G. W. WILKIN.

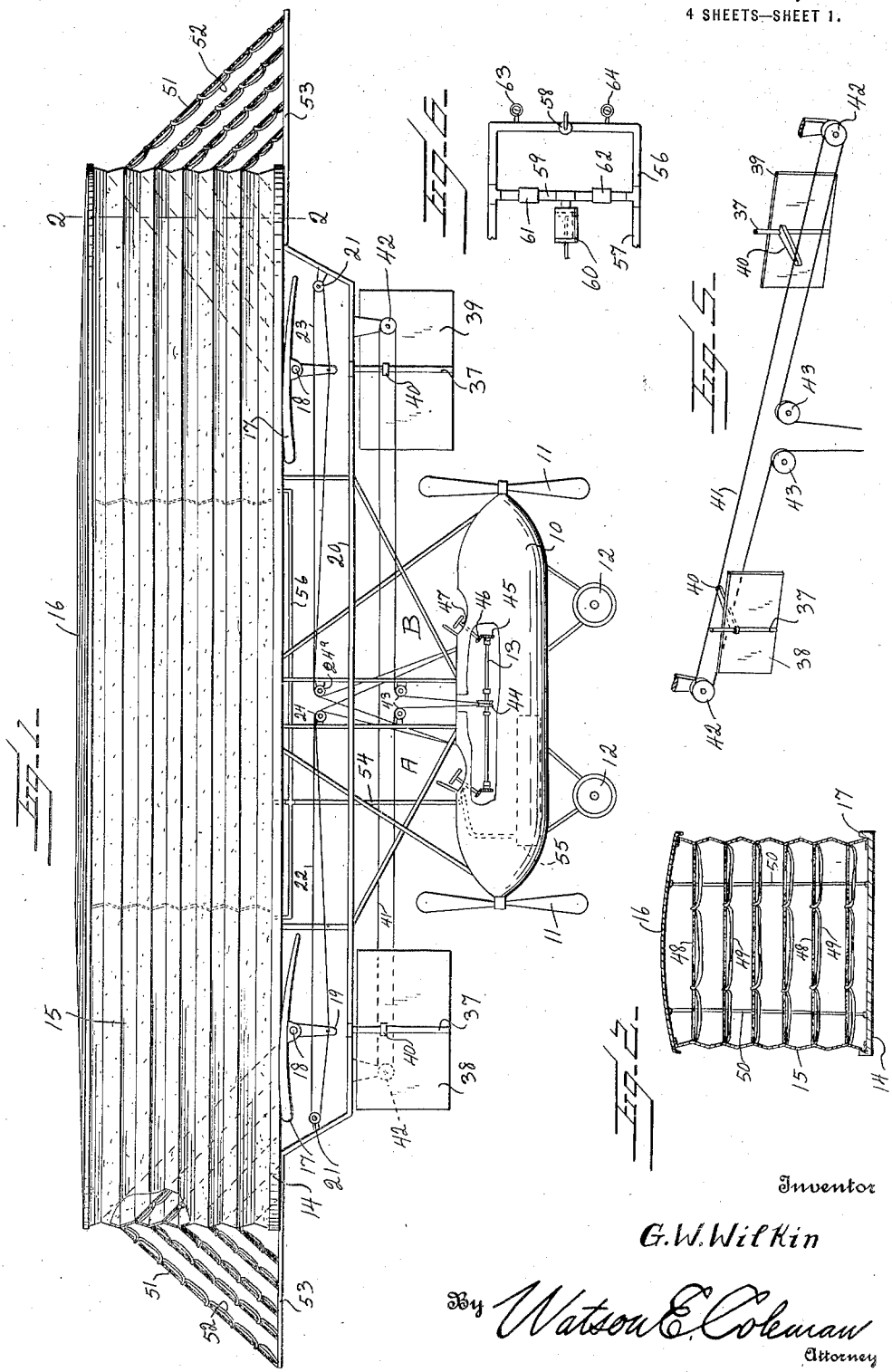
AUXILIARY BALLOON AND INFLATING TANK THEREFOR.

APPLICATION FILED DEC. 28, 1918.

1,372,260.

Patented Mar. 22, 1921.

