No. 612,808.

Patented Oct. 18, 1898.

O. L. SMITH.

AIR SHIP.

(Application filed Jan. 27, 1896.)

(No Model.)

4 Sheets—Sheet 1.

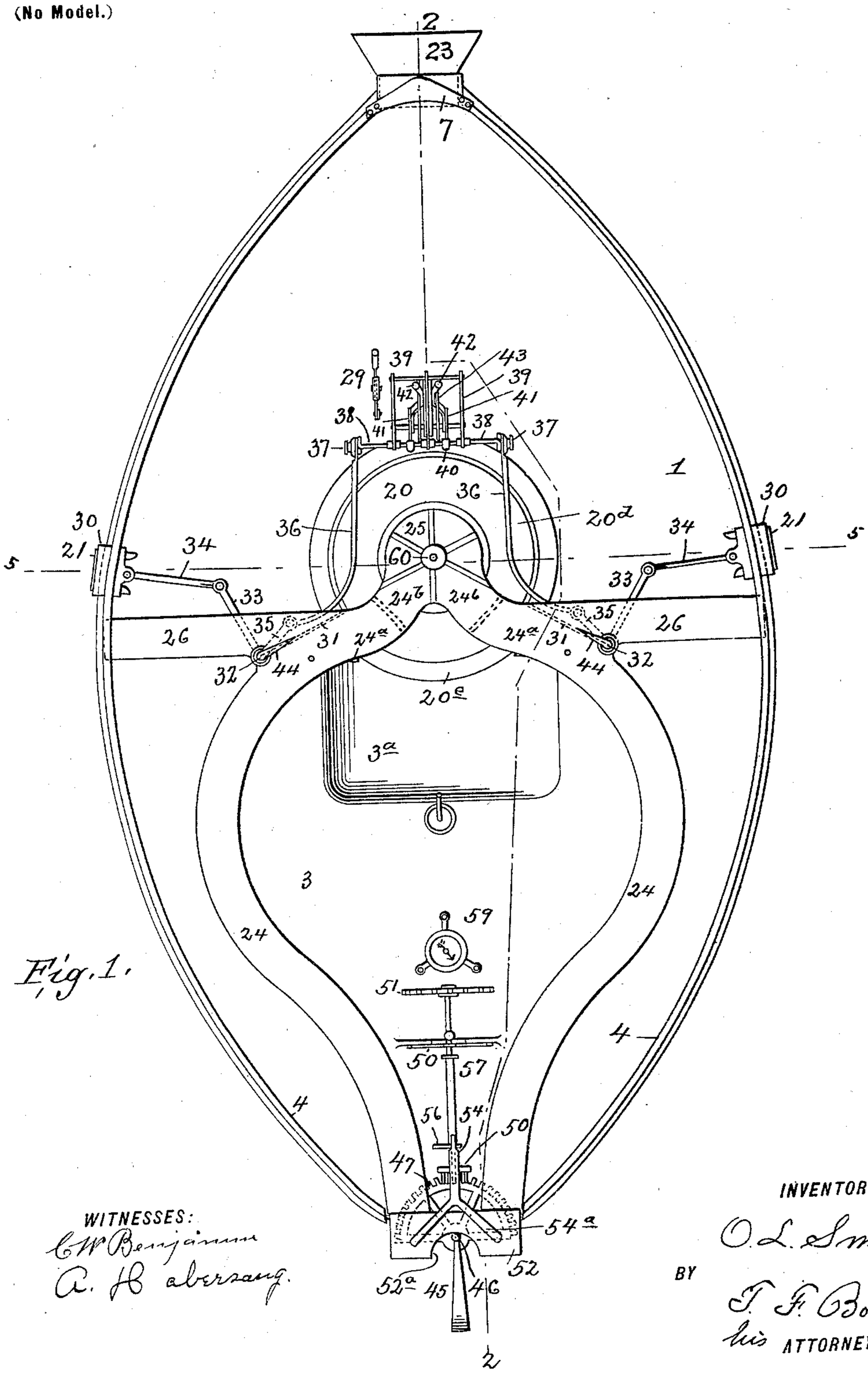

Fig. 1.

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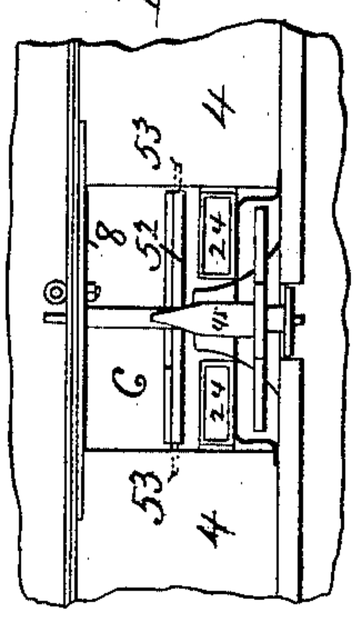

Fig. 4.

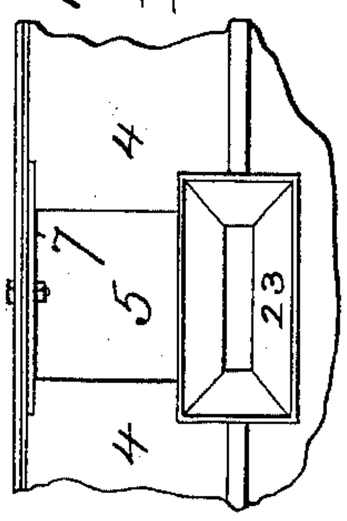

Fig. 3.

