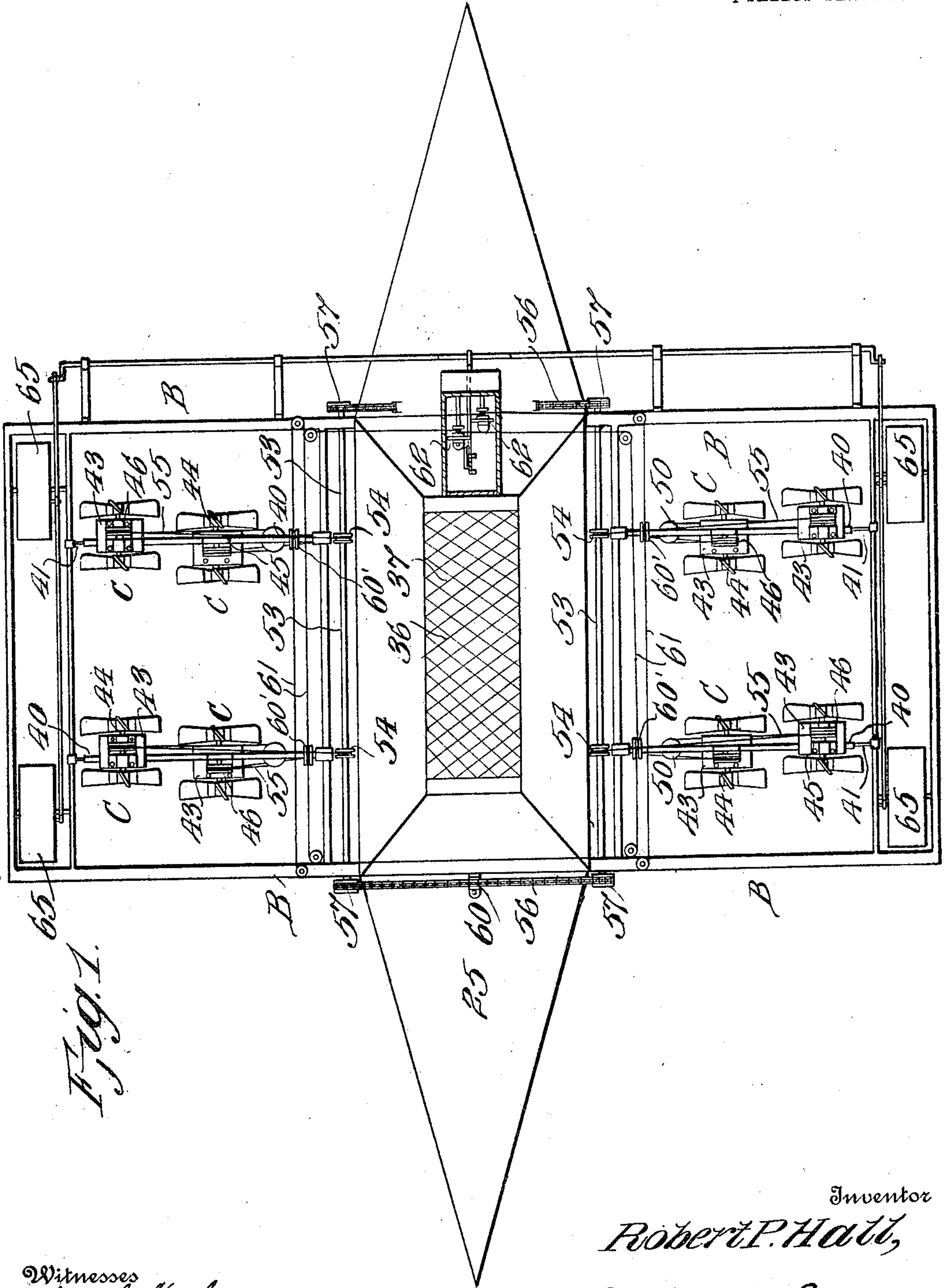


993,297.

Patented May 23, 1911.
4 SHEETS—SHEET 1.



