

April 17, 1928.

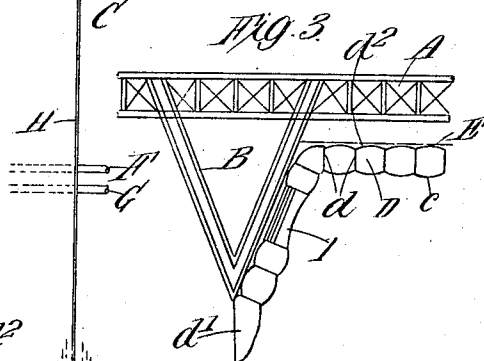
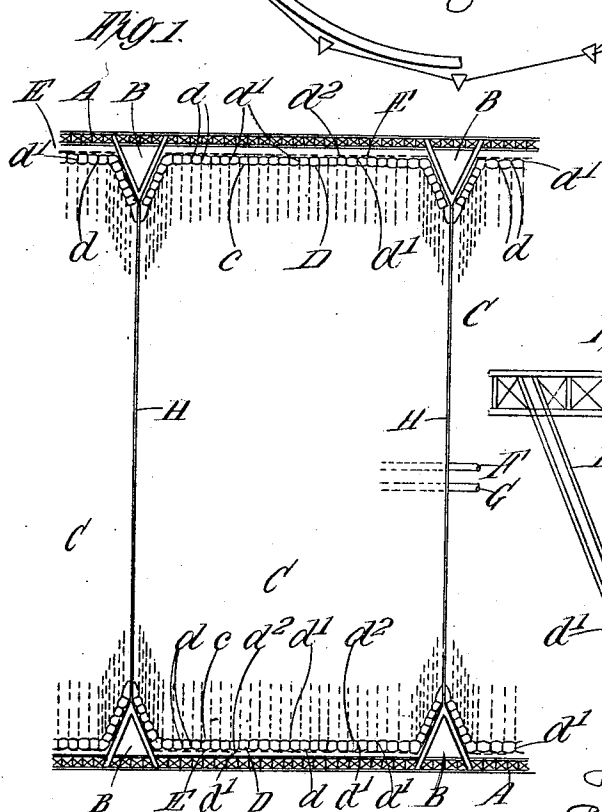
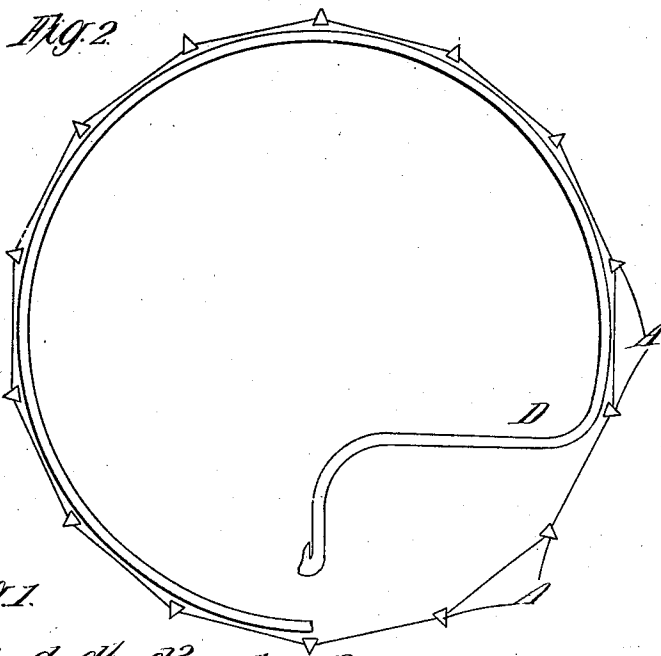
B. N. WALLIS