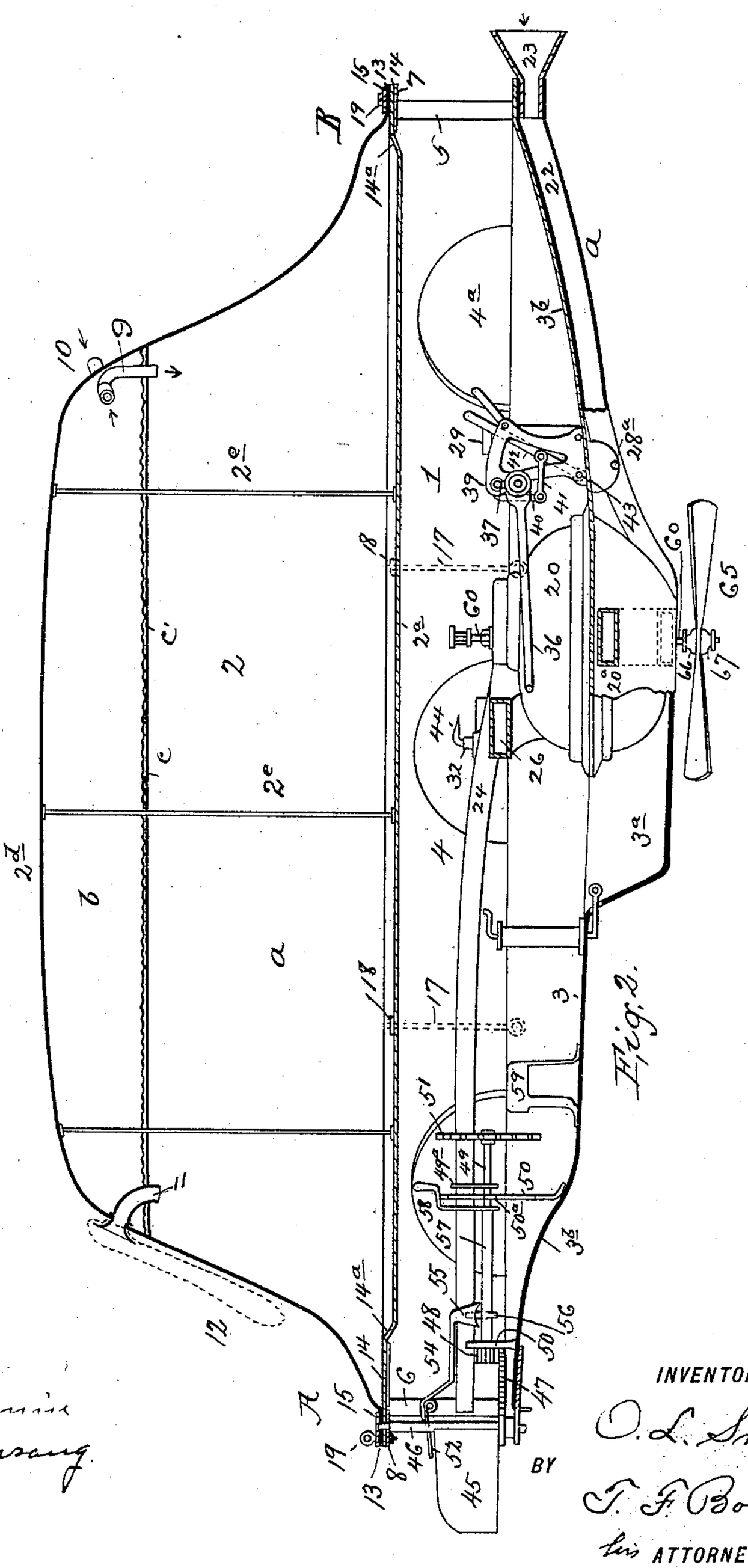

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

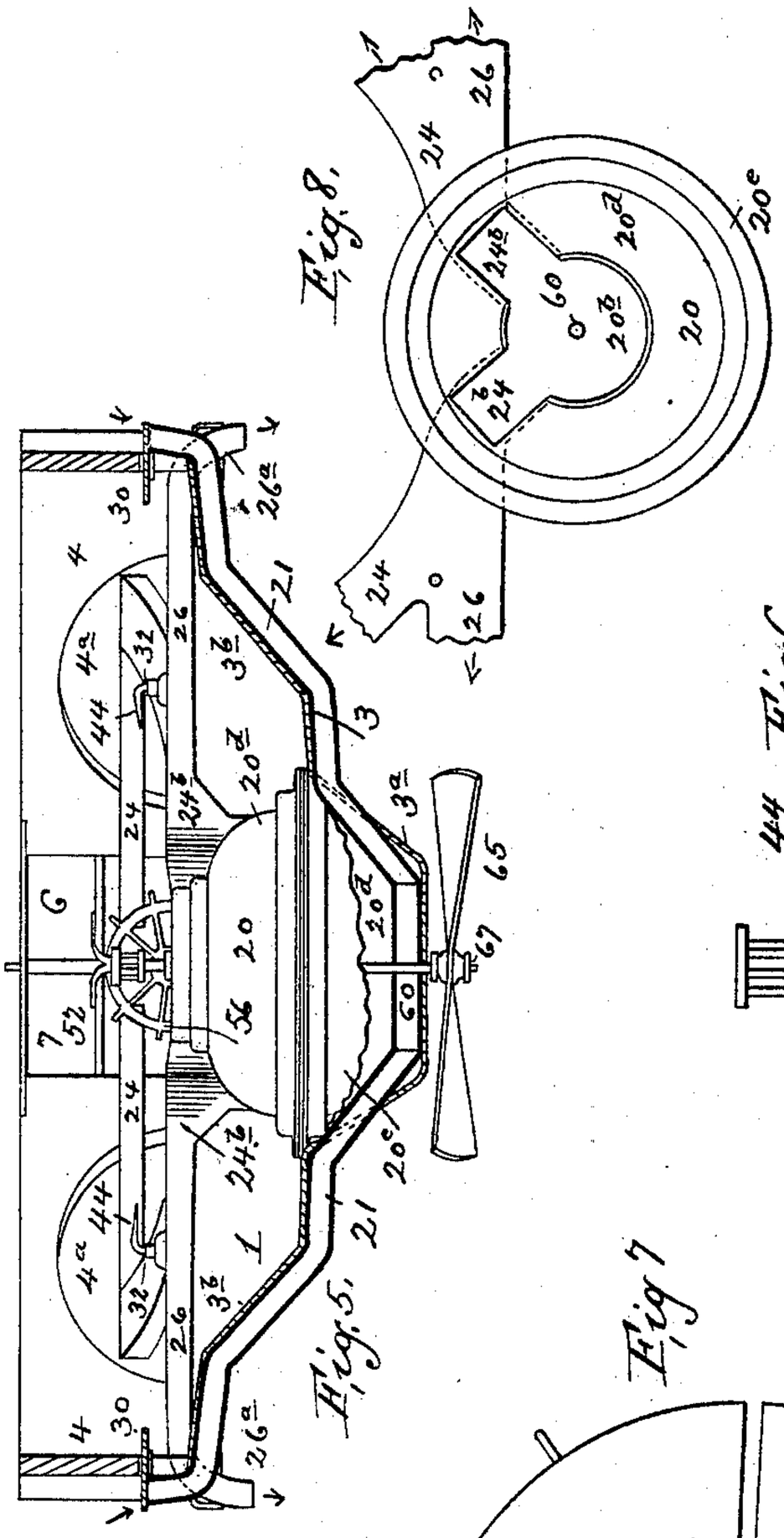

Fig. 5.

Fig. 8.

