June 24, 1930. A. S. JAMES 1,766,906

AIRCRAFT

Filed Sept. 6, 1927 3 Sheets-Sheet 1

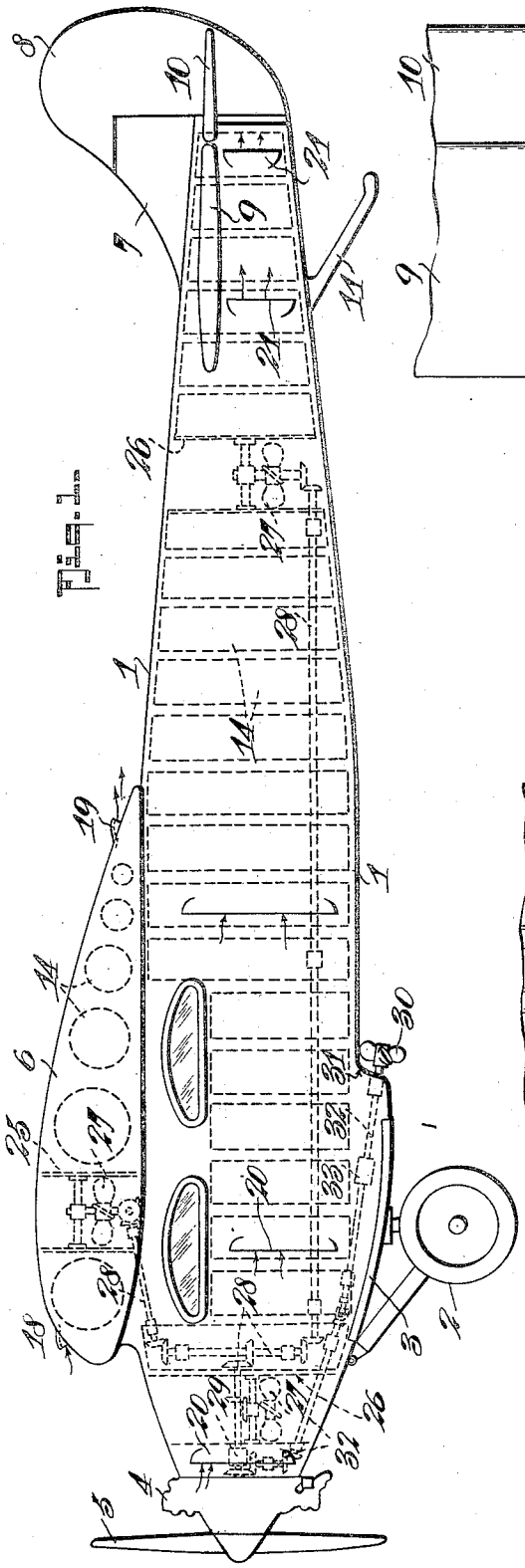


Fig. 1.