4 SHEETS—SHEET 1.



Inventor

G. W. Wilkin

By Watson E. Coleman

Attorney

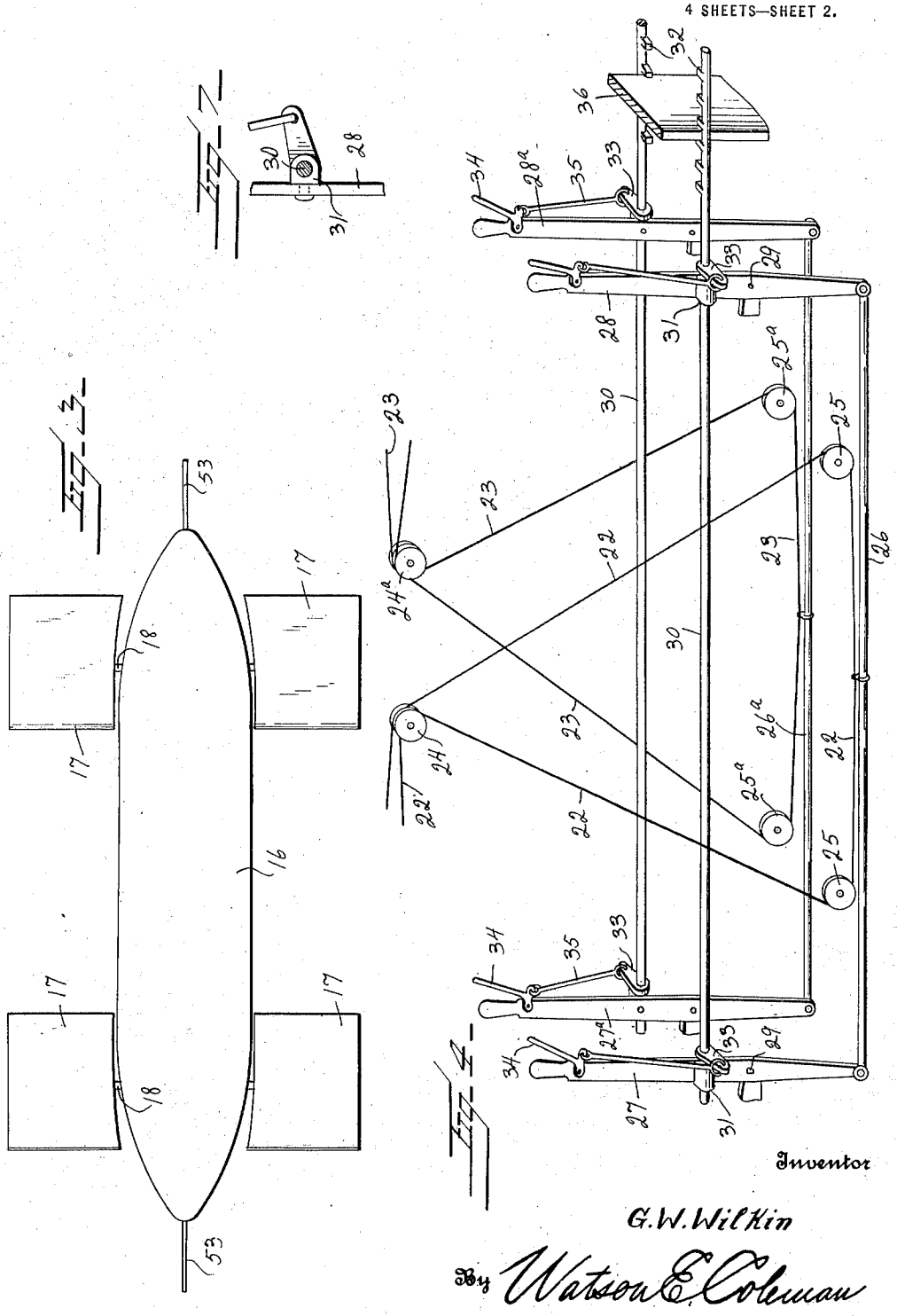
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 8.