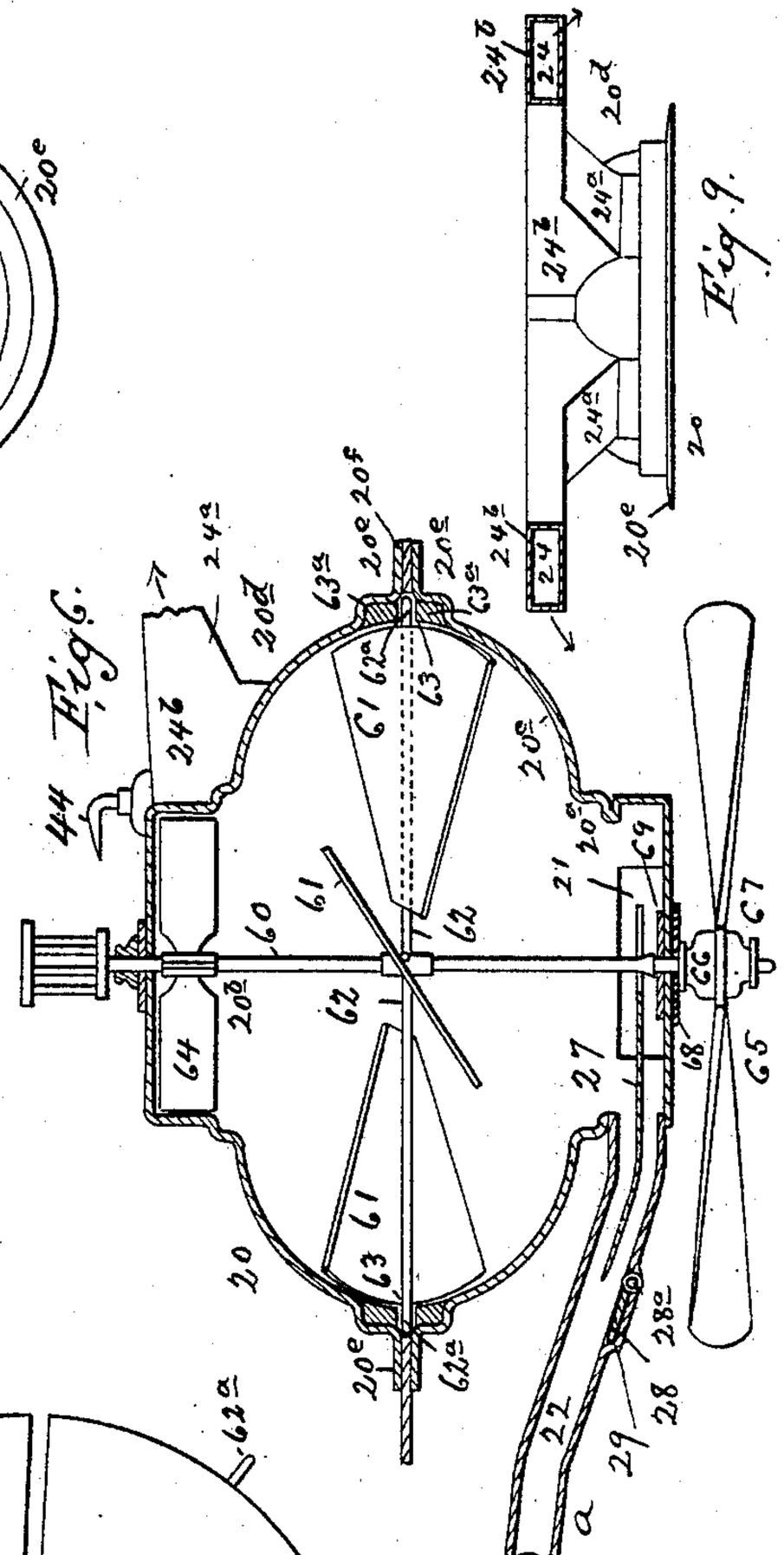

Fig. 6.

Fig. 9.

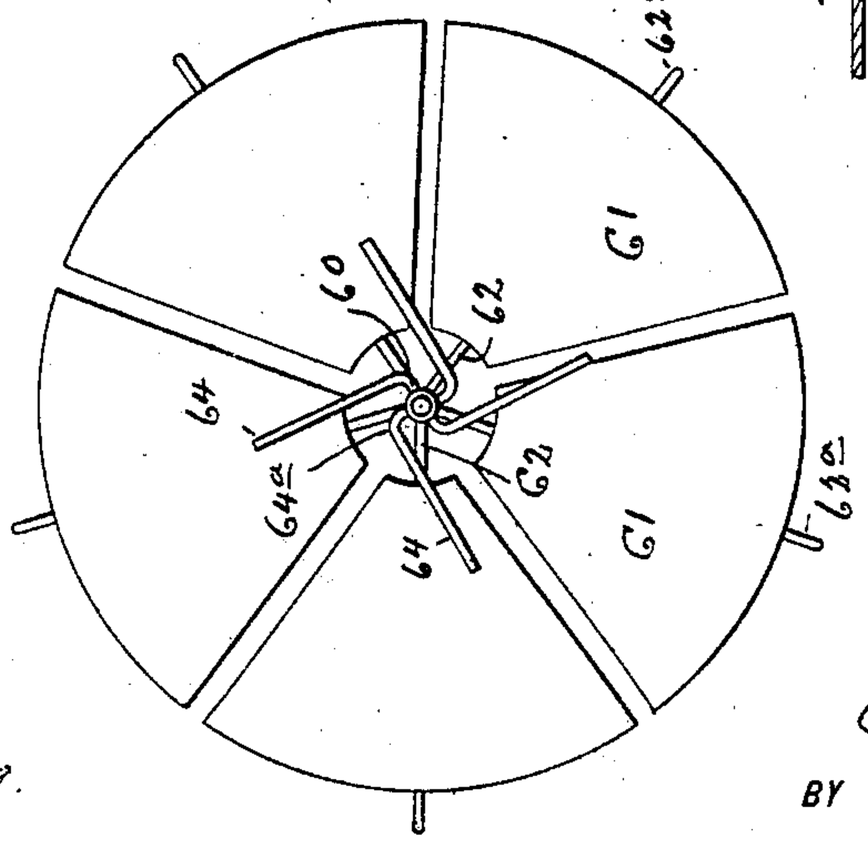

Fig. 7

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(No Model.) 4 Sheets—Sheet 4.