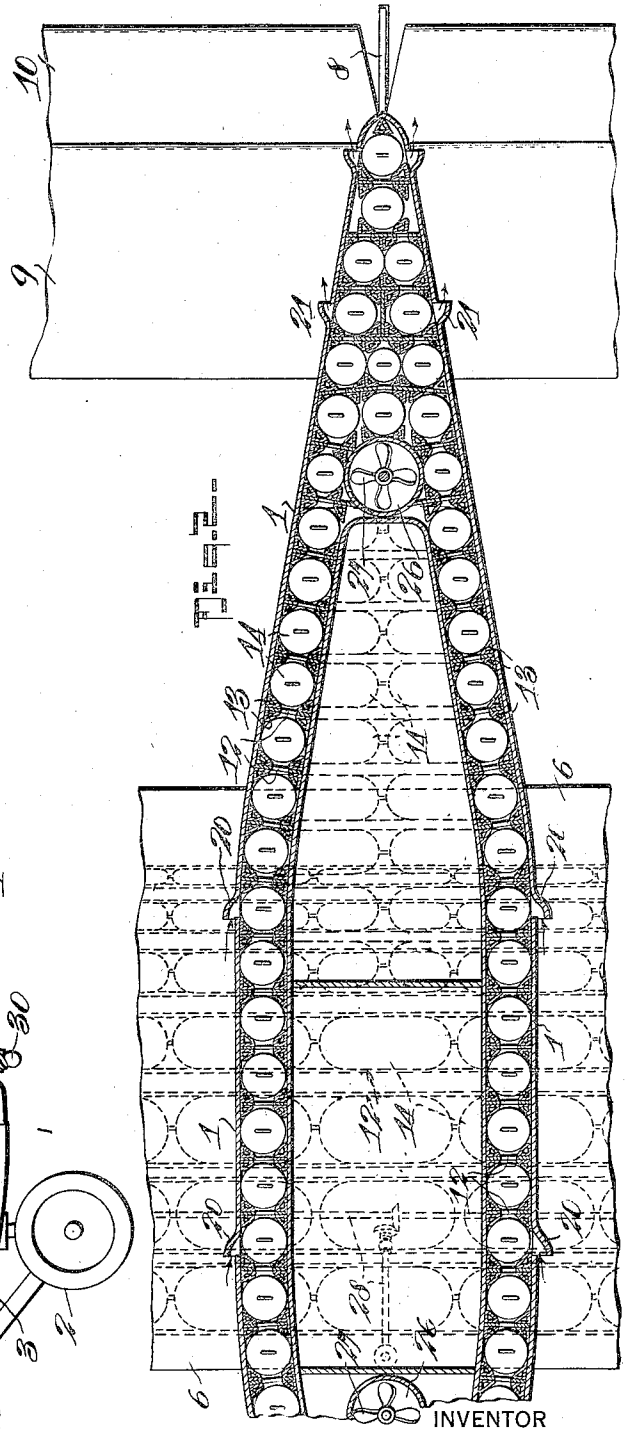


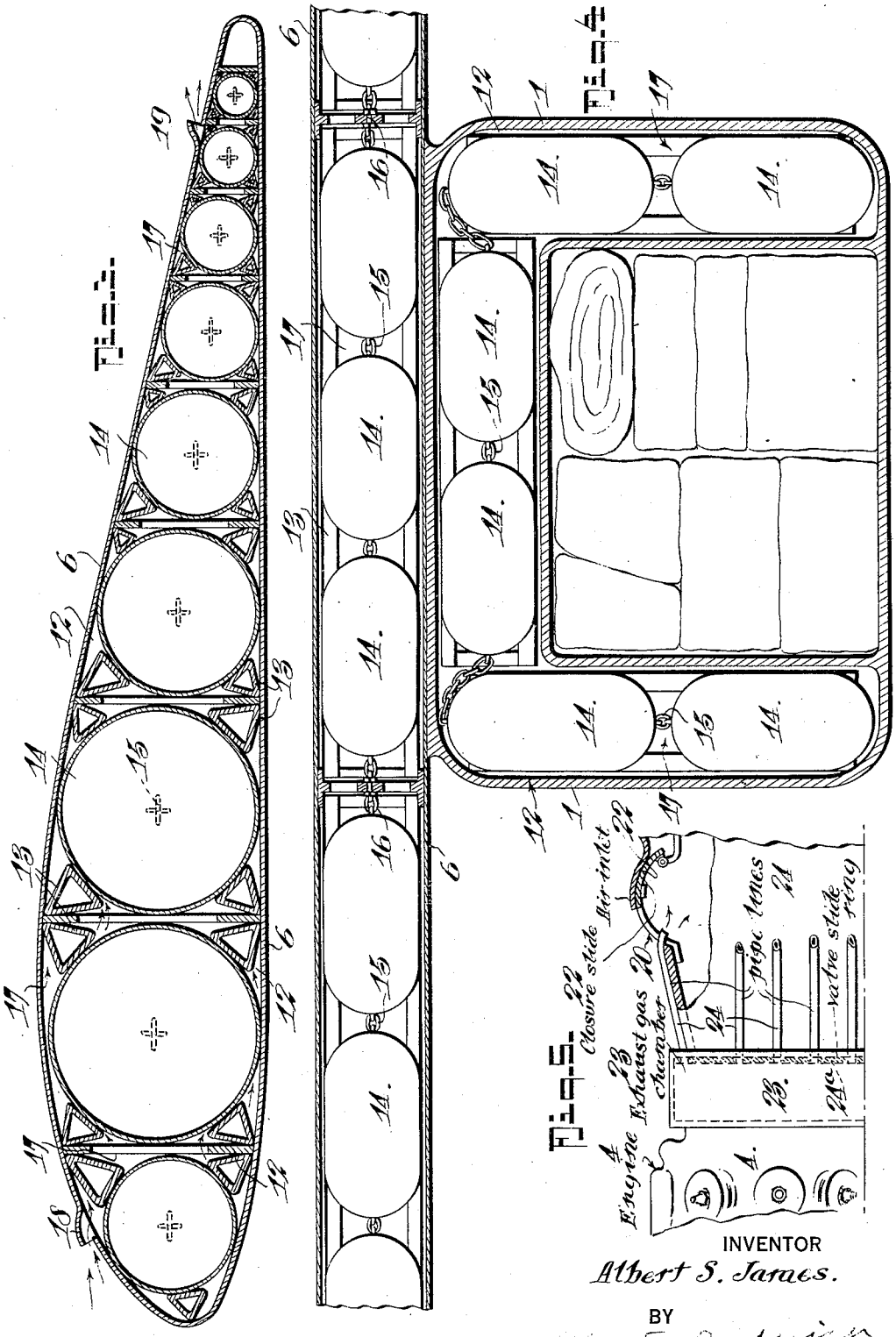
Fig. 2.

