

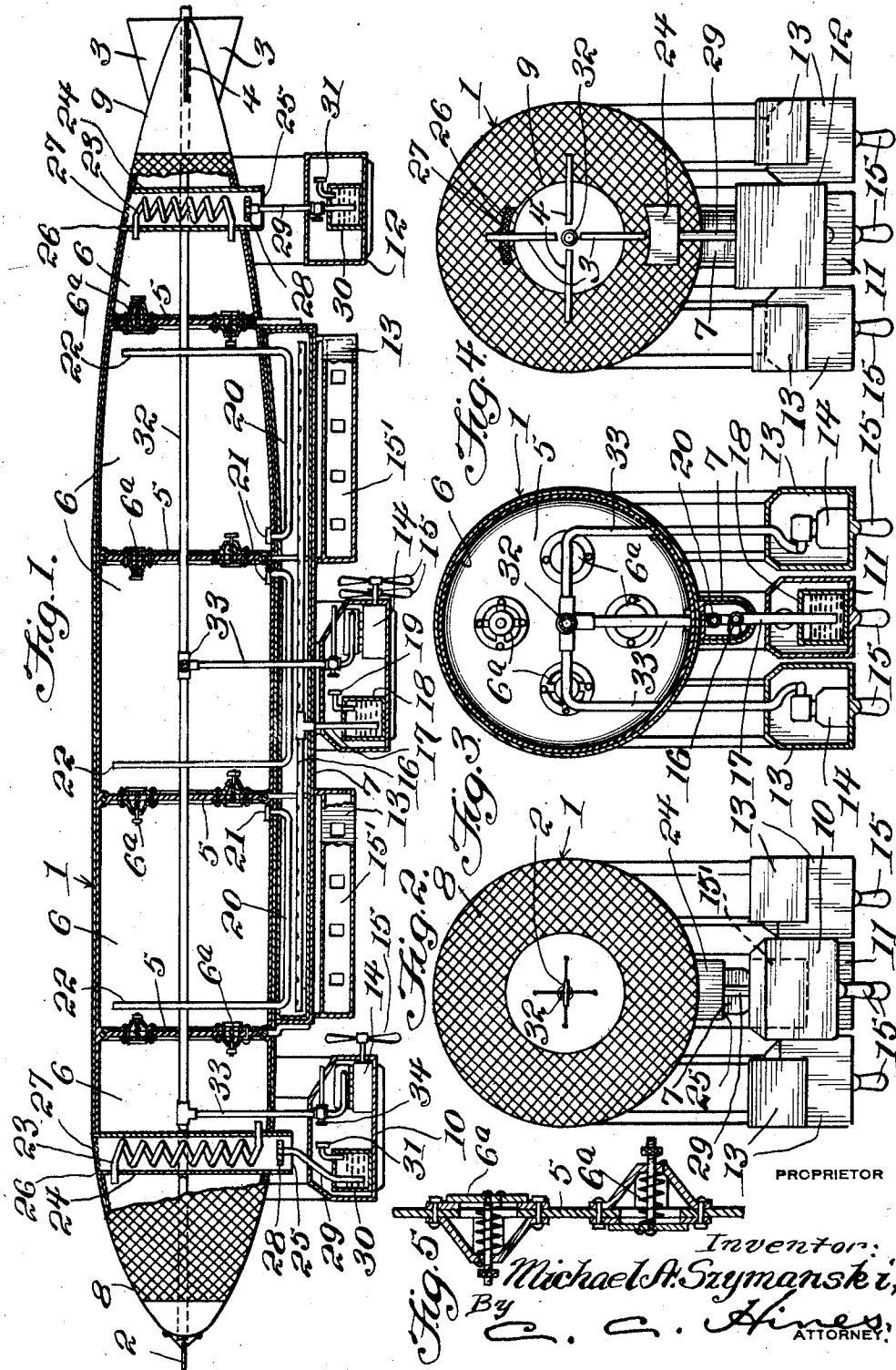
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AIRSHIP

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AIRSHIP

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This invention relates to airships or flying machines of the lighter-than-air class, and of rigid, semi-rigid or non-rigid type, employing a sustaining aerostat or envelope and a suitable non-inflammable inflating medium, such, for example, as helium gas. The invention, however, may be employed in connection with aerostats containing gas of a low degree of inflammability.