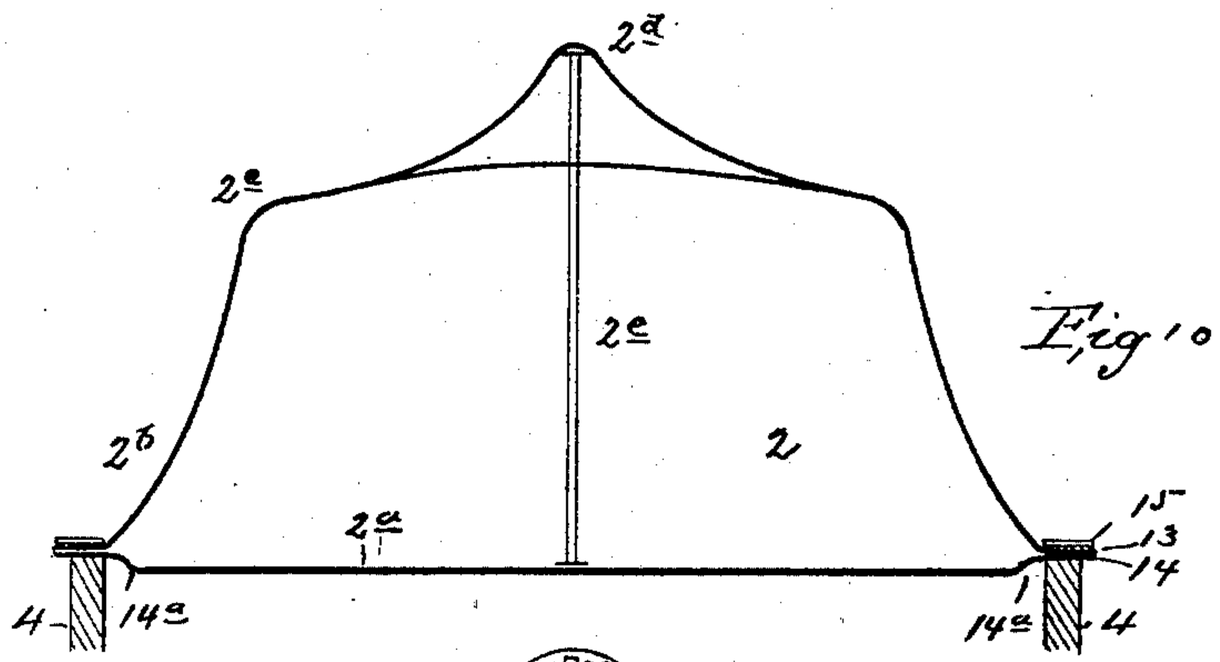
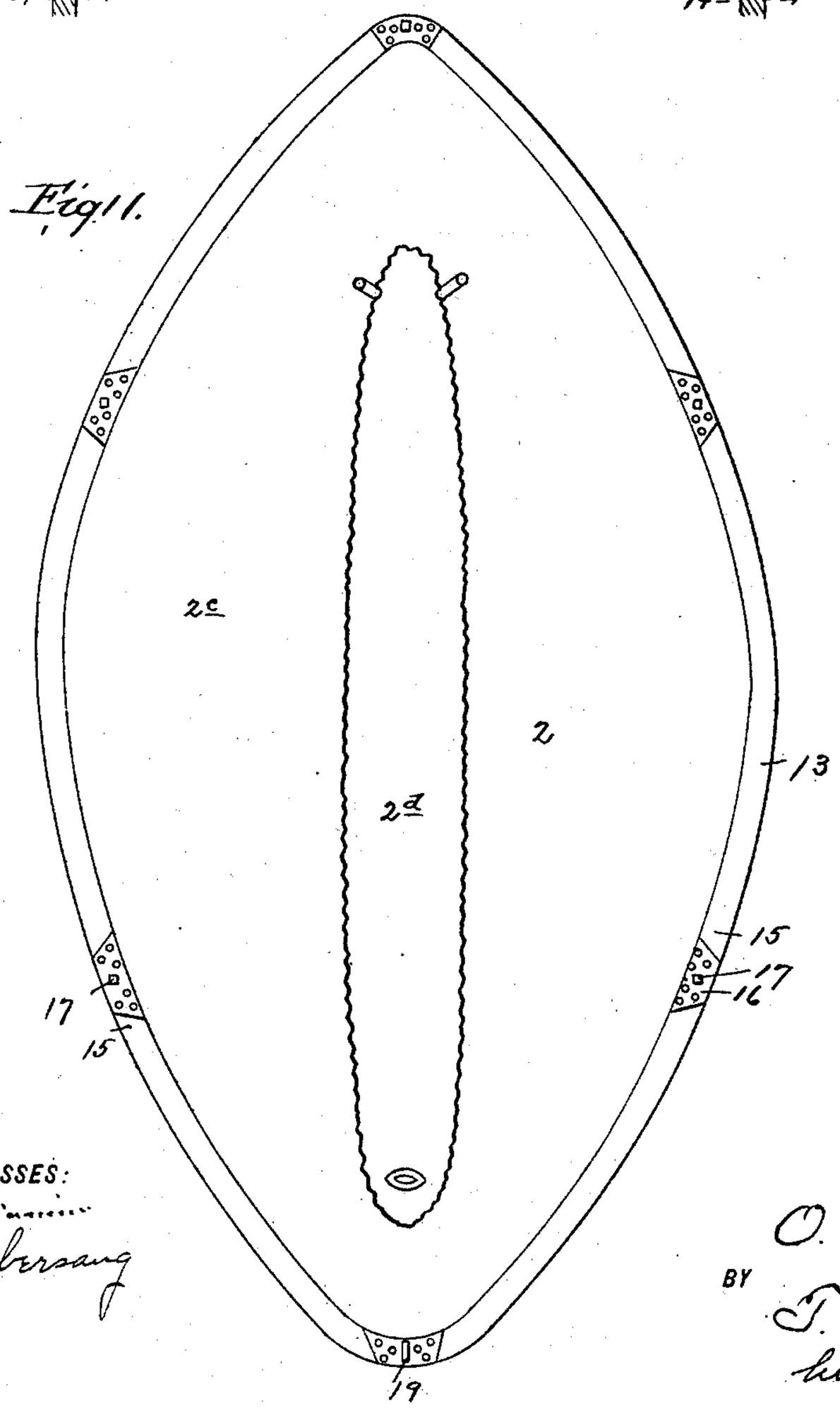


Fig 10

Fig 11.



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UNITED STATES PATENT OFFICE.

OSCAR L. SMITH, OF NEW YORK, N. Y.

AIR-SHIP.

SPECIFICATION forming part of Letters Patent No. 612,808, dated October 18, 1898.

Application filed January 27, 1896. Serial No. 577,057. (No model.)

To all whom it may concern:

Be it known that I, OSCAR L. SMITH, residing in New York, (Edgewater, Rosebank P. O.,) Richmond county, New York, have invented certain new and useful Improvements in Air and Water Locomotives for Navigation, of which the following is a specification.

The object of my invention is to so construct a locomotive that it can be raised, lowered, and propelled without depending upon a volume of gas to suspend it in the air; but I utilize a certain volume of gas merely for the purpose of counterbalancing the weight of the air-car when ready to ascend, and I use certain novel means for raising, lowering, and propelling and also for steering the locomotive.

The invention consists in the novel details of improvement and the combinations of parts that will be more fully hereinafter set forth, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a plan view of the car, the gas-reservoir being removed. Fig. 2 is a vertical longitudinal section on the line 2 2 in Fig. 1, showing the gas-chamber in position. Fig. 3 is an end view, partly broken, of the car, looking at the bow from the right in Fig. 2. Fig. 4 is an end view, partly broken, of the car, looking at the stern in Fig. 2. Fig. 5 is a cross-section of the car, substantially on the line 5 5 in Fig. 1, looking from the top, the fan or air-compressing chamber being partly in full lines and partly broken. Fig. 6 is an enlarged vertical section of the air compressing and blowing devices. Fig. 7 is a plan view of the fans. Fig. 8 is an inverted plan view of the upper part of the air-compressing chamber, showing the air outlets or passages. Fig. 9 is a rear edge view thereof. Fig. 10 is an end view looking at the front of the gas-chamber, showing the sides of the car in section. Fig. 11 is a plan view thereof.