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AIRCRAFT

Filed Sept. 6, 1927 3 Sheets-Sheet 3

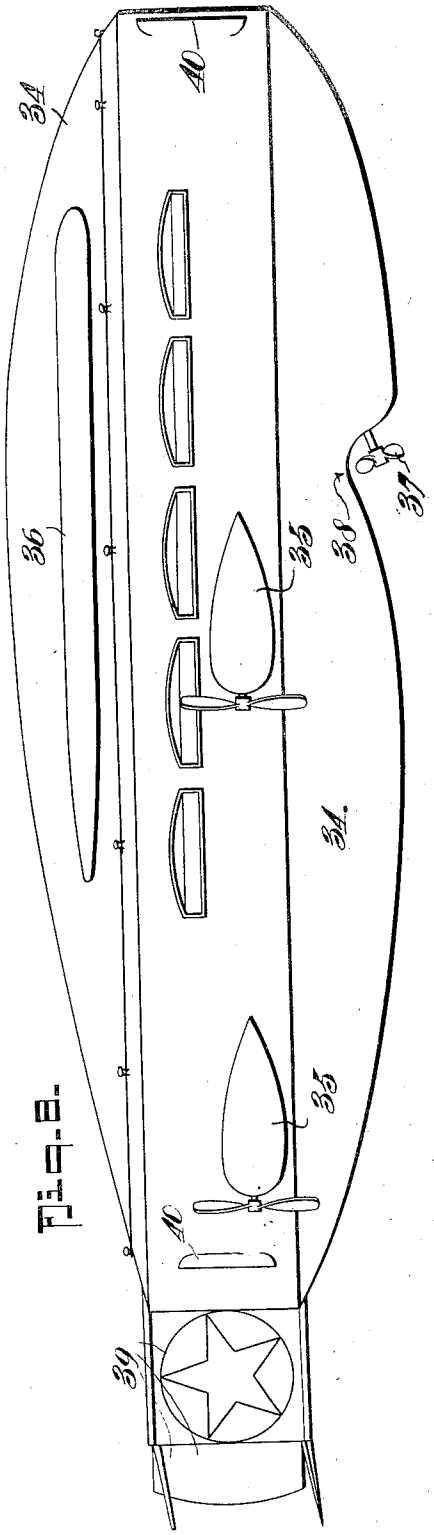


Fig. 8.