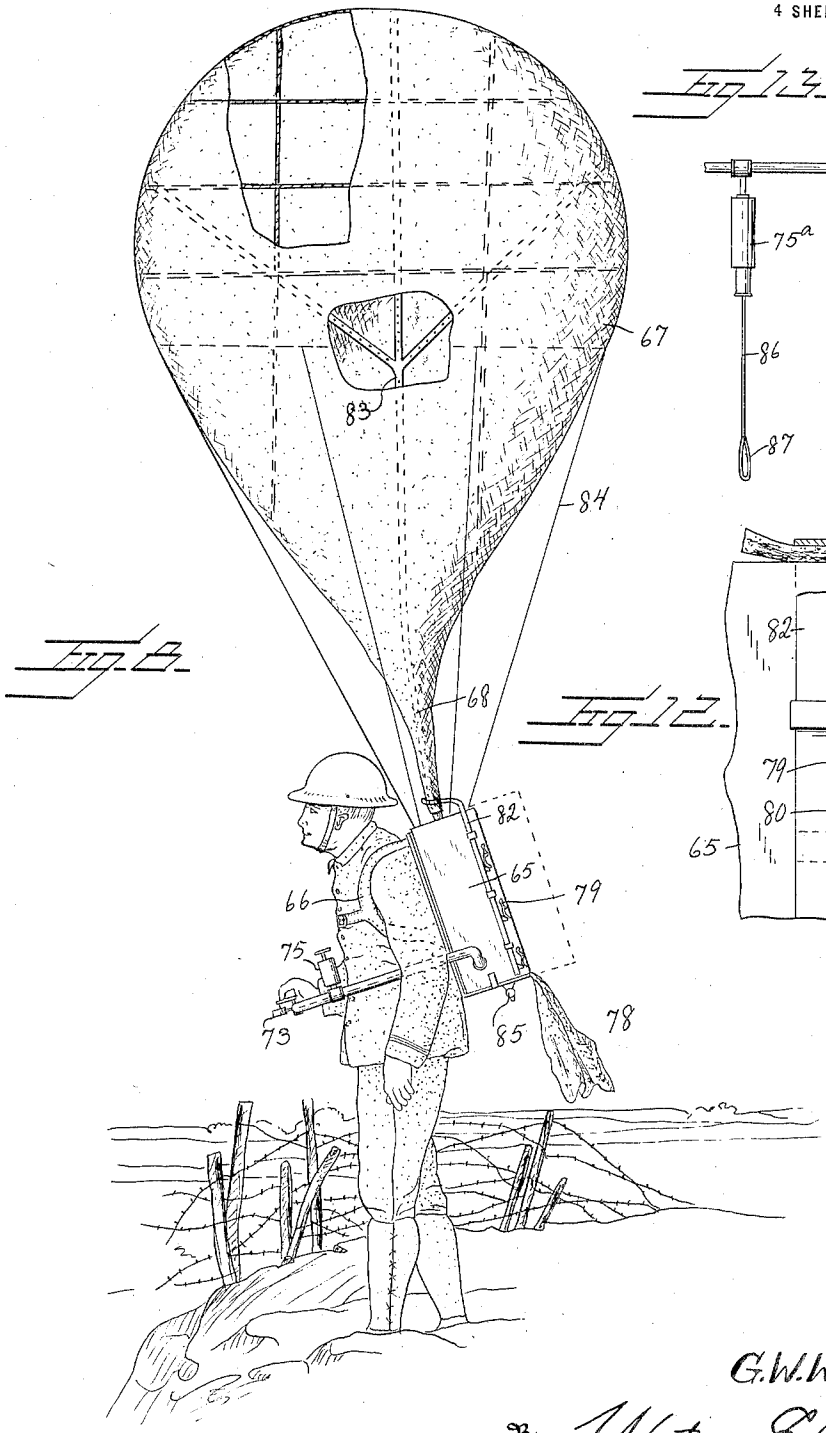


Fig. 13.

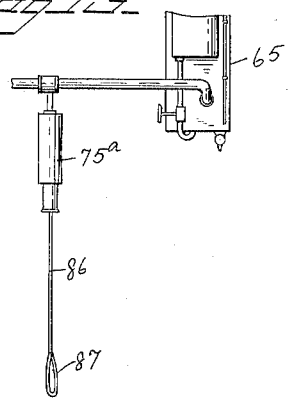
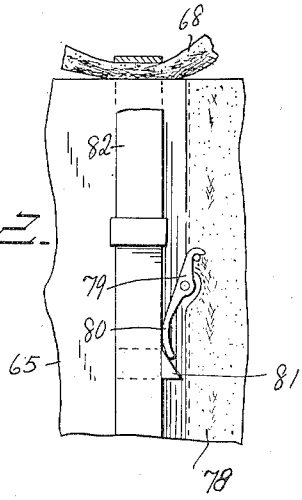


Fig. 12.



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4 SHEETS—SHEET 4.

Fig. 9.

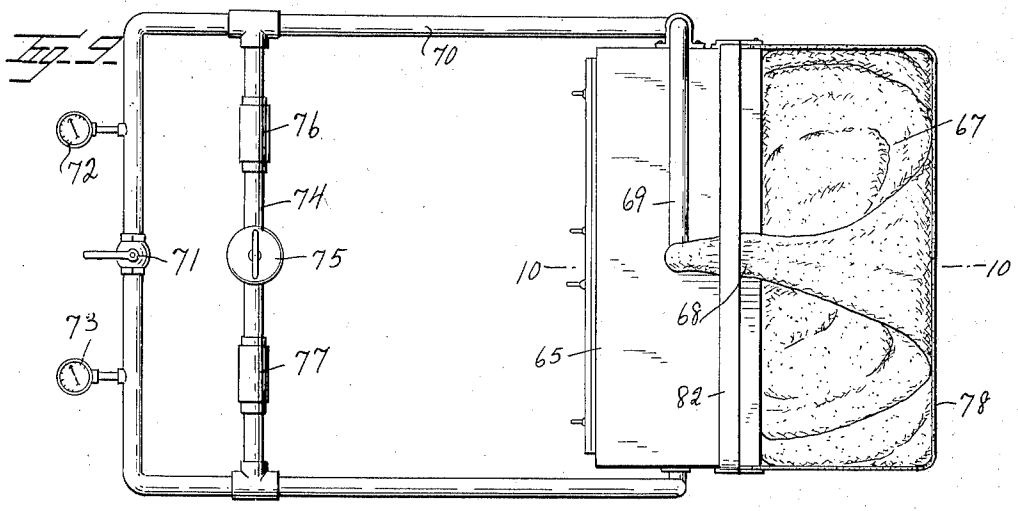


Fig. 10.