10 The main object of the invention is to provide simple, reliable, efficient and economical means for heating the gas whenever required to compensate for pressure changes below that required for proper distention of the envelope and sustention of the craft, due to vent and leakage losses and to climatic changes under which gas contraction occurs.

Another object of the invention is to provide heating means whereby the gas in differing portions or compartments of the envelope may be heated for trimming purposes or to facilitate ascent or descent of the craft.

Still another object of the invention is to provide heating devices or units using different sources of heat and which may be separably or conjointly employed for a heating action, so that a maximum heating effect may be produced in case of emergency, and so that, in the event of the inoperability of a heating unit or units using one source of heat, one or more units using a different source of heat may still be employed.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a side elevation of an airship embodying my invention, with parts broken away or in section to show the interior construction.

Figure 2 is a front end elevation of the same.

Figure 3 is a vertical transverse section on line 3—3 of Figure 1.

Figure 4 is a rear end elevation.

Figure 5 is an enlarged sectional view of the valved partitions.

Referring now more particularly to the drawing, 1 designates the sustaining aerostat

or envelope, which may be of any ordinary form as employed in craft of this character, and made of suitable air and gas tight fabric. At its forward end or nose the aerostat 1 is provided with an anchor ring 2 for connection with an anchor line, and at its rear end the aerostat is provided with a vertical rudder 3 and a horizontal rudder 4 for steering and balancing purposes. The envelope may be provided with the usual exterior netting, throughout the whole or any desired part thereof, and with fixed stability fins of any proper location if desired.

The interior of the aerostat or envelope is divided by transverse partitions 5, or otherwise, to provide compartments 6 to hold the inflating medium, and these partitions may be provided with valves 6^a or other suitable provision made for the restricted flow of the inflating medium from one compartment to another for trimming or pressure equalizing purposes, in order that the envelope may be maintained properly taut or distended at all points. In practice, the envelope may be of double envelope type, embodying an inner envelope and an outer cover, the inner envelope being divided by the partitions 5 into the compartments 6, and any suitable means for charging the compartments with the inflating medium may be employed.

The frame structure of the craft includes the partitions 5, or portions thereof, and a keel 7, which are suitably united, and properly tied and braced, and to which keel, and such other portions of a frame structure which may be employed, the envelope and its netting are suitably secured. The keel and partitions, or portions of the latter, may be made in practice of duralumin, or other suitable light and strong metal and the extent of the framing may be increased to any degree desired according to the type of craft which is to be produced, whether of non-rigid, semi-rigid or rigid type. The keel 7, as shown in the present instance, is shorter than the aerostat and terminates at front and rear at the points of junction of the main body portion of the craft with the nose portion 8 and tail portion 9, but it may be of greater or less length, as desired. A portion of this keel,

at least, depends below the medial longitudinal line of the aerostat and is channeled or U-shaped in cross-section so as to form a heating chamber.