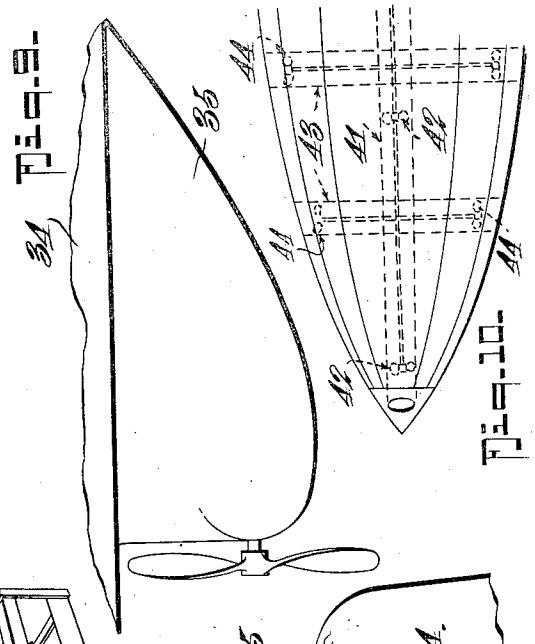


Fig. 9.

Fig. 10.

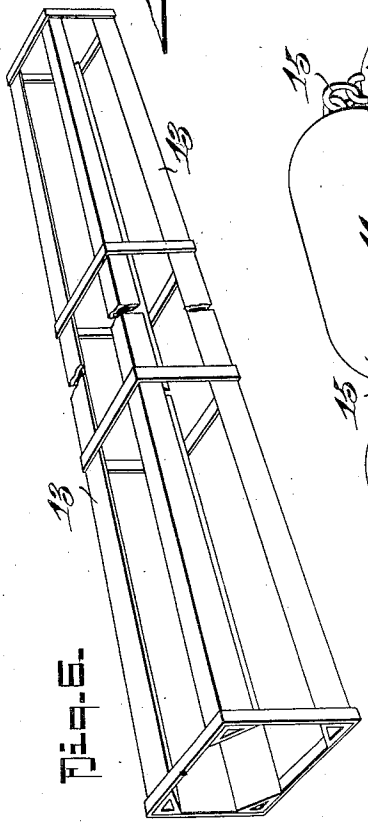


Fig. 6.

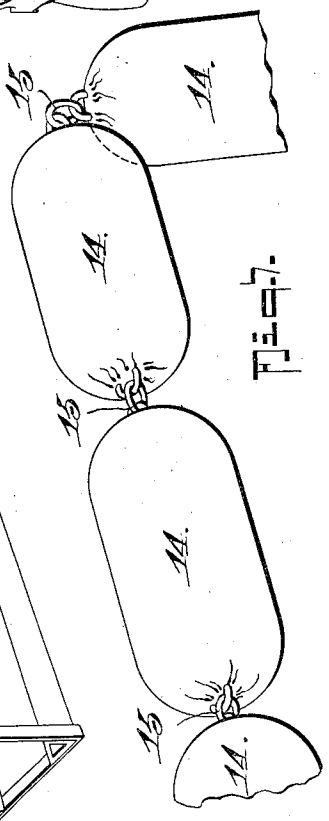


Fig. 7.

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UNITED STATES PATENT OFFICE

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AIRCRAFT

Application filed September 6, 1927. Serial No. 217,720.

The invention primarily has for its object to provide an air craft of the lighter-than-air type but which has the appearance of conventional forms of heavier-than-air types and embodies much of their advantages of speed and flexibility of control.

The invention further has for its object to provide an air craft of the character stated which is capable of transporting great weights through the air with a maximum of safety and speed relatively to the load carried, and which is capable of navigation on water in an emergency.

The invention still further resides in the provision of a plurality of individual lifting medium receptacles flexibly joined at their ends in multiples and adapted to be mounted in the wings and fuselage of the craft to impart the necessary buoyancy thereto and means to very the temperature of the lifting medium in the receptacles to vary the buoyancy of the craft to suit conditions.