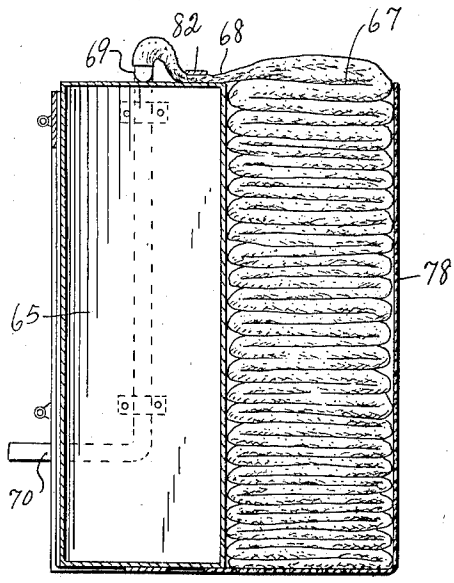
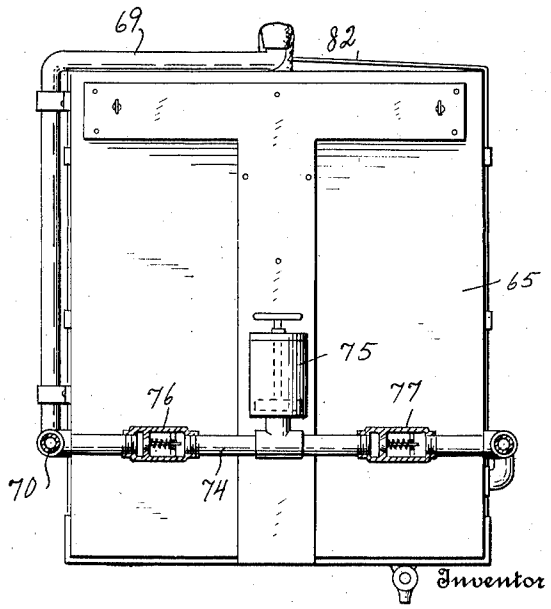


Fig. 11.



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UNITED STATES PATENT OFFICE.

GEORGE W. WILKIN, OF GRANGEVILLE, IDAHO.

AUXILIARY BALLOON AND INFLATING-TANK THEREFOR.

1,372,260. Specification of Letters Patent. Patented Mar. 22, 1921.

Application filed December 28, 1918. Serial No. 268,627.

To all whom it may concern:

Be it known that I, GEORGE W. WILKIN, a citizen of the United States, residing at Grangeville, in the county of Idaho and State of Idaho, have invented certain new and useful Improvements in Auxiliary Balloons and Inflating-Tanks Therefor, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to the art of "aeronautics" and particularly to balloons.

The general object of the invention is to provide a gas bag or balloon to be used under some circumstances in conjunction with an aeroplane, and a gas tank with pumping mechanism and valves so arranged that the gas within the tank may be discharged into the balloon for the purpose of inflating it at any time desired, or the gas within the balloon be pumped back into the tank when it is desired to deflate the balloon, the balloon when deflated being adapted to be carried in a collapsed condition in a suitable case formed for carriage on the shoulders of a man, or in a suitable case attached to and forming part of an aeroplane, airship or other apparatus used for aerial navigation.

A further object is to so construct the balloon or gas bag that it may be folded or collapsed into relatively small space until needed whereupon it may be as readily inflated by allowing compressed gas to pass thereto.

A further object is to provide an aeroplane with a normally deflated balloon which when desired may be inflated by passing gas thereto from a suitable tank carried in the body of the aeroplane and in this connection to provide means whereby the planes of the machine may be operated to cause the elevation or depression of the machine and whereby the rudders may be operated to steer the machine.

A further object is to provide a balloon adapted to be used as before stated, so constructed that it will be braced against undue expansion and further so constructed that it will automatically, upon deflation, fold into the proper folds permitting its collapse into the smallest possible bulk.

Still another object is to provide a case adapted to be carried upon the shoulders of a man, the case being formed to provide a compartment for the folded balloon and a gas tank, and in this connection to provide means whereby the balloon is normally held in its collapsed condition until gas is admitted to the balloon whereupon the fastenings which hold the case closed will automatically open to permit the balloon to expand out of the case and into operative position.

Still another object is to provide means whereby the gas may be pumped back from the balloon into the tank to cause the collapse of the balloon or to reduce its carrying capacity and thereby permit the operator to sink.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a side elevation or an airship provided with a supporting balloon or gas bag constructed in accordance with my invention;

Fig. 2 is a vertical section on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of the construction illustrated in Fig. 1;

Fig. 4 is a fragmentary perspective view of the mechanism whereby the forward and rear planes of the machine are operated;

Fig. 5 is a fragmentary perspective view showing the means whereby the forward and rear steering rudders are operated;

Fig. 6 is a fragmentary plan view of the tubular connections from the gas tank to the balloon;

Fig. 7 is a fragmentary detail view showing the manner of connecting the collar 31 to one of the control levers;

Fig. 8 is a perspective view showing my invention applied to an individual balloon and illustrating the balloon in its distended position;

Fig. 9 is a top plan view of the construction illustrated in Fig. 8;

Fig. 10 is a section on the line 10—10 of Fig. 9;

Fig. 11 is a front elevation of the construction illustrated in Fig. 9;

Fig. 12 is a fragmentary side elevation of a portion of the balloon case and cover, showing the cover latches and operating means therefor;

Fig. 13 is a detail showing a pump operating means.

