

C. J. COOKE.

AIRSHIP.

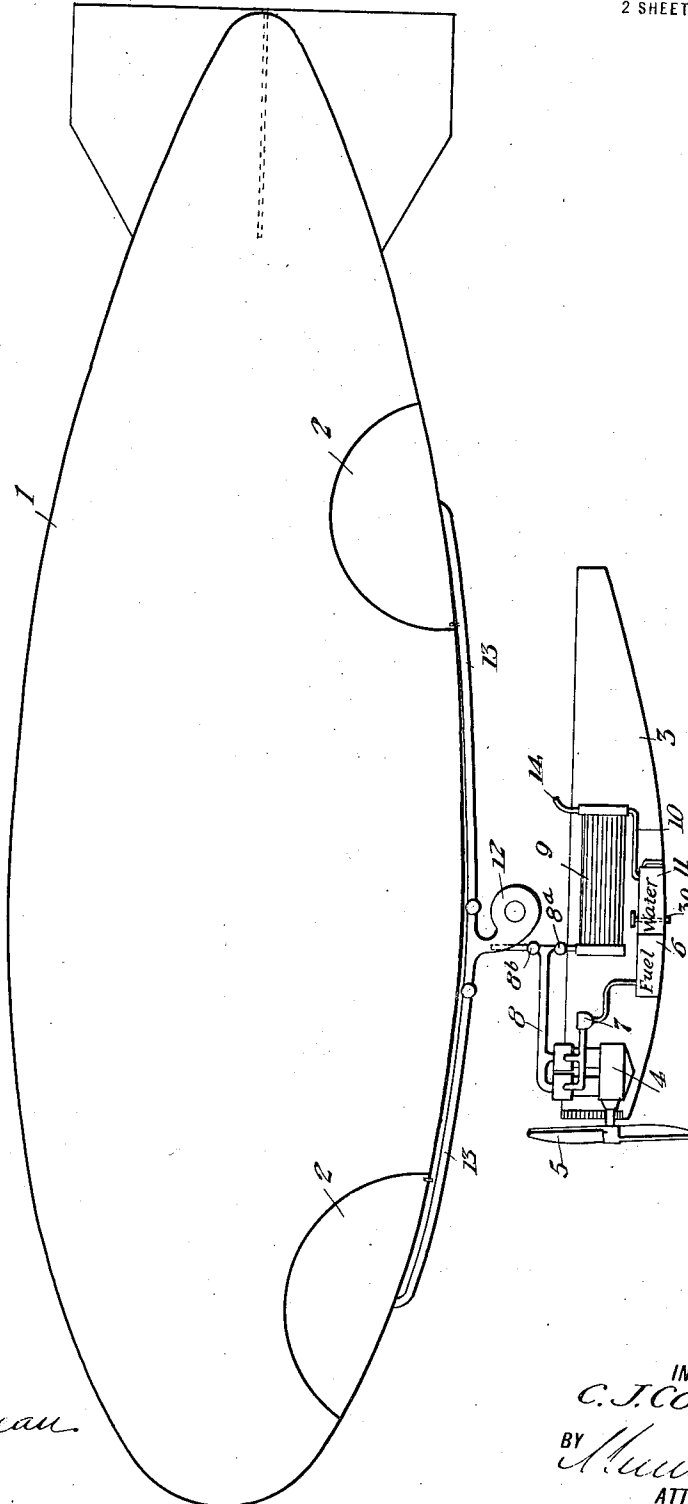
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1,426,047.