In the accompanying drawings, in which similar numerals and letters of reference indicate corresponding parts in the several views, the number 1 indicates the car or main mechanism-holding chamber of the locomotive, and 2 is a gas-chamber secured thereon. The car 1 is composed of a suitable bottom or floor 3 and upright sides 4, extending along the outer sides thereof. The outline of the bottom 3 is substantially oval, closely resembling a turtle, as shown in Fig. 1. The bottom 3, at about its middle, is provided with a depression 3^a, and the outer parts of the bottom or floor slope downwardly and inwardly, as at 3^b, all around the car or vessel. As the bottom or floor 3 is intended to be made of thin metal, this bending or sloping, in conjunction with the central depression or pit 3^a, acts to increase the strength of the entire bottom. The sides 4 may be secured along the outer edges of the bottom or floor in any desired manner, and they are shown provided with suitable openings 4^a for the admission of air and for observation.

At the bow A and stern B of the car or vessel 1 openings 5 6 are provided. These may be formed by having the ends of the sidings 4 4 separated, and strengthening-bars 7 8 cross said openings to hold the sides 4 rigidly.

The gas chamber or reservoir 2, as shown in Figs. 2, 10, and 11, closely resembles a turtle's back and has a lower substantially horizontal metal plate or bottom 2^a, and its side walls curve inwardly and upwardly at 2^b to the point 2^c, from where they extend inwardly on a suitable curve toward the center, and at the center of the chamber is a ridge or fin.

By preference the gas chamber or reservoir 2 is provided with two chambers, the main lower chamber *a* being formed by the bottom plate 2^a and the sides 2^b, and the upper chamber *b* is formed by the top of the lower chamber and by the walls of the ridge or fin 2^d. These chambers may communicate through a circular opening *c* in the wall *c'* between the two chambers. The ends of the chamber or reservoir 2 curve inwardly and upwardly, as shown in Fig. 2, the outer lines of the walls of this chamber being symmetrical to present the least possible resistance to the air. The ridge or fin 2^d serves to hold the locomotive properly in the wind. The lower wall or bottom 2^a of the gas-chamber 2 is preferably made of aluminium to afford strength with lightness, while the upper walls of the chamber may be of any suitable material, such as ordinarily used for the purpose of containing gas to raise a car. The top or backbone of the ridge or fin 2^d and the lower

plate 2^a are connected together by tie-rods or tubes 2^e, which serve to resist gas-pressure against the thin plate 2^a. The chamber or reservoir 2 may be charged with gas through a tube 9, leading into it from hollow fin 2^d, and there may also be a tube 10 leading to the latter, through which the charge may be regulated in charging the chamber and the hollow fin 2^d.

11 is a tube leading outwardly from main chamber *a*, to which tube is attached a rubber, silk, or other suitable collapsible and expansible bag 12. This bag serves to receive an excess of gas should the latter expand too much in the chambers *a* or *b*, thus relieving the pressure in said chambers, while not losing the gas, for when the expansion ceases or is reduced the gas in the bag 12 can return to said chambers.

The gas chamber or reservoir 2 is securely attached to the car 1, and is fastened directly to the sides 4 thereof, whereby the lower flange is firmly based and so they will both be united in a single structure without space between them, so as to reduce drag resistance, or that resistance consequent upon that difficult and faulty principle of one body being suspended from another, as in a balloon, when the car is suspended by ropes and nets from the gas-holder. For this purpose and to strengthen the gas-reservoir, while permitting it to be made from light material, such as suitable silk, the top portion of the reservoir is provided with a lower outer flange 13, which extends entirely around the lower portion of the chamber and is secured to a corresponding flange 14 at the edge of the plate or bottom 2^a. The flange 14 is raised above the plate 2^a, which for this purpose is curved at 14^a, which also serves to strengthen the bottom 2^a. (See Fig. 2.) The structure 5 is further strengthened at the flanges 13 14 by a metal strip or flange-bar 15, which passes around the flange 13, lying thereon. The bar 15 will be made of various strips connected together at their ends by a plate 16, all of which will be riveted together. (See Fig. 12.)

The flanges 13 14 15 will be secured to the car 1 by bolts or threaded rods 17, passing through or alongside of the sides 4 and fastened by nuts 18, (see dotted lines, Fig. 2,) and the ends of the reservoir 2 will be secured to the bars or plates 7 8 by screws or bolts 19, passing through said flanges and bars and properly fastened.

The car and gas-reservoir thus far described form a strong yet light structure capable of navigating the air when properly balanced and operated, as the shape and lines of the structure are calculated to present the least possible or free air resistance to travel in the air in any direction, the car being under perfect control by the driving and steering apparatus. It is not designed that the structure will rise in the air merely by means of gas in the reservoir 2, for that is not constructed to receive a sufficient volume of gas to raise the structure from the earth. The purpose of the reservoir is to contain sufficient gas to nearly counterbalance the weight of the structure or to nearly overcome the gravitation of the same when ready to ascend, and I rely upon certain novel mechanical devices for causing the structure or ship to rise and descend and to travel and maneuver in the air at the will of the operator. For this purpose I utilize currents of air compressed and formed by suitable mechanism and received and directed from the structure or ship in such manner as to give the desired control of the same. For this purpose I have devised and arranged the devices described herein below.

20 is a casing of suitable construction that combines the suction power of an exhauster and air-blower in one device. This device is firmly secured within the car 1, and is shown located near the center thereof in the compartment, well, or pit 3^a thereof. (See Fig. 2.) Within this casing 20 are suitable devices, such as fans, for compressing and blowing air, and to this casing are connected suitable compartments or inlets and outlets for air tubes or pipes provided with suitable valves to regulate the passage of air.

The casing 20 is divided into two main end compartments 20^a and 20^b and intermediate compartments, the compartment 20^a being the lower compartment for receiving the air drawn in and compartment 20^b being the upper compartment and side incasements connected therewith for compressing and discharging the air.

21 are feed pipes or tubes leading to the lower part of the lower compartment 20^a of casing 20 from opposite sides thereof. The pipes 21 lie along the under surface of the floor 3 of the car 1 and follow the curved lines thereof. (See Fig. 5.) The feed-pipes 21 extend to the sides of the car and open upwardly, as in Fig. 5, so that air can be drawn or sucked into the lower section of the casing 20 from above downwardly, so as to have the effect of assisting to lift the structure. As the side sets of feed and discharge pipes 21 are located on both sides of the car, the side suction and discharge of the air will be uniform and equalized.

22 is a broad feed pipe or tube, one-half wider than any of the others, which extends centrally along the under surface of the floor of the car 1, from the front end or bow thereof to the lower part of the lowest distributing and equalizing compartment 20^a of the casing 20. (See Fig. 2.)