Referring now to that embodiment of my invention wherein the gas tank is applied in connection with an aeroplane, as illustrated in Figs. 1 to 7, 10 designates a car or fuselage of any suitable form but illustrated as boat shaped and as provided at its front and rear with propellers 11 operatively connected to an engine not shown, and provided with the landing wheels 12 which may be of any suitable form. I have not illustrated the engine, nor the other necessary operating mechanism and attachments, as these form no part of my invention. Mounted within the car is the longitudinally extending shaft 13 by which the steering of the machine is controlled.

Extending upward from the car is a suitable framework which may be of any desired design and carried by this framework is the longitudinally extending flat base 14 for the balloon 15. This balloon consists of side walls which are attached to the base, and a top 16. This top or cover as illustrated in Fig. 2 is of thin material, though preferably rigid and provided with lateral flanges adapted to fit down over the lateral flanges 17 on the base 14. This base 14 is also to be of relatively light but stiff material. The construction of the balloon itself will be later stated.

Mounted upon the framework in any suitable manner, and illustrated as disposed forward and rearward of the balloon 15 are the forward and rear lateral planes 17. There are two planes at the forward end of the machine and two planes at the rear thereof, as illustrated in Fig. 3. These planes are pivotally mounted upon a transverse shaft or like member 18 and are capable of being tilted, the shaft 18 being provided with a downwardly extending arm 19 midway of its length to which an operating cable is connected.

As illustrated, the machine is provided with a longitudinally extending frame 20 which supports pulleys 21 at the forward and rear ends of the machine. Passing over the forward pulley 21 and connected to the forward arm 19 is a cable 22 while a similar cable 23 passes over the rearmost pulley 21 and to the rear arm 19. The double cable 22 passes over a double pulley 24 and the two lengths of the cable are then carried downward and divergently and around the two longitudinally spaced pulleys 25 and then the two lengths of the cable are connected to each other and to a longitudinally movable operating rod 26. The cable 23 which is also doubled passes over another set of double pulleys 24^a and then downward divergently and over longitudinally spaced pulleys 25^a, the two lengths of the cables being connected to each other and to a longitudinal rod 26^a. These longitudinally extending rods 26 and 26^a, act as pulley rods to shift the cables 22 and 23 and thus to shift the forward and rear planes.

For the purpose of shifting the rods 26 and 26^a by either or both of two operators within the car 10, I provide the forward pair of levers 27 and 27^a and the rear pair of levers 28 and 28^a. These levers are pivoted at 29 upon a suitable portion of the frame and are operatively connected at their lower ends to the rods 26 and 26^a. The levers 27 and 28 and 27^a and 28^a are connected to each other by longitudinally extending rods 30, which rods are slidingly mounted in collars 31, these collars being pivoted to the respective lever 28 or 28^a as shown in Fig. 7. By this means the rods 30 are always kept in horizontal position without regard to the inclusion of the levers and by this means the operation of the lever 27 or 27^a will act to operate the levers 28 or 28^a simultaneously or vice versa. The rods 30 not only connect the levers but also act as means for locking the levers in their angularly adjusted positions and it is for this reason that the rods 30 are rotatably mounted in the collars 31. These rods at their rear ends are provided with laterally projecting teeth 32 and at their forward and rear ends are provided with the radially extending arms 33, there being an arm 33 in connection with each of the levers and each arm being connected to a hand grip 34 by a link 35.

Thus it will be obvious from Fig. 4 that when the hand grips 34 are closed the corresponding rod 30 will be rotated to disengage its teeth 32 from the detaining member 36 and thus the rod 30 is unlocked and the levers may be shifted. By this construction I provide a double control for the planes and an individual control for either the forward plane or the rear plane and also provide means whereby both the forward and rear planes may be shifted simultaneously if desired. Of course it will be understood that these levers 27, 27^a, 28 and 28^a are intended to be disposed in conjunction with the cock pits A and B wherein the two operators are seated.

For the purpose of steering the machine I mount upon the longitudinal member 20 or in any other suitable manner the vertically depending pintles 37 upon which are mounted the forward and rear rudders 38 and 39. Each pintle is provided with an outstanding arm 40 as illustrated in Fig. 5, and a cable 41 is attached to these arms 40, this cable passing around pulleys 42 mounted upon the frame member 20 in any suitable manner, then extending toward each other and the middle of the machine, then downward over pulleys 43 and over a winding pulley 44. This portion of the cable may be provided with a sprocket chain, if desired, and the winding pulley may be in

the form of a sprocket wheel. This winding pulley or sprocket wheel 44 is mounted upon the longitudinally extending shaft 13 previously referred to, which carries at its ends the beveled gear wheels 45 engaged by beveled gear wheels 46 carried upon steering shafts 47 having steering wheels. It will be obvious that here again I provide for a double control of the steering rudders.