The invention still further resides in the provision in air craft of the character stated of propellers operable on vertical axes and active when thrown into operation to force the craft upward from or downwardly toward the earth according to the direction of rotation of the said propellers, suitable other propellers being provided for other navigation.

With the above and other objects in view that will hereinafter appear, the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation of an air craft embodying the invention.

Figure 2 is a horizontal section taken through the fuselage of the craft looking upward toward the wings.

Figure 3 is a vertical cross section of one wing of the craft.

Figure 4 is a vertical cross section taken through the fuselage and parts of the wings.

Figure 5 is a diagrammatic fragmentary section illustrating a means to administer hot air to raise the temperature of the lifting medium in the receptacles.

Figures 6 and 7 are detail perspective views illustrating a receptacle mounting cage and a plurality of linked receptacles respectively.

Figure 8 is a side elevation illustrating a modified shape into which the invention may be embodied.

Figure 9 is a fragmentary plan view illustrating one of the engine carrying warts or projections.

Figure 10 is a diagrammatic fragmentary side elevation of an air craft having both horizontal and vertical propeller mounting pockets or tunnels.

In the drawings in Figures 1 to 5 inclusive I have shown the invention embodied in an air craft of the heavier-than-air type having the appearance of more or less conventional types of monoplanes, and in this illustration of the invention 1 represents the fuselage, 2 the landing gear, which may be of the retractible type retractible through the slide doors 3, and 4 the engine by which the main propeller 5 is operated. The wing or wings are indicated at 6, the vertical stabilizing plane at 7, the rudder at 8, the horizontal stabilizing plane at 9 and the elevator at 10. It is to be understood that these parts are controlled by mechanism conventional in air craft of this type, but which not forming a part of the present invention, is not shown. The usual tail skid is indicated at 11.

All of the above mentioned parts, broadly, are conventional in design and in themselves form no part of my present invention. The single exception to this statement is that the wings 6 are not positioned on an angle but are straight. In craft of the conventional type it is necessary to incline the wings more or less into the air being travelled so that they will tend to draw the plane upwardly and are relied upon in conjunction with the speed of the plane to maintain the desired elevation thereof.

In my present invention this lifting action of the wings is unnecessary, it being provided by other means soon to be described and hence the wings may be made perfectly straight

if desired and thereby offer the minimum of resistance to forward travel.

In carrying out the principles of my invention the wings and fuselage are provided with a plurality of pockets 12 to receive the protecting cages 13 in which are mounted the receptacles 14 containing helium, hydrogen gas or any other suitable lifting medium.

The receptacles 14 are link-connected at their ends as at 15 to be connected together in series or multiples, and to secure them to position certain thereof may be anchored as at 16 to the wing ribs or other convenient parts of the craft framing. See Figures 2, 3, 4, 6 and 7.

The receptacles 14 may be constructed of any suitable material such as goldbeater's skin or light thin metal and are preferably formed with rounded noses to provide for strength and flexibility. By providing the plurality of receptacles and link-connecting them at their ends and to portions of the framing the lifting force is equally distributed and strain at individual points of the craft is eliminated. This equalization of lifting force and strain also prevents tendency toward "breaking up", and in case of accidents the receptacles will remain joined to each other and to portions of the craft and continue to contribute their lifting function. Also in case of emergencies such as collision or battle the destruction of a few of the receptacle units will have little effect toward incapacitation of the whole craft and will not seriously handicap the functioning thereof.

By providing the cages in the pockets air passages 17 are provided surrounding the receptacles in the cages and during flight a constant circulation of air is provided in these passages through the inlet and outlet ventilators 18 and 19 respectively in the wings, and 20 and 21 respectively in the fuselage.

The inlet ventilators 18 and 20 may be provided with closure slides or gates 22 which may be actuated through any suitable slide rod connection leading to the controls (not shown) and by which the said ventilators may be varied as to opening according to the needs of travel.