23 is a flaring or funnel-shaped mouth or section which enters the pipe 23 to draw in or conduct air to the suction-pipe 22. As shown, the pipes 21 22 and mouth-section 23 are of oblong rectangular shape, horizontally arranged, so as to produce a wide column or stream of air. A compressed whirlwind of air is formed in the upper compartments that strikes the right-hand sides of the openings and is forced into the two side incasements,

these upper and side incasements in the main casing and the double fan arrangement for air concentration greatly increase the rapidity of discharge and in ratio to the volume of the air-feed current leading to the lower compartment of the main casing.

As shown, the shell or casing 20 is made in two sections 20^c and 20^d, having flanges 20^e secured together, a packing 20^f being placed between these flanges to make a tight joint. The section 20^d has the upper compartment 20^b. From the compartment 20^b and section 20^d extend outwardly two incasements 24^b, that are a part of the casing, being firmly joined to it, both of which lead from the < -shaped opening in the side of the compressing and discharging compartments 20^b and section 20^d. (See Fig. 8.) These incasements 24^b open outwardly and extend well down the side of the section 20^d, being inclined downwardly at 24^a and having flaring mouths or ends to readily discharge air from the compartments to the rear and sides. (See Fig. 9.) The discharge-pipes 24, connected with the incasements 24^b, extend rearwardly through the car, above its floor, and project through the rear opening 6 side by side. (See Fig. 4.) The air rushing from the pipes 24 at the rear of the car in double columns serves to drive or propel the latter forwardly. The top of the casing 20, where the incasements extend from 24^b, may be strengthened by a spider or pronged shield 25. (See Fig. 1.) From the rearwardly-extending pipes 24 pipes 26 extend out through the side of the car, the outer ends of the pipes 26 extending downwardly at 26^a, (see Fig. 5,) so that as air is forced from said pipes it will rush downwardly, and thus act to raise the structure.

The air-inlet pipe 22, at the point where it enters the casing 20, is provided with an air-dividing plate 27, (see Fig. 6,) which extends into the casing 20, about midway thereof, and is located about in the longitudinal center of pipe 22. This arrangement provides a double inlet for pipe 22 into the casing 20, so that as the air is drawn into said casing through pipe 22 it will be caused to fully separate throughout all portions of the casing, so as to supply the fans more uniformly with air than if the air merely entered the casing at one point. Suitable valves are provided to regulate the inlet and outlet of air into and from the pipes before mentioned, as required. The inlet-pipe 22 has a valve 28, extending crosswise thereof and shown in Fig. 6, located in a depression 29 in the under wall of said pipe. The valve 28 is operated by a lever or handle 29, suitably supported within the car 1 and connected with the shaft 28^a of said valve, so that the latter can be rocked to open and close the pipe 22. The valve 28 is shown lying in advance of the plate 27. (See Fig. 6.) The inlet-pipes 21 are also provided with valves 30, which are shown in the form of plates adapted to slide over the upper open ends of the said pipes. (See Figs. 1 and 5.) Within the pipes 24 26 are valves 31, which lie adjacent to the joint between said pipes. (See Fig. 1.) The valves 31 are so arranged that when placed in one position free passage through the pipes 24 will be provided and the pipes 26 will be shut off, so that when said valves 31 are turned the pipes 24 will be shut off and the pipes 26 opened. It is designed that when the pipes 24 are closed and the pipes 26 opened the pipes 21 will also be opened, and for this purpose the valves 30 and 31 are connected together, as shown in Fig. 1. To accomplish this, the shafts or pivots 32 of the valves 31 are pivotally connected by crank-arms 33 with rods 34, which are pivotally connected with the valves 30. The valves 30 are suitably guided through the sides 4 of the car 1, and when the shaft or shafts 32 is or are rocked the valves 30 and 31 will be moved simultaneously. To the shafts 32 are also connected crank-arms 35, which are pivotally connected with rods 36, that are connected with cranks 37 on rock-shafts 38, journaled in suitable bearings on a standard 39, secured to the floor of car 1. 40 are also cranks secured to shafts 38 and connected by links 41 with hand-levers 42, which are pivoted at 43 to the standard 39, whereby as the handles 42 are rocked the shaft 32 can be rocked to move the valves 30 and 31 simultaneously.

43 is a guide-rod carried by the standard 39 to guide the handles 42.

As it may be necessary at certain times to operate one set of valves 30 and 31 without operating the other set, I provide two corresponding but separate shafts 38 and their connected cranks and levers, so that by operating either handle 42 the corresponding pair of valves 30 and 31 can be moved, and of course by operating both handles 42 together both pairs of valves 30 32 can be operated simultaneously.

44 are indicators or pointers carried by the shafts 32 and set parallel to the valves 31, so as to indicate in which position the valves 32 are situated.

In the side wall of the pipe 24, opposite the opening of the pipe 26, is a recess 24^a to receive the end of valve 31, so as to reduce the chance of air rushing past the valve.

Suppose now with the arrangement herein-above described it is desired to have the locomotive rise into the air. The handles 42 will first be so set as to cause the valves 31 to close the pipes 24 and to open the pipes 21 by moving back the valves 30. The air-compressor being now operated in the casing 20 will cause air to be drawn or sucked into said casing through the pipes 21, wherein it will be compressed and forced up to the chamber 20^b, from whence it will be forced under pressure through the pipes 26 and out through their ends 26^a in a downward direction, whereby the locomotive or ship will be caused to rise into the air on account of the little resistance or weight it possesses owing to the gas

in the reservoir 2, which, as before stated, is sufficient to practically overcome the gravity of the structure. When the locomotive or ship has risen to the desired height and it is desired to propel it forwardly, the valve 28 in air-inlet pipe 22 is opened and the handles 42 are drawn back to close the valves 31 across pipes 26 and also close the valves 30 over pipes 21. Air will now enter the casing 20 of the air-compressor through pipe 22 from the bow or front of the locomotive and will be directed to all parts of the chamber 20^a by the plate 27 and will be compressed in chamber 20^b and forced therefrom rearwardly through the pipes 24, and thus out from the stern of the locomotive. The air rushing in double columns from the pipes 24 by striking against free air or atmosphere will cause the locomotive to advance, and the air being drawn into the pipe 22 and forced from pipes 24 serves to assist in sustaining the locomotive in the air, or, in other words, the pipes of the locomotive pass over or inclose a column of compressed air which, in connection with the lightness or substantial equilibrium of the structure, affords somewhat of a support for the latter.