The balloon 15 is composed of any suitable fabric, such as silk or other cloth treated so as to render it impermeable to gas, and as before stated, this balloon is composed of side walls which are made of the material before described, these side walls being attached to the base or bottom 14 and the top or cover 16 in the manner illustrated in Fig. 2. The interior of this balloon may be and preferably will be divided into a plurality of small compartments by partitions of silk so that if one portion of the balloon is punctured by a bullet the balloon will still maintain enough gas to prevent collapse.

The dimensions of the balloon are such that when expanded it will be from ten to forty feet in height. The length of the balloon will, of course, depend upon the size of the machine. Preferably the balloon will be so constructed that when it is collapsed it will fold longitudinally on a plurality of lines as in an accordion and to the end that when the balloon is collapsed it shall automatically fold on these lines, and collapse as an accordion collapses, I provide a plurality of elastic ties 48 extending transversely of the balloon and connected to the apices of the reëntrant folds as illustrated most clearly in Fig. 2. These ties 48 are made of any elastic material which will have sufficient contraction and which will permit of sufficient expansion to in turn permit the balloon to be expanded or collapsed. When the balloon is expended, as shown in Fig. 2, these ties will be expanded but as soon as the balloon is deflated and the pressure is decreased in the interior of the balloon, the ties will commence to retract which will cause the balloon to fold, as illustrated.

Also mounted in connection with the balloon and extending transversely thereacross are a plurality of ties 49 which will prevent the undue expansion of the side walls and which will brace these side walls against any possible strain. Vertical ties 50 are also provided attached to the base 14 and to the upper collar 16 which prevents the undue upward expansion of the balloon or a distension of the balloon which would tend to tear or otherwise damage the side walls.

In order to hold the balloon in a position perpendicular to the bottom 14 when the balloon is expanded and also brace the fabric of the balloon against thrust or strain, I provide a plurality of forwardly and rearwardly extending exterior elastic ties 51 and rigid ties 52, and a plurality of interior elastic and rigid ties of like construction. These last named ties are attached to the wall of the balloon at intervals and extend downward and are attached to the bottom or base 14. The exterior ties, both the elastic ties and the non-elastic ties, are connected to forwardly and rearwardly extending portions 53 of the supporting frame. The elastic ties yieldingly hold the balloon in its perpendicular position relative to the bottom 14, the inelastic ties prevent undue stretching of the elastic ties and the elastic ties act to assist in drawing the balloon into a collapsed condition when pressure of gas within the balloon is reduced.

In order to provide for the inflation of the balloon, a pipe 54 is provided which is connected to a gas tank 55 and which is connected to a header pipe 56 having branches opening into the several compartments of the balloon. The tank 55 is designed to contain gas under pressure and therefore is of relatively small cubic capacity or it may have means whereby gas may be generated when desired. This tank 55 is so connected to the balloon that by an operation of a valve, the gas may be allowed to pass out from the tank into the balloon or by the operation of a pump, the gas may be withdrawn from the balloon and forced back by pressure into the tank.

To this end, as illustrated in Fig. 6, I provide a tubular connection 56 which is approximately U-shaped in form and is connected at one end, as at 57, to the gas tank 55 and at the other end connects to the pipe 54. A stop cock 58 is provided in this tubular connection 56. Extending across the two legs of the U-shaped pipe 56 is a pipe 59 which at its middle is connected to any suitable air pump or gas pump as at 60. This pump may be of any suitable construction and is illustrated diagrammatically in Fig. 6. It is to be understood that the pump may be operated by the engine of the machine or by an auxiliary motor or even by hand power. Provision must be made for causing this pump to exhaust gas from the tank and force it into the balloon or draw it from the balloon and force it into the tank and to this end I provide the pipe 59 with a check valve 61 which opens with the suction stroke of the pump and closes upon a pressure stroke thereof. A like check valve 62 is disposed or connected on the opposite side of the pump connection 60 which opens upon the compression stroke of the pump and closes either on the suction stroke or is closed by the pressure of gas within the gas tank. A gage 63 is connected to the pipe 56 for the purpose of showing the pressure of gas within the balloon and the gate 64 on the opposite side of the stop

cock 58 shows a pressure of gas within the tank or tanks.

Now with the gas under pressure within the tank or tanks, when the balloon collapses if the operator opens the stop cock 58 the gas will pass from the gas tanks around through the pipes 56 and so to the balloon. If, on the other hand, the gas bag is deflated and it is desired to inflate it, then the stop cock 58 being closed, the pump is operated which immediately withdraws the gas from the balloon through the valve 61 and forces it through the valve 62 back into the tank.

I do not wish to be limited to the pipe connection illustrated whereby this result may be secured, as it is obvious that other systems may be provided which will accomplish the same end. This arrangement, however, is very simple, it cannot readily get out of order and it provides for an easy control of the means for inflating or deflating the balloon.

