Nov. 15, 1927. 1,648,935

L. M. CAMPAU

DIRIGIBLE BALLOON

Filed Aug. 15, 1925 2 Sheets-Sheet 1

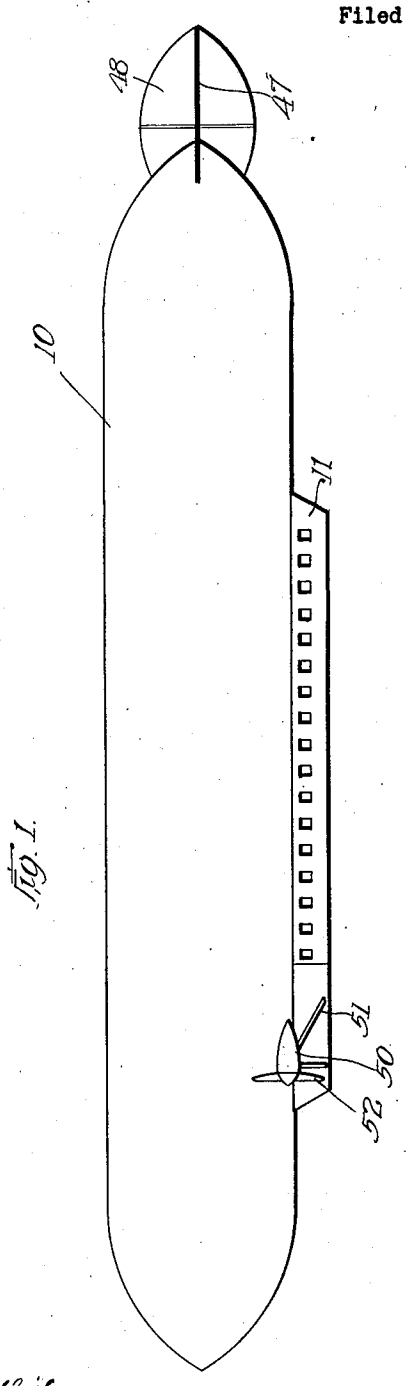


Fig. 1.

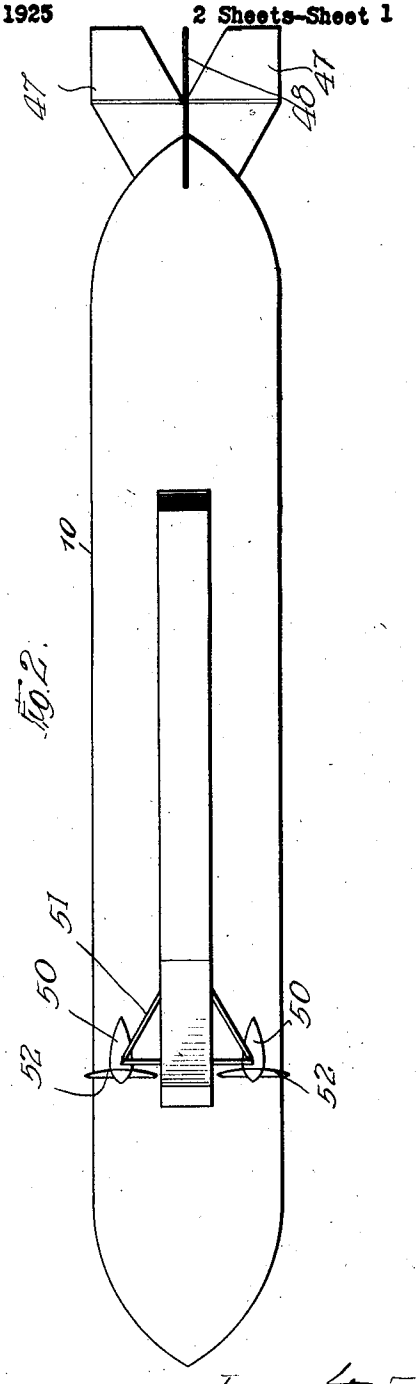


Fig. 2.

Witnesses
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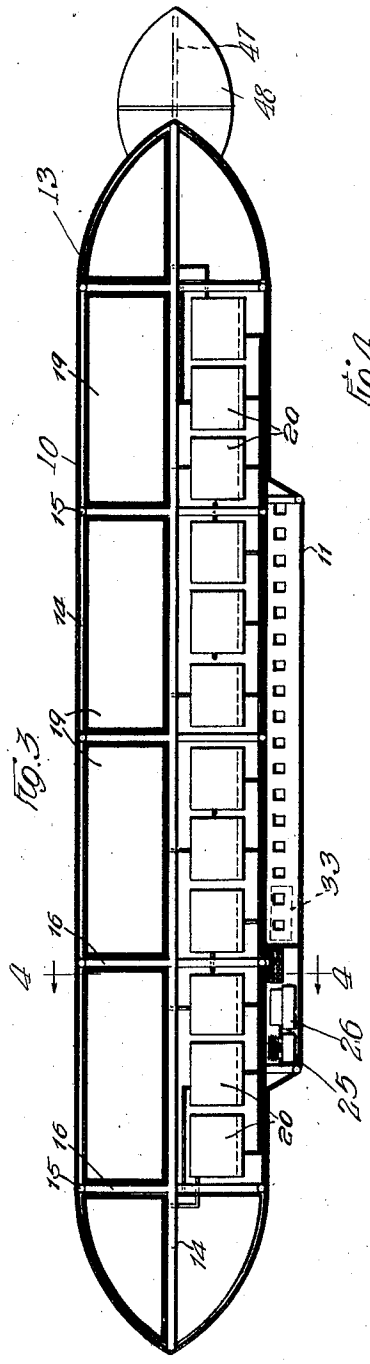