5 Carried by the aerostat are centrally disposed cars 10, 11 and 12, the cars 10 and 12 being secured to the bow and stern portions 8 and 9 and the car 11 to the keel 7 or central portion of the body of the aerostat. At
10 opposite sides of the cars 10, 11 and 12 other cars 13 may be disposed, which cars 13 may be suspended from the netting of the envelope. The car 10 may serve as the pilot's car in which the steering controls for oper-
15 ating the rudders 3 and 4 are arranged. The cars 10 and 11 and, if desired, the car 12 may serve as power cars on which propelling mechanism of any suitable type may be placed. In the present instance the cars 10
20 and 11 are shown as each provided with propelling means in the form of a motor 14 driving a propeller 15, which motor 14 is preferably of the Diesel or other internal combustion type. These cars 10, 11 and 12
25 may be suitably constructed to hold provisions, fuel, ballast and other supplies, and may also provide quarters for officers or members of the crew. The cars 13 may also be constructed to provide quarters for officers
30 and crew and to carry provisions or other supplies and freight, mail or express matter. Additional cars or cabins 15' may be provided between the car 11 and the cars 10 and 12, respectively, for the transportation
35 of freight or mail matter, or passengers, if any. These cars or cabins 15' may be supported directly from the keel 7.

Disposed within the heating chamber formed by the keel 7 is a longitudinally extending heater 16, in the form of a burner
40 pipe. This pipe is supplied with fuel from a conductor 17 communicating with a fuel storage tank 18 on the car 11, which tank is designed to contain a liquid hydrocarbon or similar fuel. Communicating with the tank
45 18 is an air conductor or blast nozzle 19, by which air under pressure from a suitable source may be pumped into the tank so as to provide carbureted fuel to be supplied to
50 the burner pipe, producing a blow-torch or Bunsen type of burner apparatus. The pipe 16 is provided with burner orifices at which the streams of issuing gas are ignited, where-
by the interior of the keel chamber 7 is
55 heated. At its sides, or at other suitable points the chamber 7 is perforate or provided with openings for the supply of air to support combustion and for the discharge of the products of combustion. The chamber
60 7 may be provided, in practice, with a lining of asbestos or other incombustible material, covering also the superposed portion of the framing and the fabric of the craft, so as to protect the same against the direct heat of
65 the flames or from the direct transmission

of heat thereto. The burner 16 is employed to heat heater pipes or tubes 20, one for each of the three overlying aerostat compartments 6. Each of these pipes 20 has an intermediate portion disposed in the chamber 70 7, an inlet end 21 communicating with the base of its compartment 6 and an outlet end 22 communicating with the top of said compartment 6. All three of these pipes 20 are heated by the same burner 16, from which
75 it will be seen that the inflating gas within the associated compartment 6 will be drawn through the inlet 21 into the pipe 20 and discharged through the outlet 22, passing
80 through said pipe 20 and being heated within the chamber 7. Provision is thus made for the heating of the inflating gas within these compartments. The gas so heated may circulate through the partitions 5 between
85 said compartments, so that the gas content thereof may be equally heated.

For heating the inflating gas contained within the bow and stern chambers 6, separate heaters may be employed. Each of these
90 heaters consists of a spirally coiled conductor 23 disposed within a flue 24 and having inlet and discharge ends 25 and 26 communicating with the lower and upper portions of its compartment. The flue 24 extends vertically
95 through the compartment 6 between the top and bottom of the aerostat, said flue having a gauze cover 27 at its upper outlet end and extending at its lower end below the
bottom of the envelope. This lower extended end of the flue receives a burner 28 connected
100 with a fuel conductor 29 leading from a storage tank 30 on the car 10, said tank 30 having an air blast pipe or nozzle 31 connected therewith, the construction in this respect being
105 similar to that employed for supplying fuel to the burner pipe 16. The flames and products of combustion from the burner 28 impinge against the heating tube 23, thus heating the same and the gas flowing there-
through, and finally discharging through the
110 foraminous outlet 27. Inflating gas is thus drawn from the lower portion of the compartment 6 and discharged into the upper portion of said compartment, being heated
115 on its passage. By providing separate heaters for the bow and stern compartments, the gas in both of these compartments may be heated at the same time the central compartments are being heated whenever it is
120 required to heat the entire body of gas, as in case of an emergency, for sustention purposes. The separate heaters at the bow and stern further permit of the gas in the bow or stern compartment being heated to facili-
125 tate and expedite up and down steering motions of the craft, as will be readily understood. As all of the compartments may be in restricted communication, it may ordinarily only be found necessary to heat the
gas in a certain number of compartments in 130

order to keep the entire envelope distended or properly taut, even when flying at high altitudes or when there has been a loss of gas by ventage or leakage, but, by providing means whereby a certain number or all of the compartments may be heated, the control of the craft will be facilitated and rendered easier and, in case of an emergency, the aerostat may be distended to a maximum degree to maintain sustentation until the craft makes a safe landing.