I also utilize the columns of compressed air passing from discharge-pipes 24 for the purpose of assisting in steering the locomotive either horizontally or on an incline downwardly. For this purpose I provide a lateral rudder 45, which is carried by a shaft or rudder-post 46, journaled in the keel-plate projecting from the floor of the car 1 and in the cross-bar 8. From the lower part of shaft or post 46 extends inwardly a toothed segment or curved rack 47, with which a pinion 48 meshes. The pinion 48 is carried by a shaft 49, journaled in bearings 50, carried by the floor of the car 1, and provided with a wheel 51, by which means the lateral rudder can be operated. While this rudder may steer the locomotive by acting against the free air, it is placed in such position as to encounter the column of air rushing rearwardly from either of the pipes 24, by which means the rudder acts more readily in steering. Furthermore, I do not depend upon momentum to enable me to steer the locomotive, as the air rushing from one pipe 24 acts against rudder 45 as a direct means for steering or turning the locomotive, while at the same time air rushing from the other pipe 24 acts to propel the device. In fact, with this arrangement if the locomotive is balanced in mid-air it can be then readily steered by turning the rudder so that it will encounter the discharging air. This gives me great control of the locomotive. This rudder therefore may steer the locomotive horizontally.

In order to allow the locomotive to descend on an incline, I provide a swinging or rocking plate or horizontal rudder which is automatically balanced and is pivoted to the sides 4 of the car 1, as at 53, in such position that it lies above the open ends of the pipes 24 and can be swung down or partially over said ends to receive the impact of the escaping air.

54 is a rod extending inwardly from the plate or rudder 52 and has its end weighted and bent downwardly at 55 to rest upon a skeleton eccentric or cam 56, carried by a tube or sleeve 57, mounted on the shaft 49. The outer end of rod 54 is forked at 54^a and is secured to the plate or rudder 52, as shown in Fig. 1, whereby strength with lightness are provided. The tube 57 has a handle 58 by which the eccentric 56 can be operated to raise and lower the rod 54 to cause the plate or rudder 52 to close more or less over the ends of the pipes 24. The handle 58 is bent so as to bear upon projections 50^a on a standard 50, by which said handle can be held in the desired position. The shaft 49 has a pointer 49^a to indicate the direction of the lateral rudder 45. Pointer 49^a may be arranged to secure and hold the pilot-shaft 49 at any point desired to relieve the wheelman for a reasonable time when he so desires. With these arrangements if it is desired to descend at any time on a gradual incline the plate or rudder 52 can be moved downwardly in line with the ends of pipes 24 to receive the thrust of the escaping air, which will cause the locomotive to tilt downwardly at its forward end. According to the degree of inclination of the plate or rudder 52 with relation to the end 55 of rod 54 the locomotive can be caused to descend on more or less of an incline, as desired. The plate or rudder 52 at its outer edge is cut away at 52^a to enable it to fall down without interfering with the lateral rudder 45 and the rudder-post 46.

59 is a compass secured to the floor of the car 1, near the wheel 51, to assist in navigating it.

The devices I have shown for drawing or sucking the air into casing 20 and for driving it therefrom through the pipes 24 and 26 are as follows: 60 is a vertical shaft that is located in the casing 20 and is journaled at its upper and lower ends in suitable bearings. The ends of this shaft project from the top and bottom of said casing and through the bottom of car 1, and it may be rotated by any suitable means, such as an engine or motor. (Not shown, but carried within the car 1 under the control of the navigator.) The shaft 60, at about the central portion within the casing 20, carries a series of fans or blades 61, which are so arranged as to draw air into the casing through pipes 21 and 22. These fans or blades 61 are shown secured to horizontal rods 62, secured to shaft 60, the fans or blades being attached to said rods by any suitable means and arranged at the proper incline or angle relatively to shaft 60. The rods 62 project beyond the outer ends or edges of the fans or blades 61 and enter an annular channel or groove 63 in the outer wall of the casing 20. The channel or groove 63 may be formed by suitably bending the walls of the casing 20 or by inserting metal rings 63^a, as shown in Fig.

6. The projecting ends 62^a of rods 62 do not normally engage the walls of the groove or channel 63, but are free therein and arranged to engage the wall of the groove to assure the stability of the rods and blades against excessive air-pressure up or down. The outer ends of the fans or blades 61 are curved to follow the curve of the wall of the casing 20. As feed-air is delivered equally on opposite sides of the lower half of the casing 20 by the feed-pipe 21 and distributing-plate 27, (from the broad feed-pipe 22 by the plate 27,) the fan-blades are enabled also to draw the feed-air equally to all parts of the lower compartments into the casing and force it to the upper compartment 20^b. While the fans 61 serve to force some air out through the incasements 24^b and pipes 24, other air-compressing fans 64 are carried by the shaft 60 within the compartment 20^b of casing 20. These fans 64 are placed edgewise vertically, so as to present a flat surface to the air, and they act to compress the air in the compartments 20^b into a strong steady whirlwind that is forced into the incasements and equally discharged from the side pipes or rear end pipes and to force it under pressure through the incasements 24^b and pipes 24.

As shown in Fig. 7, the fan-blades 64 extend outwardly from the shaft 60 and are then bent backwardly at 64^a, whereby they extend tangentially to the shaft, so as to force the air into the incasements 24^b and pipes 24 and 26.

The construction above described affords a simple, yet compact and effective, structure for sucking or drawing in air and for compressing and forcing it under pressure from the casing and incasements, and all by the rotation of a single shaft. By this arrangement also the air is forced in through pipe 22 and is discharged from pipes 24. In this manner the locomotive is forced forward. This also helps to sustain the car while in forward motion, as the air, like a cable, is continually being firmly forced through it, and the rotation of the fan 65 helps to sustain the locomotive at all times.

To assist the locomotive in ascending, I provide the lower projecting end of shaft 60, below the bottom of floor 3, with a suitable fan 65, so arranged that when rotated it will create an upward pressure on shaft 60, thus reducing the friction of shaft 60 on plate 69, the upward pressure being delivered on the bottom plate 68 and the fan-shaft 60. This fan 65 helps also to support the car; but this fan does not in any particular retard the former movement of the locomotive, but, on the contrary, assists such movement to some extent. This fan 65 is preferably removable from shaft 60, and for this purpose the shaft is provided with a shoulder 66, against which the fan rests, a suitable nut 67 on shaft 60 serving to hold the fan in position.

The mechanical and operative parts of the locomotive are so distributed throughout that the structure will be evenly balanced both laterally and longitudinally, so that when suspended in the air the locomotive will remain level under normal conditions. It will also be understood that all of the parts are mostly hollow and all will be made of the lightest metals and materials possible consistent with strength and that aluminium will be used, by preference, where possible.

One of the principal features of my invention consists in a combination that consolidates the reservoir and the motive appliances of propulsion directly together, which enables me to thoroughly control the gas-reservoir in a firm and reliable manner against free-air resistance, and especially against drag resistance, by locating the driving and maneuvering power where it is most needed to exert its full effect on the reservoir in forcing it through the air. The driving and maneuvering power developed is one or more steady firm columns of compressed air that are delivered with great rapidity devoid of all regressive oscillating movements of propulsion and noise. The method that I have developed for propulsion is the continuous rapidity of the discharge of compressed air that is readily controlled by the lever-handle of the motor or by the valve-operator. The peculiar formations of the structure and the manner of propulsion and steering are vastly superior to any free-air current that comes in contact with it, and it is this fact that prevents loss or waste of energy in the entire construction upon which I base my claim that it overcomes obstacles to practical air navigation.