As before stated, it is also within the province of my invention to provide an individual balloon normally held in a collapsed condition, but adapted to be distended when desired, this balloon being of such size and capacity that it will support an operator and preferably of such capacity that it will lift the operator, if desired, or allow him to descend gently. Such a construction as this I have illustrated in Figs. 8 to 11 and in these figures, 65 designates the gas tank which is made of relatively light material and is adapted to be carried upon the shoulders of the operator and held thereto by means of any suitable harness or system of belts 66, as illustrated in Fig. 8, these belts being strong enough to support the body of a man from the gas tank when the balloon is inflated.

Mounted in conjunction with the gas tank 65 is the balloon 67 which, as illustrated in Fig. 10, is normally disposed in a deflated condition back of the gas tank and preferably so folded that it will occupy but little space. This balloon has its neck 68 connected to a pipe 69, which extends over the top of the tank, then downward at one side and is there connected to a U-shaped pipe 70 which corresponds in every respect to the U-shaped pipe 56 illustrated in Fig. 6. This pipe 70 at its opposite ends is connected to the tank 65 as shown in Fig. 9 and is provided with the stop cock 71 and with the two pressure dials or registers 72 and 73 designed to register the pressure of gas within the balloon or within the tank. The U-shaped pipe 70 is connected by a transverse pipe 74 which at its middle is connected to a hand pump 75 of any suitable construction and which is provided with the inlet check valve 76 between the pump and the balloon and with the outlet check valve 77 between the pump and the tank. When the pump is operated, gas is drawn off from the balloon through the pipe 70 and pipe 74 and forced into the tank. When the stop cock 71 is open communication is established between the gas tank and the balloon to permit the compressed gas within the tank to be delivered into the balloon.

The balloon is held to the back of the tank and in a folded condition by means of a cover 78 and this cover is held closed, as illustrated in Fig. 12, by latches 79 engaging over the studs of the cover, these latches having tails 80 which when the latches close project outward in the path of triangular lugs 81 mounted upon a band 82 in turn slidingly mounted upon the side walls of the tank and extending over the top of the tank. This band 82 may be made of leather or other suitable material and normally extends over the neck of the gas bag or balloon. Now when gas is turned into the balloon the pressure of the gas in the neck 68 will cause the neck to expand and lift, thus lifting the sliding strip 82 and releasing the latches and the cover or inclosure and thus releasing the balloon so that the gas can pass freely thereinto and distend the balloon to the position shown in Fig. 8.

The balloon may be of any suitable construction. It is preferably made of very light and thin material, such as varnished silk or the like and preferably, though not necessarily, there will be a flexible perforated hose 83 disposed within the balloon 67 and extending into the neck thereof which hose will have branches radiating to all portions of the balloon so as to let the gas pass equally into all portions of the balloon. This balloon may be connected by guys or cords 84 to the tank 65 so as to support the weight of the tank and of the operator from the balloon when the balloon is inflated. Preferably, the cover 78 may be of flexible material such as canvas, so as to permit the ready release of the balloon as soon as the latches are detached. The tank 65 will be provided with a valve 85 whereby gas may be let out of the tank or whereby gas may be pumped into the tank.

The life preserving balloon illustrated in Fig. 8 is designed to be used by aeronauts in place of a parachute, for instance, so that the aeronaut may at any time release the folded balloon, turn the valve so as to permit the gas to pass from the valve into the balloon and then jump from his machine, the inflated balloon supporting the occupant in mid-air and allowing him to descend gradually. It is my design to have the balloon of such capacity that when fully inflated it will elevate the operator and the gas tank and when partially inflated will allow him to descend gradually or to remain more or less at the same elevation in the air at which he

jumped. This may be accomplished by controlling the amount of gas allowed to escape from the tank into the gas bag and this in turn may be readily regulated by watching the pressure registers or indicators 72 and 73 which will indicate exactly the pressure of gas within the balloon and tank respectively.

I design also to provide a pump 75 as before stated whereby the gas may be pumped back from the balloon into the casing, to thus reduce the lifting capacity of the balloon and I have illustrated this pump as being provided with a manually operable piston. This pump may be mounted in any suitable position where it will be convenient to the operator.

In Fig. 13 I have illustrated the pump 75ª as having a piston adapted to be operated by the feet, by means of a pump rod 86 having a stirrup 87 into which the operator can thrust his foot and thus operate the pump. It will be obvious that the pump might be a double-acting pump and operated by both feet of the operator. The life preserver shown in Fig. 8 may be used as before stated for aeronauts or it may be used by sailors, climbers, to assist in climbing mountains or crossing chasms, or by structural iron workers. In fact, it is adapted to be used by any persons who occupy dangerous positions from which they are liable to fall. It is obvious that the details of both of these constructions may be changed, in many ways, without departing from the principle of the invention, but I do not wish to limit myself to the details illustrated or to the exact arrangement of parts.