I also provide means whereby the gas in all of the compartments 6 may be simultaneously heated through the utilization of the waste heat from the motors 14. To this end, a heating pipe 32 is extended longitudinally through the envelope 1 the full length thereof and in the line of the axis of said envelope. This pipe is imperforate except at its ends, which connect with the extremities of the bow and stern portions 8 and 9 and open to the atmosphere through such extremities. Pipes 33 lead from the exhaust outlets of the motors 14 for conducting the exhaust gases from the motors to the pipe 32. Each of these pipes 33 may be provided with a controlling and cut off valve 34 so that the supply of the heated gases to the pipe 32 may be regulated or entirely cut off. Provision is thus made whereby the compartments may be heated by the waste gases of the driving motors, whenever such motors are running, so that the other heaters need only be employed in case of an emergency or whenever the driving motors are inactive or inoperative, thus economizing in the use of the heating fuel. The pipe 32 may be made of any suitable diameter for an effective heating action by conduction and radiation.

From the foregoing description, taken in connection with the drawing, the construction and operation of my invention will be readily understood, and it will be seen that simple, reliable and efficient means are provided for heating the gas in the envelope to maintain a desired pressure on the envelope irrespective of climatic or other conditions, whereby the craft may be the better controlled and maneuvered and greater safety of operation ensured. It will be apparent, also, that by the use of a plurality of heaters having variant sources of heat supply, economy in the use of fuel is ensured, as well as a greater factor of safety, inasmuch as in the event of the inoperativeness of one set of heaters from any cause another set may be used.

Having thus fully described my invention, I claim:—

1. An airship embodying an envelope having a gas containing compartment, a flue extending through said compartment but closed against communication therewith, a heating coil in said flue and communicating at different levels with said compartment, and heating means communicating with the flue.

2. An airship embodying a gas containing envelope, a flue sealed against communication with the gas containing space of the envelope and extending through the envelope from top to bottom thereof, the upper end of said flue communicating with the atmosphere, heating means at or communicating with the lower end of the flue, and a gas conductor comprising a tube located in the flue and communicating at its ends with the top and bottom of the gas containing space of the envelope.

3. An airship embodying a gas containing envelope, a flue sealed against communication with the gas containing space of the envelope and extending through the envelope from top to bottom thereof, the upper end of said flue opening to the atmosphere, heating means at or communicating with the lower end of the flue, and a coiled gas conducting tube arranged in the flue and having its ends communicating with the top and bottom of the gas containing space of the envelope.

4. In an airship embodying an envelope having a gas containing compartment, a heating chamber exteriorly of said envelope, and a pipe body extending horizontally in said chamber beneath said compartment and having its ends extending upwardly into the compartment at opposite ends thereof and communicating therewith at different levels.

5. In an airship embodying an envelope having gas containing compartments, a keel extending longitudinally of the ship and embodying a hollow chamber, a heating element within said keel, and a plurality of pipes within the keel over said element, each having its ends passing through said envelope into a gas compartment, one end of each pipe terminating within the lower part thereof, the other end extending to and terminating in the upper part of the compartment.

6. An airship embodying an envelope having a gas containing compartment, a flue extending into but closed against communication with said compartment, a tube extending longitudinally through said flue and communicating at the ends and at different levels with the compartment, and means for heating the interior of said flue.

In testimony whereof I affix my signature.
MICHAEL A. SZYMANSKI.

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