Patented Aug. 15, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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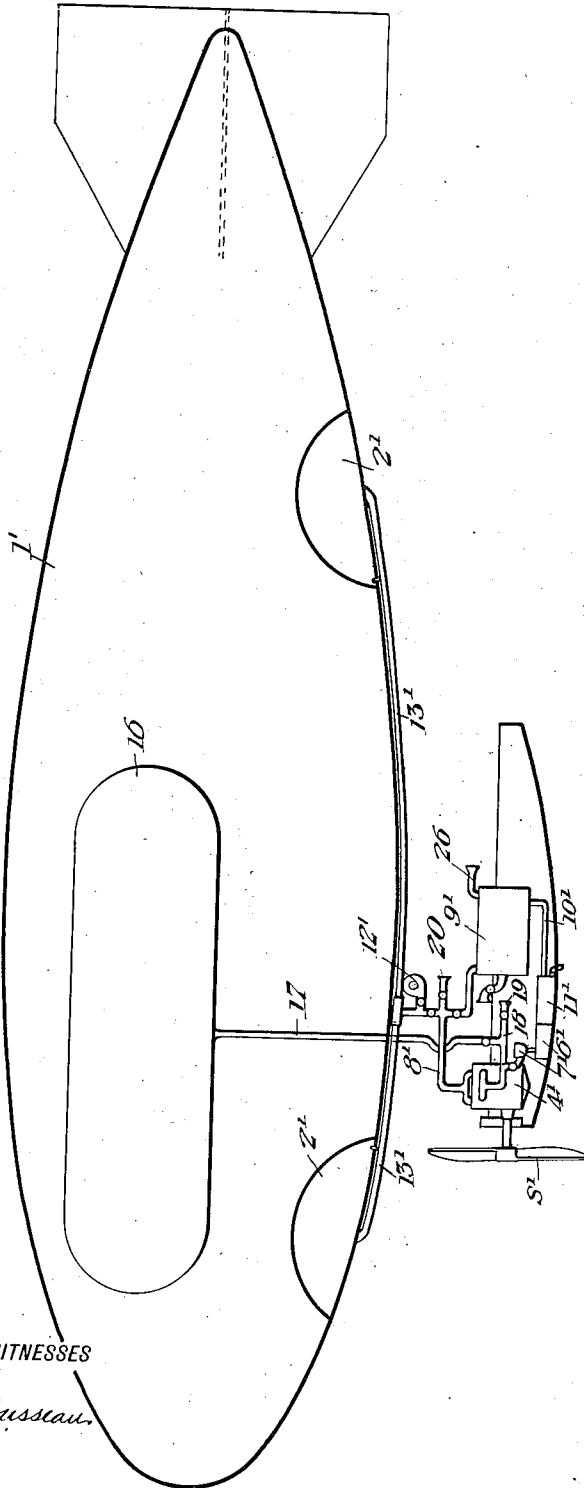
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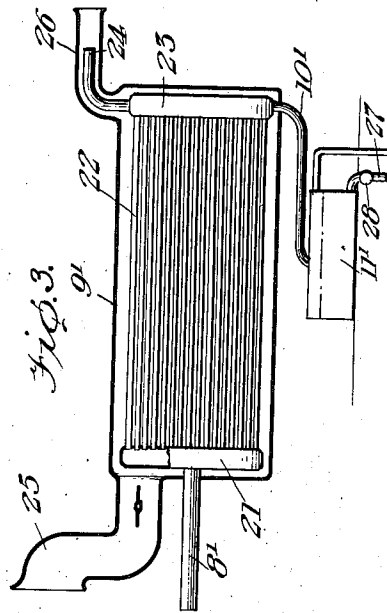
2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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AIRSHIP.

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To all whom it may concern:

Be it known that I, CHARLES J. COOKE, a subject of the King of Great Britain, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Airships, of which the following is a specification.

My invention relates to improvements in airships, of the lighter than air type, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a device by means of which the decrease in weight carried by a gas bag, which ordinarily occurs from the consumption of fuel in the internal combustion engine by means of which the air ship is propelled, is compensated, either wholly or in part, by the condensation of the aqueous portions of the products of combustion, these condensed portions being conserved as ballast.

A further object of my invention is to provide a novel process for producing ballast from the products of combustion of the engine.

One difficulty in operating airships of the lighter than air type, especially when long voyages are to be made, lies in the fact that it is often necessary to descend to the ground to obtain ballast to compensate for the loss of weight resulting from the consumption of fuel in the internal combustion engine by means of which the airship is driven. This results in a loss of time and also in a loss of gas, since in order to descend it is necessary to let out a portion of the gas.

The present invention is designed to obviate the necessity of descending for ballast, so that a longer flight may be made with a given amount of gas and a given amount of fuel, than ordinarily.

My invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a view of an airship having ballast producing means constructed according to my invention;

Figure 2 is a modified form of the device; and

Figure 3 is a detailed view of a condenser.

Referring now particularly to Figure 1, I have shown therein a gas bag 1 of the conventional shape, which is adapted to contain hydrogen or helium. At 2 I have shown balloonettes, whose purpose will be explained later. A car, or basket, 3 is suspended from the gas bag in any suitable manner, the suspending means being omitted for the sake of clearness. The car 3 carries an internal combustion engine 4 which drives a propeller 5. A fuel tank 6 communicates with a carbureter 7 which is connected with the engine in the usual manner. An exhaust pipe 8 communicates with a condenser 9 by means of which the aqueous portions of the exhaust gases may be condensed, the water passing by a drain pipe 10 into a receiver or storage tank 11. The exhaust pipe 8 has a branch which communicates with a blower or pump 12, the latter being in communication with the balloonettes 2 by means of the pipes 13.

From the foregoing description of the various parts of the device, the operation thereof may be thoroughly understood. As the fuel is used up in the internal combustion engine, the products of combustion pass through the condenser, the gaseous portions escaping at the outlet 14, that is to say, the uncondensable gaseous portions such as carbon dioxide, while the aqueous portions are condensed and are led into the receiver 11 where they may be retained as ballast.

If it should be desired to heat the gas in the gas bag 1, then a portion of the products of combustion may be introduced into the balloonettes 2 by opening the valve 8^a and permitting the gases to be forced by the blower 12 through the pipes 13 into the balloonettes. The blower 12 may be operated by the engine through any suitable connections (not shown). The valves 8^a and 8^b it will be observed, control the course of the products of combustion.