In the construction illustrated in Figs. 1 to 7 it will be seen that the balloon when deflated and with the cover 16 depressed tightly against the base portion 14 constitutes a plane and that the machine, under these circumstances, may be used like an ordinary heavier-than-air machine, the planes 17 constituting ailerons or elevating planes whereby the machine may be caused to ascent or descend or fly horizontally. Then if for any reason the engine should stop or if it be desired that the machine shall hover over a certain locality, the balloon may be inflated and then the propeller is gradually slowed down and in this case the machine will have the character of a dirigible balloon and may be used for all purposes for which a dirigible balloon is capable. Thus the machine illustrated in Fig. 1 constitutes a combined aeroplane and dirigible balloon either of which may be used as occasion demands. When it is desired to use the machine as an aeroplane or the necessity for the inflation of the ballooon no longer exists it is only necessary to start the pump, whereupon the gas will be gradually withdrawn from the balloon and the balloon will commence to collapse and the engines will be started, the speed of the engines being increased as the gas bag is deflated. At first the weight of the car will be supported by the partially inflated balloon and the planes 17, but when the balloon is fully deflated the machine will be supported by the plane 17 and also by the plane formed of the deflated balloon within its relatively stiff covers.

It will be understood that the suction when the balloon is deflated will hold it in a collapsed condition. In other words, the gas having been sucked from the interior of the balloon, the air pressure on the exterior of the balloon will hold it collapsed. It is also to be understood that an emergency gas tank may be disposed within the car of the dirigible balloon and that means may be provided for generating gas for emergencies so that this gas may be generated whenever desired and pumped into the balloon or compressed within the tank.

I claim:—

1. A flying machine comprising a supporting frame and a car supported thereby, a flat, relatively thin balloon base carried by the supporting frame and extending over the car, a balloon attached to said base and comprising flexible walls, and a top or cover of relatively rigid material, said cover having a flange on its margin fitting over the base when the balloon is collapsed with the cover lying flat upon the base and together with the base constituting an aeroplane, a gas tank carried by the car and containing gas under pressure, means for admitting gas from the gas tank to the balloon to inflate it, and means for pumping gas out of the balloon and into the tank.

2. In a machine of the character described, a balloon having internal, flexible, inelastic braces engaging at spaced points with the side walls of the balloon, vertical, non-extensible, flexible braces attached to the top and lower walls of the balloon, said braces acting to prevent undue distension of the balloon, and elastic braces operatively connected at spaced points to the opposite walls of the balloon, yieldingly resisting the distension of the balloon and causing the balloon to fold at a plurality of spaced points and along a plurality of longitudinally extending lines when the balloon is deflated.

3. A balloon of the character described having side walls of flexible material longitudinally creased along a plurality of horizontal lines to form a plurality of reentrant folds, a plurality of elastic braces disposed in spaced, superposed relation within the balloon and connected at their ends to the side walls at the apices of the reentrant folds to thereby cause the balloon, when deflated, to fold along a plurality of longitudinally extending, parallel lines.

4. A balloon of the character described including a rigid base, a rigid cover and flexible side walls, the base of the balloon having an extension projecting beyond one end wall of the balloon, a plurality of upwardly inclined, flexible braces attached to said extension of the base and to the end wall of the balloon at different heights to thereby resist end thrust on the end wall, and a plurality of upwardly inclined, flexible braces attached to the base upon the interior of the balloon and extending upward from said end wall and attached thereto at a plurality of points.

5. A balloon of the character described including a rigid base, a rigid cover and flexible side walls, the side walls being formed to provide a plurality of alternate reëntrant and reëxtrant, longitudinally extending folds, the base extending beyond an end wall of the balloon, a plurality of upwardly and inwardly inclined, flexible, elastic braces attached at different points to said extension of the base and attached to the apices of the reëxtrant folds of the balloon, and a plurality of upwardly inclined elastic braces attached to the base inside of the balloon and extending upward and attached to the end wall of the balloon at the apices of the reëntrant folds, whereby when the balloon is deflated, the exterior braces will pull the reëxtrant folds outward, the interior braces will pull the reëntrant folds inward to thereby cause the collapse of the balloon on the said folds.

6. A balloon of the character described including a rigid base, a rigid cover, and flexible side walls, non-extensible flexible braces extending across the balloon and vertically through the balloon and preventing undue extension of the balloon, transversely extending elastic braces attached at intervals to the walls of the balloon to thereby cause the balloon when collapsed to fold at a plurality of uniformly spaced points, the base of the balloon extending beyond the side wall thereof, a plurality of upwardly inclined flexible, non-extensible braces attached to said extensions of the base and to the end walls of the balloon at different heights to thereby resist thrust on the end walls, and a plurality of elastic braces attached to the end walls of the balloon and causing them to fold at a plurality of spaced points when the balloon is collapsed.

7. A machine of the character described including a balloon, a U shaped pipe connected at one end to the balloon, a gas tank connected to the other end of the pipe, a stop cock arranged in said pipe and controlling passage from the gas tank into the balloon, a pipe connecting the legs of the U-shaped pipe, a pump connected to the middle of the connecting pipe, and a check valve disposed in one side of the pump and in said connecting pipe opening upon a suction stroke of the pump and closing upon a compression stroke, and a check valve on the opposite side of the pump and in said connecting pipe opening upon a compression stroke of the pump but closing upon the suction stroke thereof.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE W. WILKIN.

Witnesses:

HAROLD HARRIS,

R. F. FULTON.