Both rudders can be worked together or separately, as may be desired by the operator. These rudders do not depend in any manner upon the conditions of the surrounding free atmosphere, neither is it necessary to have any momentum in maneuvering or holding the car to any point of the compass, as the compressed air is forced from the pipes on each side of the lateral rudder and the rudder can enter the discharged air from either pipe.

The forward operator controls the three switch-valve handles that open and close all the valves, and the pointers that indicate which pipes are open or closed can be seen from any part of the car. A signal-bell connection is also provided between the wheel-operator and the valve-operator. The car is broad, as can be readily seen by the drawings, but its weight is principally confined in a central line, taking up less than one-third of the entire space between the sides of the car. This gives the proper range of ballast for the side branches of short pipes. Being hollow and light, the ballast is central where it is needed.

Having now described my invention, what I claim is—

1. The combination of a car and a gas-reservoir secured thereto, with an air compressor

or blower carried by said car, a feed-pipe leading from the bow of said car along its bottom to the lower chamber of said compressor or blower, incasements at the top of said compressor and discharge-pipes 24 leading therefrom to the stern of said car, discharge-pipes 26 extending outwardly from the discharge-pipes 24, and having their outer ends curved downwardly at 26^a, with discharge-valves 31 adapted to close the discharge-pipes 26 while opening the discharge-pipes 24, and vice versa, and means for operating said valves, substantially as described.

2. The combination of a car and a gas-reservoir secured thereto with an air compressor or blower carried by said car, a feed-pipe leading from the bow of said car along its bottom to the lower part of said compressor or blower, incasements at the top of said compressor and discharge-pipes 24 leading therefrom to the stern of said car, discharge-pipes 26 extending outwardly from the discharge-pipes 24 and having their outer ends curved downwardly at 26^a, with discharge-valves 31 adapted to close the discharge-pipes 26 while opening the discharge-pipes 24, and vice versa, and means for operating said valves, and feed-pipes 21 extending along the bottom of the car and connected with the lower part of said compressor or blower on opposite sides thereof, the upper ends of feed-pipes 21 extending upwardly, and valves 30 adapted to open and close pipes 26, the feed-valves 30 being connected with the discharge-valves 31 all arranged for joint operation, substantially as set forth.

3. The combination of a car and a reservoir secured thereto with a compressor or blower carried by said car, a feed-pipe 22 leading along the bottom of the car to the lower part or chamber of said compressor and opening at the bow of said car, a feed-valve 28 in said pipe to open and close the same, a handle 29 for operating said valve, feed-pipes 21 lying along the bottom of said car and extending from opposite sides thereof to the lower part of said compressor or blower, incasements at the top of said compressor or blower, discharge-pipes 24 leading therefrom to the stern of the car, discharge-pipes 26 extending downwardly from the discharge-pipes 24 to the sides of the car and having their ends turned downwardly at 26^a, discharge-valves 31 adapted to open discharge-pipes 26 and close pipes 24 simultaneously, and vice versa, feed-valves 30 to open and close feed-pipes 21, arms 35 connected with the shafts or pivots of valves 31, rods 36 connected with said arms, crank-shafts 38 connected with said rods, a standard to support said shafts, handles or levers to rock said shafts, arms 33 connected with the shafts or pivots of discharge-valves 31, and rods 34 connecting the arms 33 with the feed-valves 30 all arranged for joint operation, substantially as set forth.

4. The combination of a car and a reservoir secured thereto with a compressor or blower carried by said car, a pipe 22 leading along the bottom of the car to the lower part of said compressor and opening at the bow of said car, a feed-valve 28 in said pipe to open and close the same, a handle 29 for operating said valve, feed-pipes 21 lying along the bottom of said car and extending from opposite sides thereof to the lower part of said compressor or blower, incasements at the top of said compressor or blower, discharge-pipes 24 leading therefrom to the stern of the car, discharge-pipes 26 extending downwardly from the discharge-pipes 24 to the sides of the car and having their ends turned downwardly at 26^a, discharge-valves 31 adapted to open discharge-pipes 26 and feed-valves 30 simultaneously, and vice versa, valves 30 to open and close feed-pipes 21, arms 35 connected with the shafts or pivots of discharge-valves 31, rods 36 connected with said arms, crank-shafts 38 connected with said rods, a standard to support said shafts, handles or levers to rock said shafts, arms 33 connected with the shafts or pivots of discharge-valves 31, and rods 34 connecting the arms 33 with the feed-valves 30, and indicators 44 connected with the discharge-valves 31 and feed-valve 30 to show the positions they may be in, all arranged for joint operation, substantially as set forth.

5. The combination of a car or reservoir carried thereby with a compressor or blower carried by said car and consisting of a casing 20 having a lower compartment 20^a and an upper compartment 20^b and intermediate compartments, with a vertical shaft in said casing, fans or blades 61 carried by said shaft for sucking in air, blades 64 carried by said shaft in the compartment 20^b, a pipe 22 leading from the bow of the car to the compartment 20^a, an air-distributing blade 27 at the inner end of feed-pipe 22 and located in lower compartment 20^b extending part way across the latter and feed-pipes 21 leading from the sides of the car to the lower compartment 20^b and having their outer ends extending upwardly, and incasements at the top and sides of said compressor or blower, discharge-pipes 24 extending therefrom to the stern of the car, discharge-pipes 26 extending from discharge-pipes 24 to the sides of the car and having their outer ends extending downwardly at 26^a, discharge-valves 31 in the discharge-pipes 24 adapted to open the latter while closing the discharge-pipes 26, and vice versa, feed-valves 30 to open and close the feed-pipes 21, said valves 30 and discharge-valves 31 being connected together in pairs to operate simultaneously and means for operating said pairs of valves, as and for the purposes specified.

6. The combination of a car and a reservoir carried thereby with a compressor or blower carried by said car, an air-inlet for said compressor leading from the bow of said car, inlets leading from said compressor to the sides of said car and discharge-pipes leading from

the top of said compressor to the sides and also to the stern of said car, a shaft in said compressor for carrying fans or blades, and a detachable fan 65 carried by said shaft below the bottom of said car, and valves in said pipes for regulating the inlet and discharge of air, substantially as described.

7. The combination of a car and a reservoir carried thereby with a compressor or blower carried by said car, means for admitting air to said compressor, pipes leading from said compressor to the stern of said car, and a horizontal plate or rudder located near the ends of said pipes and adapted to be moved into an inclined position over said ends of said pipes to receive a discharge of air therefrom, an arm extending from said plate or rudder and a cam or eccentric to raise said arm to operate said plate or rudder, a shaft having a tube for carrying said cam or eccentric and means for oscillating or rotating said shaft and for holding it in any desired position as and for the purposes specified.

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Witnesses:
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