It is well known in lighter-than-air craft that difficulties are experienced due to the differences of temperature especially as night comes on and the gases tend to contract and lose some of their lifting power. With this effect in mind I have designed means to regulate the temperatures of the lifting means in the receptacles 14 to meet the requirement of atmospheric conditions at various times. To merely draw in cool air through the intake ventilators would, of course, have a cooling effect on the gas in the receptacles and prevent undesirable expansion thereof when that alone would be the problem being contended with. It is necessary, however, at times, to warm up the lifting medium and cause it to expand and thereby increase its lifting power.

To this last stated end I provide a hot air chamber 23 which may, for example, be heated by the exhaust gases from the engine and the interior of this chamber communicates through the pipe lines 24 with the inlets of the ventilators 18 and 20, see Figure 5. An apertured ring valve 24ª having openings registering with the intake ends of the pipe lines 24 may be mounted in the chamber and shifted in any suitable manner to bring the apertures thereof in register with the pipes to open communication therethrough, or out of register with the pipes to close communication therethrough. It will be observed by reference to the figure referred to that the delivery ends of the pipe lines extend a short distance into the inlet ventilators so that when the pipes are delivering hot air they may do so even when the closure slides 22 are completely closed. Thus, the closure slides may be closed against induction of cooled air and hot air alone directed into the air passages, or the slides may be adjusted to adjust the mixture of hot and cold air admitted into the said passages and thus regulate the temperature of the circulation to suit the immediate needs occasioned by flying conditions.

The wings and fuselage of the craft may be provided with vertical bores or pockets 25 and 26 respectively in which are mounted propellers 27 rotatable on vertical axes through any suitable transmission devices 28 from the main engine or any other source of power, and in the illustration made any suitable clutch and reversing means is diagrammatically indicated at 29. Thus the propellers 27 may be operated or left stationary according to the needs of flying or may be rotated in either direction, and when rotated in one direction will tend to lift the craft vertically and when rotated in the opposite direction will tend to force the craft downwardly.

As many of the propellers 27 as may be desired may be employed and they may be positioned at suitable places along the wings or body of the craft according to the particular design thereof. I am aware that propellers placed on vertical axes have heretofore been used but they have usually been placed in such a manner as to cause great friction due to wind resistance. By placing my propellers in the manner described they offer no wind resistance whatever and may be employed to maintain or assist in maintaining the desired elevation of the craft or to securely hold the craft to the ground while loading the same or discharging passengers or unloading freight.

The provision of the gas receptacles in the wings and fuselage of the craft not only provide for suitable buoyancy of the craft in

the air but also provide for suitable buoyancy in the water should a forced landing be made necessary, and it will be observed by reference to Figure 4 of the drawings that the receptacles in the fuselage are so arranged that when the craft is loaded with freight or baggage as indicated in that figure, its center of gravity will be thrown low in a manner causing the craft to ride steadily and smoothly on an even keel in the air or in the water.

In the case of a forced landing it would be possible, if the ship was intact, to "taxi" along the surface of the water. It is possible, however, that the forced landing might be due to a broken propeller blade in which case such navigation would be impossible and for this reason I have provided a propeller 30 which projects from beneath the fuselage in the pocket 31 and which is driven from the main engine through suitable transmission devices 32 which include any suitable type of throw-out clutch diagrammatically indicated at 33. When the craft is thus navigated the landing gear may be retracted into the fuselage through the slide doors 3, and when the propeller 30 is not so used the mounting thereof in the pocket 31 overcomes objectionable wind resistance which would ordinarily be set up thereby.

In Figures 8 and 9 I have indicated another adaptation of the invention in which the craft embodying the same is of more conventional lighter-than-air craft shape, the use of straight line planes or wings, however, being also included in this form. In this form of the invention 34 indicates the body of the craft from which project stream line warts 35 which accommodate the navigating engines. The straight line wings are indicated at 36 and the water navigating propeller 37 is projected into a pocket 38 equivalent to that 31 hereinbefore referred to in detail. The control rudders and stabilizers are generally indicated at 39, and 40 designates the air space ventilators.