Fig. 3.

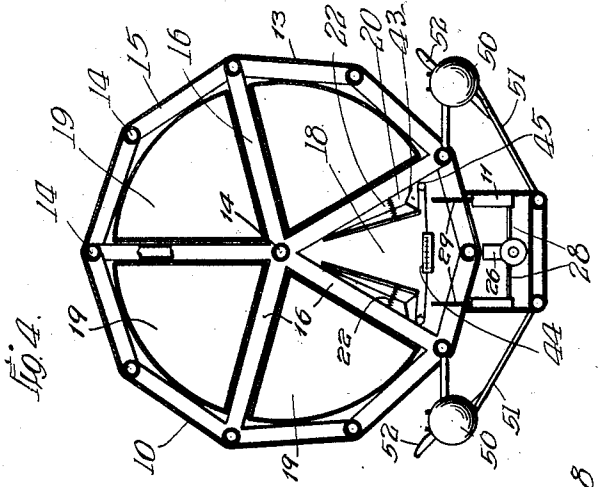


Fig. 4.

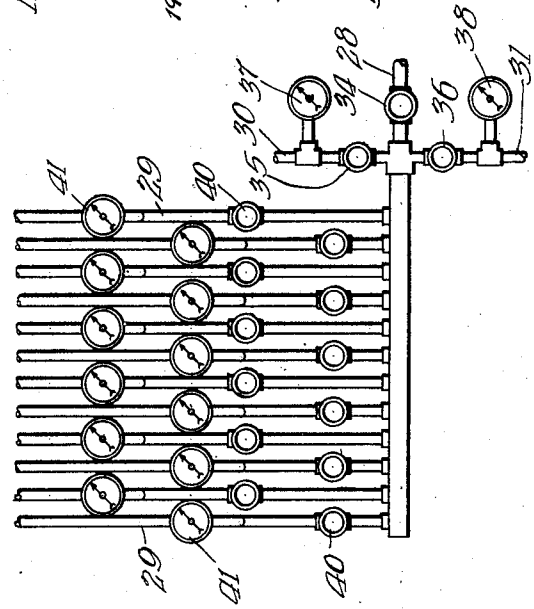


Fig. 5.

Witnesses
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Patented Nov. 15, 1927. 1,648,935

UNITED STATES PATENT OFFICE.

LAWRENCE M. CAMPAU, OF DETROIT, MICHIGAN.

DIRIGIBLE BALLOON.

Application filed August 15, 1925. Serial No. 50,493.

My invention relates to dirigible balloons or airships and has among its other objects the production of devices of the kind described, which are simple in construction, durable efficient and satisfactory for use wherever found applicable.

A particular object of the invention is the provision of a dirigible balloon, the movements of which may be readily controlled without loss of any of the gas contents thereof.

Another particular object of the invention is to provide a dirigible balloon having improved apparatus for handling the supply of gas in the balloon.

One form of the invention is embodied in a dirigible balloon having a plurality of gas compartments communicating with bellows adapted to receive excess gas from the compartments, the bellows being connected to a gas compressor adapted to withdraw excess gas therefrom. The balloon is preferably provided with a tubular frame in which the excess gas may be stored, the gas being withdrawn from the bellows by the compressor and then pumped into the frame. Means is provided whereby the gas may be returned to the bellows and thence to the gas compartments.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a side view of a dirigible balloon embodying the novel features of my invention;

Fig. 2 is a bottom plan view of the improved dirigible balloon;

Fig. 3 is a longitudinal vertical section taken through the improved dirigible balloon;

Fig. 4 is a section taken on line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary elevation of apparatus for controlling the flow of gas to and from the gas compartments of the improved dirigible balloon.