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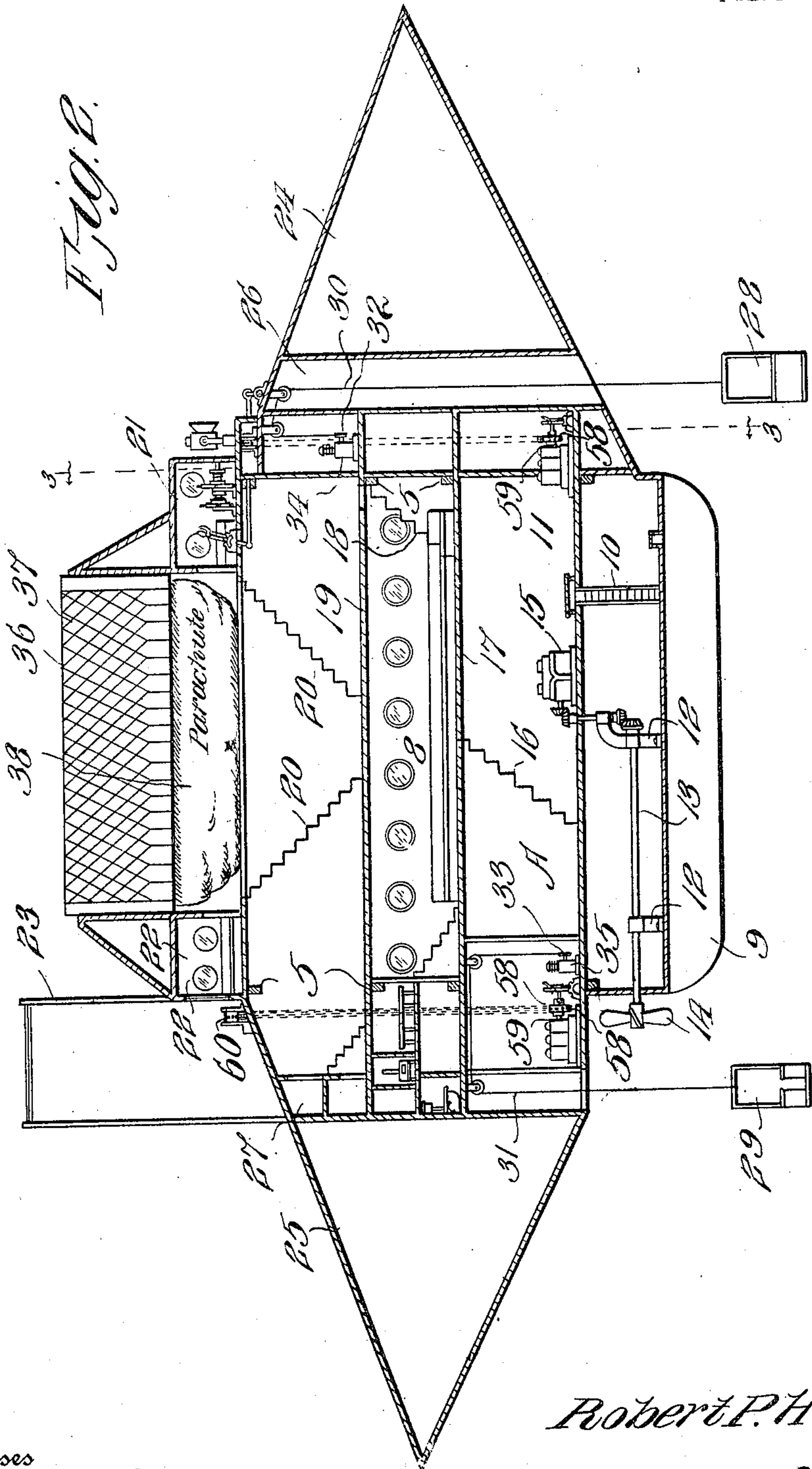
AIRSHIP.

APPLICATION FILED APR. 9, 1910.

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4 SHEETS—SHEET 2.

993,297.