In Figure 2, I have shown a construction in which the bag 1' is provided with the balloonettes 2' and also has an auxiliary chamber 16 which contains hydrogen. The chamber 16 communicates by a pipe 17 with a pipe 18 leading into the intake manifold of the engine 4'. In this form of the device, the fuel may be taken from the fuel tank

6' through the carbureter 7', or hydrogen may be admitted as a fuel and mixed with air coming through the air inlet 19. In this instance, where hydrogen is taken from the chamber 16 to be used as a fuel, there is a loss in sustaining power due to the consumption of the hydrogen. There is also a portion of the products of combustion which escape into the atmosphere, but the aqueous portions of the products of combustion are condensed in the condenser 9' and are returned to the receiver 11'.

The form shown in Figure 2 has certain advantages over that shown in Figure 1, these advantages lying largely in the nicety of adjustment of the sustaining power of the device. The normal operation of the apparatus shown in Figure 2 is the same as that shown in Figure 1, that is to say, under normal circumstances the fuel is taken from the tank 6' and the aqueous products of combustion are condensed to conserve the ballast.

It often happens that it is necessary to quickly add to or decrease the lifting effect and the form of the device shown in Figure 2 is designed to accomplish this quickly and positively.

Consider the case where the airship encounters a warm stratum of air which would tend to expand the gas field and thus to increase the lifting power. In such instance the fuel tank 6' would be cut off and hydrogen would be admitted from the receiver 16 through the pipe 17 and mixed with air as fuel for the engine. The consumption of hydrogen decreases the lifting power and the condensation of the aqueous products of combustion adds weight, thereby tending to compensate for the increase in lifting power due to the presence of heated stratum. On the other hand, if a cold stratum should be encountered then the fuel is taken from the tank 6'. The products of combustion are passed into the balloonettes 2', thereby heating the gas in the gas bag and increasing the lifting power. If necessary, the ballast, which has been previously stored in the tank 11' may be let out, thereby adding still more to the lifting effect and bringing the balloon in equilibrium.

In addition to the advantages set forth, the provision of the receiver 16 will enable the airship to be propelled for a greater length of time than if the liquid fuel in the tank 6' were only available for propulsion purposes, for, when the latter is exhausted, the hydrogen in the receiver 16 may be used to propel the device, thereby giving a greater range than ordinarily.

The condenser shown in Figure 3 is of the preferred type, although any suitable condenser may be used for the purpose. In Figure 3 it will be seen that the pipe 8' leads to a header 21 which is connected by

pipes 22 with a header 23 having an outlet pipe 24. An air intake tube 25 communicates with the casing 9' while the outlet tube 26 is disposed at the opposite end and encloses the pipe 24. The products of combustion pass through the pipe 8', thence into the header 21, and through the tubes 22 into the header 23. Here the aqueous portions are condensed and pass by the pipe 10' into the receiver 11'. A drain pipe 27 is provided with a valve 28 for letting out ballast when desired. The cold air coming in through the inlet pipe 25 chills the pipes 22 to condense the aqueous portions of the products of combustion, and the uncondensable products which pass out through the pipe 24 entrain the air, thus drawing it through the intake pipe 25 at a rapid rate.

It will be observed that the condensers in both forms of the device, are in such a position that they will be cooled by air from the propellers. These condensers, however, may be placed at points which are exposed to the rush of air occasioned by the forward movement of the airship, and need not necessarily be immediately behind the propellers. Provision is made in each instance for the emptying of the ballast, the means in Figure 1 being indicated at 30.

I am aware that it has been proposed to pass products of combustion into balloonettes for the purpose of heating the gas in the main gas bag. This, however, does not constitute my invention. The invention lies, rather, in the condensation of the aqueous products of combustion and the retention of the condensed products as ballast, while permitting the uncondensable products to escape. By condensing the aqueous products, the loss in the weight of fuel may be compensated, thereby permitting a maintenance of the equilibrium, i. e., the sustaining forces so that the airship may remain for a longer time in the air than where such products of combustion are permitted to escape freely.

I claim:

1. The combination in an airship, an internal combustion engine, with a propeller and a liquid fuel supply; a gas bag with sustaining gas, and a separate receiver with combustible gas; and connection with regulating means for cutting off the liquid fuel and opening the gas supply from the receiver to the engine when the airship encounters a warm air stratum, to thereby reduce the total volume of expansible gas.

2. The combination in an airship, an internal combustion engine, with a propeller and a liquid fuel supply; a gas bag with sustaining gas, and a separate receiver with combustible gas; connection with regulating means for cutting off the liquid fuel and opening the gas supply from the receiver to the engine when the airship encounters a

warm air stratum, to thereby reduce the total volume of expansible gas, and balloonettes in the gas bag in controllable communication with the engine, inflatable with exhaust gas to heat the bag gas when a cold stratum is encountered.

3. In combination with the internal combustion engine and propeller of an airship,

a condenser receiving the products of combustion for condensation and preservation 10 of the aqueous contents, and a surrounding air jacket with a valved inlet directed toward the propeller to catch a rapidly moving stream of air and thus accelerate condensation by cooling the condenser.

CHARLES JOHN COOKE.