Referring to the drawings, the reference character 10 designates in general a dirigible balloon having a gondola 11. As shown in Figs. 3 and 4, the dirigible balloon 10 preferably comprises an outer envelope 13 enclosing a tubular frame which comprises longitudinal tubular members 14, circumferential tubular members 15 and radial tubular members 16, the tubular members 14, 15 and 16 communicating with each other so that gas may be distributed throughout the frame-work. The tubular members 16 divide the dirigible balloon into five longitudinal compartments, one of which is disposed directly above the gondola 11, as indicated at 18 (Fig. 4). Disposed in each of the remaining longitudinal compartments are a plurality of collapsible gas compartments 19 formed of any suitable material. Communicating with each of the gas compartments 19 is a bellows 20, the several bellows 20 being disposed in the longitudinal compartment 18. Each bellows 20 is yieldingly held in its collapsed position by springs 22 until the pressure within its associated gas compartment 19 reaches a predetermined value whereupon the gas flows from the compartment 19 into the bellows and expands the bellows against the action of the springs 22.

Disposed in the forward end of the gondola 11 is an internal combustion engine 25 adapted to drive a compressor 26 which is connected to the bellows 20 by mains 28 and a plurality of branch pipes 29. The compressor 26 is connected to the tubular frame-work. Each main 28 is connected to the tubular frame-work of the dirigible balloon by a pipe 30 and is connected by a pipe 31 to a suitable tank 33 which may be disposed in the gondola 11, if so desired. Each main 28 is provided with a valve 34 which is interposed between the compressor 26 and the pipes 30 and 31. The pipes 30 and 31 are provided with valves 35 and 36, respectively, and with pressure gauges 37 and 38, respectively. Each of the branch pipes 29 is provided with a valve 40 and a pressure gauge 41. Obviously, the pressure gauges 41 will indicate the pressures obtaining in the several gas compartments 19 and the gauges 37 and 38 will indicate the pressures obtaining in the tubular frame-work and the tank 33, respectively. The valves 34, 35, 36 and 40 may be manipulated to permit the compressor 26 to withdraw the gas from any of the bellows 20 or may be manipulated to permit the gas to flow from the tubular

frame-work or from the tank 33 to the bellows. It is, of course, understood that the pressures obtaining in any one of the bellows 20 and its associated gas compartment 19 will be substantially equal at all times.

Means may be positioned at each bellows 20 for indicating the pressure obtaining within the bellows. Thus, one end of a cable 43 may be secured to the free leaf of each bellows and the other end thereof may be operatively secured to a scale 44 mounted in the longitudinal compartment 18, the cable 43 being trained over a sheave 45 carried by the tubular frame-work. When gas flows from one of the gas compartments 19 into its associated bellows 20 and expands it, the increase in pressure will be indicated upon the associated scale 44.

I have shown horizontal rudders 47 and a vertical rudder 48 for controlling the movements of the dirigible balloon, the rudders 47 and 48 being controlled by any suitable apparatus (not shown). The means for propelling or driving the dirigible balloon may comprise a plurality of internal combustion engines 50 enclosed within suitable housings and mounted in an auxiliary frame-work 51 projecting from the aforementioned tubular frame. The crank shafts of the internal combustion engines 50 carry propellers 52.

The longitudinal compartment 18 constitutes a gangway extending from end to end of the dirigible balloon and provides space wherein any desired apparatus may be mounted or stored. In some instances I may dispense with the gondola 11 and mount the internal combustion engine 25, the compressor 26 and the tank 33 in the longitudinal compartment 18, it being obvious that the controls for the balloon may all be mounted in this space if so desired.

An advantage of my improved construction is that the dirigible balloon may be raised or lowered by inflating or deflating, respectively, the gas compartment 19. This obviates the necessity of discharging gas into the atmosphere when the dirigible balloon is to be brought to a landing as the excess gas may be compressed and stored in the tubular frame-work and in the tank 33 for future use.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

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

1. In a device of the kind described, a gas compartment, a bellows communicating with said compartment, means for storing compressed gas, and a compressor for pumping gas from the bellows to the storing means.

2. In a device of the kind described, a plurality of collapsible gas compartments, a plurality of bellows communicating with said compartments, means for storing compressed gas, and a compressor for pumping compressed gas from said compartments and said bellows to said storing means.

3. In a device of the character described, a tubular frame-work, a plurality of gas compartments, a plurality of bellows communicating with said compartments, means for normally maintaining the bellows in a collapsed position, means for storing compressed gas, and means for pumping said gas from said storing means to said tubular frame-work and compartments, the gas from the compartments entering and expanding the bellows against the action of said retaining means.

4. In a device of the character described, a gas compartment, a bellows communicating with said compartment, means for storing compressed gas, a compressor for pumping gas from the bellows to the storing means, and means for indicating the pressure of gas within said bellows.

5. In a device of the kind described, a gas compartment, a bellows communicating with said compartment, means for storing compressed gas, a compressor for pumping gas from the bellows to the storing means, means for returning the gas from the storing means to the bellows, and means for returning the gas from the bellows to the gas compartment.

6. In a device of the class described, a plurality of collapsible gas compartments, a plurality of bellows communicating with said compartments, means for storing compressed gas, a compressor for pumping compressed gas from said bellows and said compartments to said storing means, and means for returning the gas from the storing means to the bellows and gas compartments.

In testimony whereof, I have hereunto signed my name.

LAWRENCE M. CAMPAU.