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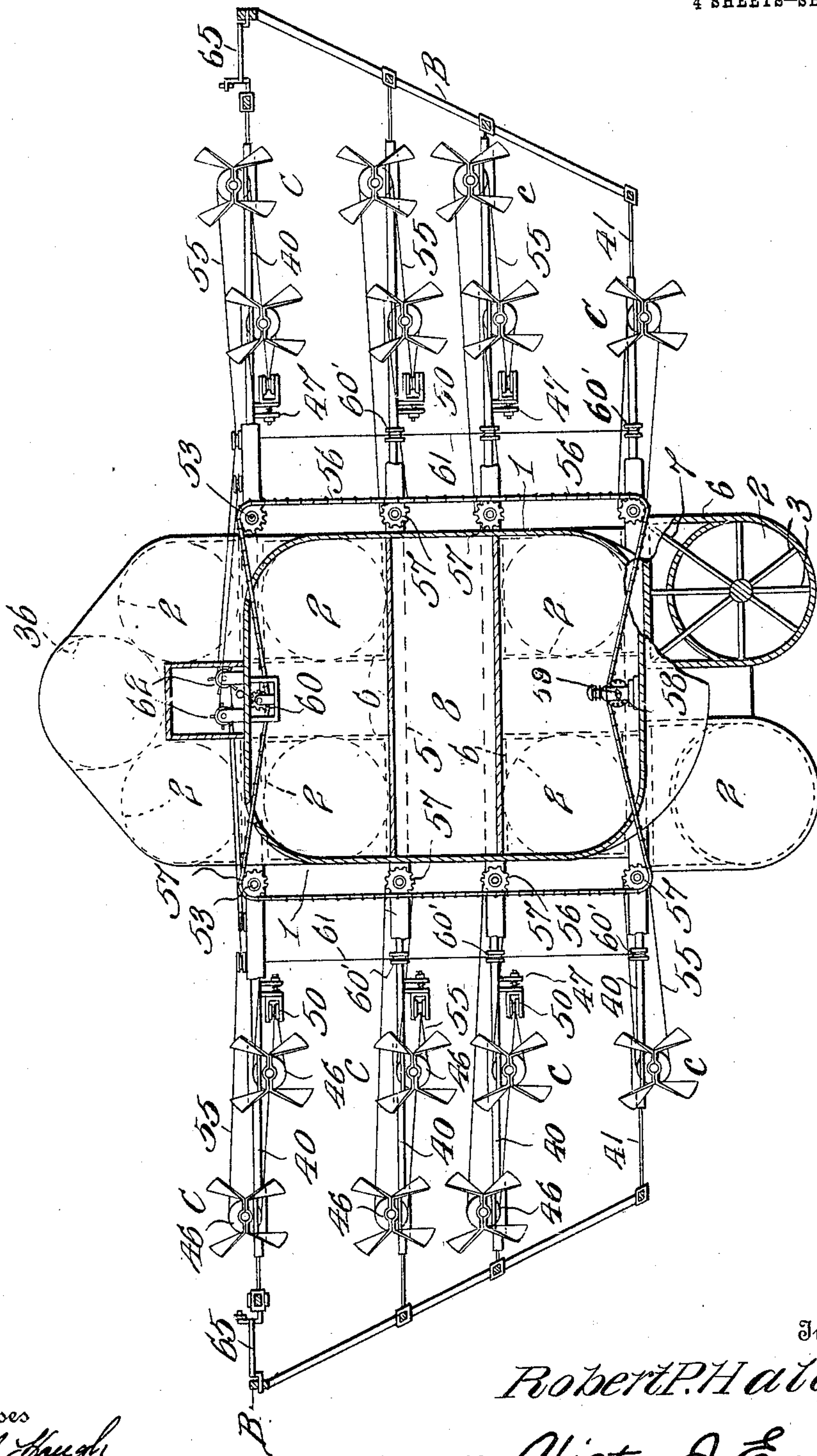
AIRSHIP.

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4 SHEETS-SHEET 3.

993,297.