1,666,112

AIRSHIP

Filed May 29, 1925

2 Sheets-Sheet 1



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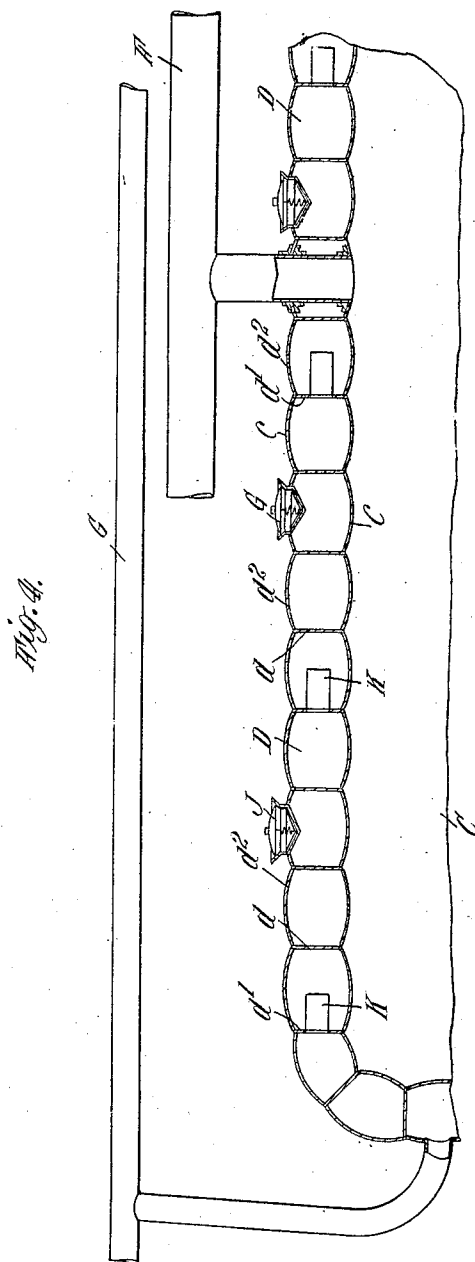
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Filed May 29, 1925

2 Sheets-Sheet 2



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Patented Apr. 17, 1928.

1,666,112

UNITED STATES PATENT OFFICE.

BARNES NEVILLE WALLIS, OF WESTMINSTER, LONDON, ENGLAND, ASSIGNOR TO AIRSHIP GUARANTEE COMPANY, LIMITED, OF LONDON, ENGLAND, A BRITISH COMPANY.

AIRSHIP.

Application filed May 29, 1925, Serial No. 33,680, and in Great Britain June 12, 1924.

This invention relates to airships of the kind in which provision is made for accommodating an inert or relatively inert gas such as nitrogen, carbon dioxide, etc., between the usual hydrogen gas bag or bags and the external envelope of the airship, so that in the event of the hydrogen gas bag or bags being penetrated by fire, an incendiary bullet, bomb or other missile, the inert gas will serve to prevent or restrain the hydrogen gas from burning.

The usual proposals for accommodating the inert or relatively inert gas possess the objection that, owing to the increased pressure prevailing at the upper regions of the airship, the compartment containing the inert gas is collapsed at the top of the airship, so that the hydrogen gas bags are either unprotected in these regions or else are not protected to the same extent all round by an envelope of inert gas.

According to the present invention this objection is overcome by accommodating the inert or relatively inert gas within a bag or envelope comprising outer and inner walls (hereinafter termed the nitrogen envelope), which envelope surrounds the hydrogen gas bag or each separate gas bag, and is provided with partitions which serve to connect together the said outer and inner walls. The inner walls of the nitrogen envelope is preferably constituted by the gastight outer cover of the hydrogen gas bag itself, but a separate inner wall may be provided, if desired, the outer wall being made of a material which is impervious to nitrogen such as suitably treated cotton fabric. The partitions may be in gas communication with each other, and to this end they may be composed of a non-gastight material, or certain of the partition walls may be gastight so as to divide the nitrogen envelope into a number of separate sections, and suitable means, such as non-return valves, may be provided for placing the various sections in communication with one another so as to enable them to be filled from a common supply pipe while preventing the escape of nitrogen from other sections, in the event of one or more sections being ruptured. When the nitrogen envelope is inflated, compartments of circular or approximately circular shape in cross section will be formed around the gas bag or each gas bag.

Suitable means are provided for permitting the nitrogen to escape from its envelope or envelopes in proportion to the escape of the hydrogen gas from its bag or bags, this provision being necessary owing to the expansion of the gas due to the decrease in atmospheric pressure which takes place as the air ship rises. The nitrogen main is preferably constructed of the same material as the nitrogen envelope and said main may be provided with suitable non-return valves in addition to or in lieu of the aforesaid non-return valves. The gas bag mesh wiring system, which may be of the type described in our co-pending specification No. 2115 of 1924 is preferably arranged outside the nitrogen envelope so that the latter is located between the hydrogen gas bag and the said mesh wiring.

In order that the said invention may be clearly understood and readily carried into effect the same will now be described more fully with reference to the accompanying drawing, which shows by way of example one embodiment of the present invention, and in which:—

Figure 1 is an axial section of the centre portion of a rigid airship showing hydrogen gas bags fitted with nitrogen envelopes constructed according to the present invention.

Figure 2 is a diagrammatic transverse section, the half section on the left hand side of the figure showing a hydrogen gas bag fully inflated and the half section on the right hand side of the figure showing the position assumed by the nitrogen envelope when the hydrogen gas bag is partly deflated.

Figure 3 is a detail view on an enlarged scale showing the position of one of the automatic and manœuvring gas valves for relieving the pressure of the hydrogen gas bag.

Fig. 4 is a sectional view showing on an enlarged scale a portion of a gas bag fitted with the inert gas containing envelope.