It is to be understood that in this last described form of the invention the construction and mounting of the gas receptacles are the same as hereinbefore described.

If desired the craft may be equipped with longitudinal or horizontal air tunnels 41 equipped with navigating propellers 42 in addition to the vertical tunnels 43 equipped with lifting and "force down" propellers 44 so that the craft may not only be raised and lowered by such equipment but navigated as well. The propellers 42 and 44 may be operated by any suitable mechanism (not shown).

In the foregoing description I have disclosed an air craft which possesses the qualities of lifting power and safety usually present in lighter-than-air craft and the advantages of speed and flexibility of control of the airplane or heavier-than-air craft and which is capable of navigation both in the air and, when necessary, in the water.

I have also disclosed means whereby the buoyancy of the craft may be regulated to a nicety to suit immediate flying conditions and means by which the craft may be held to the ground while loading and unloading or the attainment and maintaining of desired altitude provided and assisted.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the novel details of construction, the manner of use and the advantages of my invention will be readily apparent to those skilled in the art to which it relates.

What I claim is:

1. An air craft comprising a body, a plurality of gas receptacles, said body having pockets to receive the receptacles, and protective mounting cages to mount the receptacles in the pockets each said cage having provision to receive a plurality of receptacles.

2. An air craft comprising a body, a plurality of gas receptacles, means to flexibly connect the receptacles in multiples, said body having pockets to receive the multiples of receptacles, and protective cages to mount the multiples of receptacles in the pockets.

3. An air craft comprising a body, a plurality of gas receptacles in the body, said body having pockets to receive the receptacles, cages to mount the receptacles in the pockets and provide air spaces surrounding said receptacles, and means to direct heating or cooling air or controllable mixtures of heating and cooling air into and out of the air spaces.

4. An air craft of substantially conventional heavier-than-air type of aeroplane shape comprising a fuselage, wings, rudder, elevator, propeller and engine and other controls; a plurality of individual and independent gas receptacles mounted in the wings and in the sides and top of the fuselage to provide a lighter-than-air craft of heavier-than-air shape, and means to flexibly link-connect the receptacles together at their ends into multiples.

5. An air craft of substantially conventional heavier-than-air type of aeroplane shape comprising a fuselage, wings, rudder, elevator, propeller and engine and other controls; a plurality of gas receptacles mounted in the wings and in the sides and top of the fuselage to provide a lighter-than-air craft of heavier-than-air shape, means to flexibly link-connect the receptacles together at their ends into multiples, and protective cages to receive the multiples of receptacles.

6. An air craft comprising a body, a plurality of gas receptacles in the body, means to mount the receptacles to provide surrounding air spaces, and means to direct air into and out of the air spaces, said mounting

means including individual protective and spacing cages each adapted to receive a plurality of receptacles.

7. An air craft comprising a body, a propelling engine, lifting gas impounding means in the body, means to mount the lifting gas impounding means to provide surrounding air spaces, air intake ventilators, air outlet ventilators, an exhaust gas chamber to receive exhaust gases from the engine, hot air ducts to receive exhaust gases from the chamber and deliver it into the air intake ventilators, and a ring valve to adjust the output of the hot air ducts.

8. An air craft comprising a body, a propelling engine, lifting gas impounding means in the body, means to mount the lifting gas impounding means to provide surrounding air spaces, air intake ventilators, air outlet ventilators, an exhaust gas chamber to receive exhaust gases from the engine, hot air ducts to receive exhaust gases from the chamber and deliver it into the air intake ventilators, a ring valve to adjust the output of the hot air ducts, and adjustable slides to control the intaking of air into the air intake ventilators without affecting the output of the hot air ducts.

9. In air craft comprising a body, a plurality of longitudinal buoyant medium encasing receptacles in the body, means link-connecting the receptacles end to end in series, and means for connecting series of receptacles in multiple to fixed parts of the craft.

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