', whereby the rods or wires can be tightened up or strained. The details of construction of the central frame will vary of course according to the size of the air ship and other circumstances. The gas envelopes 4 are housed or inclosed as usual in nets 5 which are securely fastened in a suitable manner to the rib cradles, and to the ends of the framing. The whole series of balloons and nets may be held together, so as to avoid any rolling or working about of the separate balloons, by lacing or net work 6 disposed tangentially between adjacent balloon nettings.

The usual car or cars for the accommodation of the crew, the motive power, stores, ammunition and other articles are also connected rigidly to the main frame and tied to it in convenient manner, as for example by ties 16. For this purpose some of the ribs may be prolonged or furnished with extensions 8 which may be continued in the form of a ring 9 to contain or embrace the car 17. This construction is obviously a somewhat elastic arrangement and would afford relief to the machine on taking the ground.

This relief may be further developed as shown in Fig. 4, to constitute a buffer car, the supporting member taking a D or C shaped spring form 10 to which longitudinal sleigh spring runners or wheels, not shown in the drawing, may be fitted for stability and ease of grounding and movement. These spring rings may or may not be separate from those holding the cars.

Wings, rudders, fins or sails 14, can readily be fitted between the balloons as shown in Figs. 1 and 3 and on end, in Figs. 5 and 6.

The actual holding and guiding members or spars 15 for such devices can have bearings 18 rigidly supported from the central member and the stayed ends of the struts 2 and can be adapted to be readily controlled by suitable gear or connections operable from within the car. Fig. 5 shows a single axis or single stemmed fan-shaped rudder or fin, such as the steering rudder 14 in Fig. 3. Fig. 6 shows an arrangement of a double axis or a two stemmed sail or fin 14 of greater length, and wherein both stems similarly control the inclinations of the fin or plane to the main framework as a means for raising or depressing the air-ship. In this case the two stems may be cranked or suitably bent in the parts beyond their bearings.

The elongated gas envelops 4 may be subdivided or comprise several sections, while appropriate means may be provided for reefing or furling the envelops so that the lifting may be diminished or that they may be readily stowed away in their respective cradles.

The central member 1 when of a tubular construction may be used as a vacuum or pressure reservoir which can be brought into service for any purpose as circumstances may require. If it be desirable to increase the tubular central member to its greatest capacity it may be inwardly tied or otherwise stiffened. In the case of a central member of the open or built up class, a gas envelop may be inclosed therein as a means of regulating displacement.

Suitable means may be provided on one or more (the top one in the case of three, as shown, by preference) of the gas envelops for deflation to any desired extent so as to balance the weight of fuel, projectiles or other materials as they are expended without disturbing the equilibrium or poise of the ship.

The form of framing above described is most suitable for taking the thrust of propulsion along the axis of the ship and does away with all the cross strains that arise when driving from under-cars or side-brackets. Fig. 3 shows a propeller 11 fitted in the axis of the ship, and it may be driven by an electric motor 12 disposed outside or

inside the central frame and axis, the necessary internal combustion engine and dynamo for driving the motor being situated in the car, a method that has been successfully adopted in the case of some types of omnibuses and cars. In this position also the propeller screw is in no danger of damage when the ship grounds, and is freer when putting the machine into motion; but of course the propeller 13 can, if desired, be fitted alternatively or in addition to the cars or brackets provided for the purpose.

Other forms of propulsion may be employed such as that detailed in my copending United States application Serial No. 609,245 and wherein a propeller is used that is capable of propelling backward or forward or up and down or in any direction either in air or water, or traveling on land.

Fig. 7 shows a modification wherein the series of balloons 4, clustered round the central longitudinal frame, are inclosed within an outer envelop or balloon 7, of circular section, but it may, as depicted in Fig. 7, be flattened underneath. It is provided with an opening or sleeve 7' through which pass the extensions 8 of the ribs 2, braced together and carrying the spring buffer device 10 which can be of a size to encircle and leave a clear space or margin around a car carried in the ring members 9 supported as in Fig. 1 from other rib extensions 8. The rib extensions traversing the sleeve pass through a flanged diaphragm 7² secured in suitable manner to the sleeve 7'. The outer envelop 7 is stiffened to the central longitudinal frame by the rigidly connected inner balloons, against which it bears for their whole lengths.

Having now described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A dirigible air-ship or the like, having a longitudinal rigid frame comprising a central compression member, a plurality of radially disposed struts connected with and projecting from the central member, and tension members connecting the outer ends of the struts and the ends of the central member, said central member being thereby placed in compression and a plurality of elongated gas envelops attached to and disposed in clustered and longitudinal relation to said frame.

2. In a dirigible air-ship or the like, the combination of a longitudinal rigid frame comprising a central compression member, a plurality of radially disposed struts connected with and projecting from the central member, and tension members connecting the outer ends of the struts and the ends of the central member, said central member being thereby placed in compression, a plurality of elongated gas en-

velops attached to said frame and a propeller rotatably mounted on one end of the frame and in axial alinement therewith.

3. In a dirigible air-ship or the like, having stiffening means comprising a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts and means for securing the tension members to the ends of the compression member.

4. A dirigible air-ship or the like having stiffening means comprising a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts and adjustable means for securing the tension members to the ends of the compression member.

5. A dirigible air-ship or the like having stiffening means comprising a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts, means for securing the tension members to the ends of the compression member and bracings connecting adjacent sets of ribs.

6. A dirigible air-ship or the like having stiffening means comprising a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts, adjustable means for securing the tension members to the ends of the compression member, and bracings connecting adjacent sets of ribs.

7. In a dirigible air-ship or the like, having a plurality of gas envelopes, the combination of a central support arranged longitudinally to the axis of the ship, and a series of strut devices attached to said support and to each other, said devices comprising parts formed as cradles surrounding the support for the reception of the gas envelopes.

8. In a dirigible air-ship or the like, the combination of a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts, adjustable means for securing the tension members to the ends of the compression members, parts extending from the ribs and a car attached to said parts.

9. In a dirigible air-ship or the like, the combination of a longitudinally arranged compression member, a plurality of sets of ribs, said sets being spaced apart along the length of the compression member and the ribs of each set connected together in pairs to constitute struts, tension members correlated with said struts, adjustable means for securing the tension members to the ends of the compression member, and depending spring buffer devices connected to the sets of ribs for the purposes described.

10. In a dirigible air-ship or the like the combination of a rigid frame comprising a central compression member arranged longitudinally to the axis of the ship and trussed all around, a plurality of elongated gas envelopes secured to said frame, and an outer gas envelop adapted to inclose and bear against the exterior surfaces of said elongated balloons for the purpose described.

11. In a dirigible air-ship or the like the combination of a rigid frame comprising a central compression member arranged longitudinally to the axis of the airship and trussed all around, a plurality of elongated gas envelopes secured to said frame, an outer gas envelop adapted to inclose and bear against the exterior surfaces of said elongated balloons for the purpose described; a propeller rotatably mounted exteriorly to said outer gas envelop on an end of the frame and in axial alinement therewith, guiding surfaces, pivotally mounted on said frame, and structures supported from said frame and adapted for the reception of the crew, power generating and other devices.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN ARTHUR ARMSTRONG.

Witnesses:

JOSEPH MILLARD,

WALTER J. SKERTEN.