A, A are the longitudinal frames of the airship. B, B are the transverse frames. It will be observed that the transverse frames are triangular in cross section with the apex directed inwards towards the axis of the airship and that the longitudinal frames are also triangular in cross section the apex being directed outwards. C, C are the hy-

drogen gas bags, and D, D are the nitrogen envelopes. In the example shown the nitrogen envelopes are formed by providing the outer gastight wall *c* of the gas bag with a number of non-gastight partitions *d*, *d* as also a number of gastight partitions *d*¹, *d*¹, pitched at suitable distances apart, the partitions being sewn or otherwise connected at their inner edges to the gas bag C and at their outer edges to a lining *d*², *d*² composed of nitrogen-tight material. E, E is the mesh wiring which encloses both the nitrogen envelopes D, D and the gas bags C, C. The gas bags are filled from a hydrogen main F, and the nitrogen envelopes D, D from a nitrogen main G. The relief valves are shown at J, J and the non-return valves at K, K, the latter being fitted in the gas tight partitions *d*'. The non-return valve K is shown in the open position and consists of a fabric sleeve which, during charging of the inert gas envelope, allows the gas to flow through the valve. If, however, the gas tight compartment is ruptured the reversal of pressure within the compartment causes the sleeve K to collapse, thus sealing the opening in the gas tight partition *d*'.

The nitrogen envelopes D, D in the example shown merely surround the periphery and part of the sides of each gas bag C, but it will be understood that, if desired, nitrogen envelopes can also be located between contiguous gas bags; in such cases the nitrogen envelopes will be continued on one or both sides of the mesh wiring or bracing wires, located at H, H, between contiguous gas bags.

The automatic and manœuvring gas valve I (Figure 3) for the hydrogen gas bag C, communicates with the interior space of the transverse frame B, the latter thus acting as a gas trunk for conducting the hydrogen to a suitable opening located at the top of the airship. The relief valves for the nitrogen envelopes D, D can also communicate in a similar manner with the interior of the frames B, B.

Instead of the said nitrogen envelopes being constituted by annular compartments as aforesaid, they may be formed by longitudinally disposed segmental sections, in which case each section may be charged with nitrogen to a pressure equal to the pressure to which it will be subjected by the hydrogen in the corresponding section or region of the gas bag. Each section of the nitrogen envelope will be provided with a suitable charging non-return valve to enable it to be charged to the proper degree as also with a relief valve which may be set to blow off at a pressure slightly in excess of its normal working pressure.

What I claim and desire to secure by Letters Patent of the United States is:—

1. An airship provided with a plurality of

separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gas-tight partitions dividing up said outer chamber into separate gas-tight compartments and other partitions dividing up said outer chamber into non gas-tight compartments.

2. A hydrogen gas bag for an airship provided externally with a surrounding envelope comprising inner and outer walls and partitions which serve to connect together said outer and inner walls, some of said partitions being gas-tight and some non gas-tight.

3. An airship provided with a plurality of separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gastight partitions dividing up said outer chamber into separate gastight compartments, other partitions dividing up said outer chamber into non-gastight compartments, and a network of mesh wiring circumferentially surrounding said outer chamber.

4. An airship provided with a plurality of separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gastight partitions dividing up said outer chamber into separate gastight compartments, other partitions dividing up said chamber into non-gastight compartments, and means permitting of the escape of the inert gas from said outer chamber in proportion to the escape of lifting gas from said inner chamber.

5. An airship provided with a plurality of separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gastight partitions dividing up said outer chamber into separate gastight compartments, other partitions dividing up said outer chamber into non-gastight compartments, and relief valves in said outer chamber adapted to blow off at a pressure slightly in excess of the normal working pressure prevailing within said inner chamber.

6. An airship provided with a plurality of separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gastight partitions dividing up said outer chamber into separate gastight compartments, other partitions dividing up said outer chamber into non-gastight compartments, and valve means in said gastight partitions placing the separate compart-

ments of said outer chamber in gas communication with one another.

7. An airship provided with a plurality of separate gas bags, each gas bag comprising an inner chamber for containing a lifting gas and an outer chamber surrounding said inner chamber for containing an inert gas, gastight partitions dividing up said outer chamber into separate gastight compartments, other partitions dividing up said outer chamber into non-gastight compartments, and non-return charging valves in said gastight partitions which place the separate compartments of said outer chamber in gas communication with one another.

8. A hydrogen gas bag of an airship provided externally with an enveloping outer wall forming a chamber for containing an inert or relatively inert gas, said outer wall being attached to the gas bag by gastight partitions which divide up said chamber into separate gastight compartments and by other non-gastight partitions which divide up said outer chamber into non-gastight compartments, relief valves in said outer wall and valve means for placing all said compartments in gas communication with one another.

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