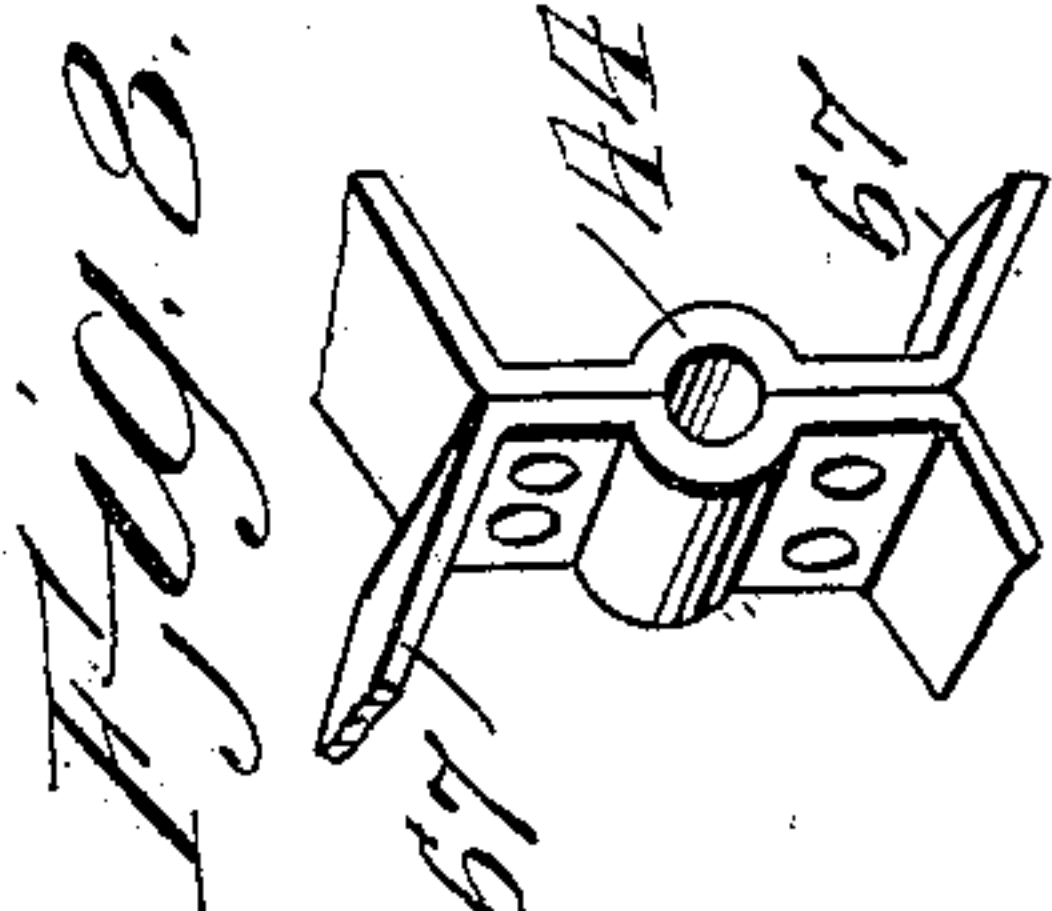
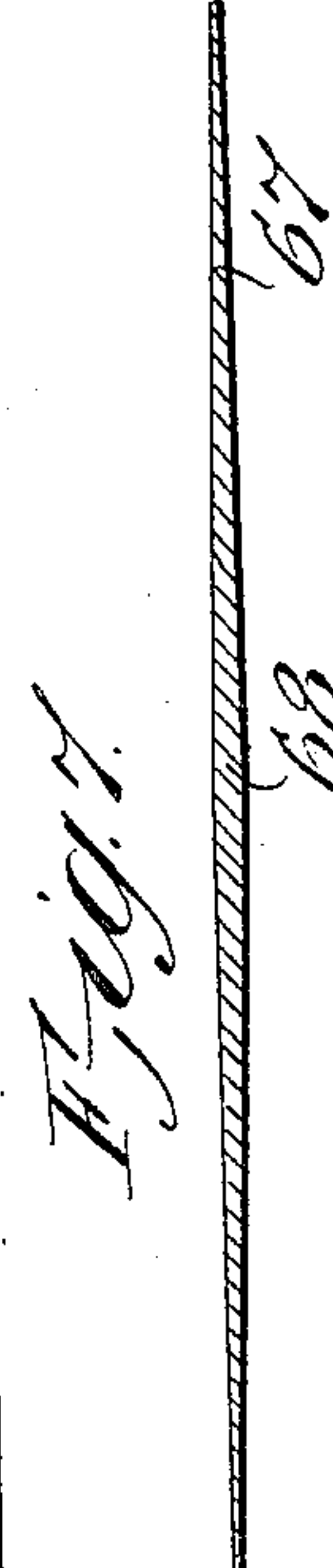
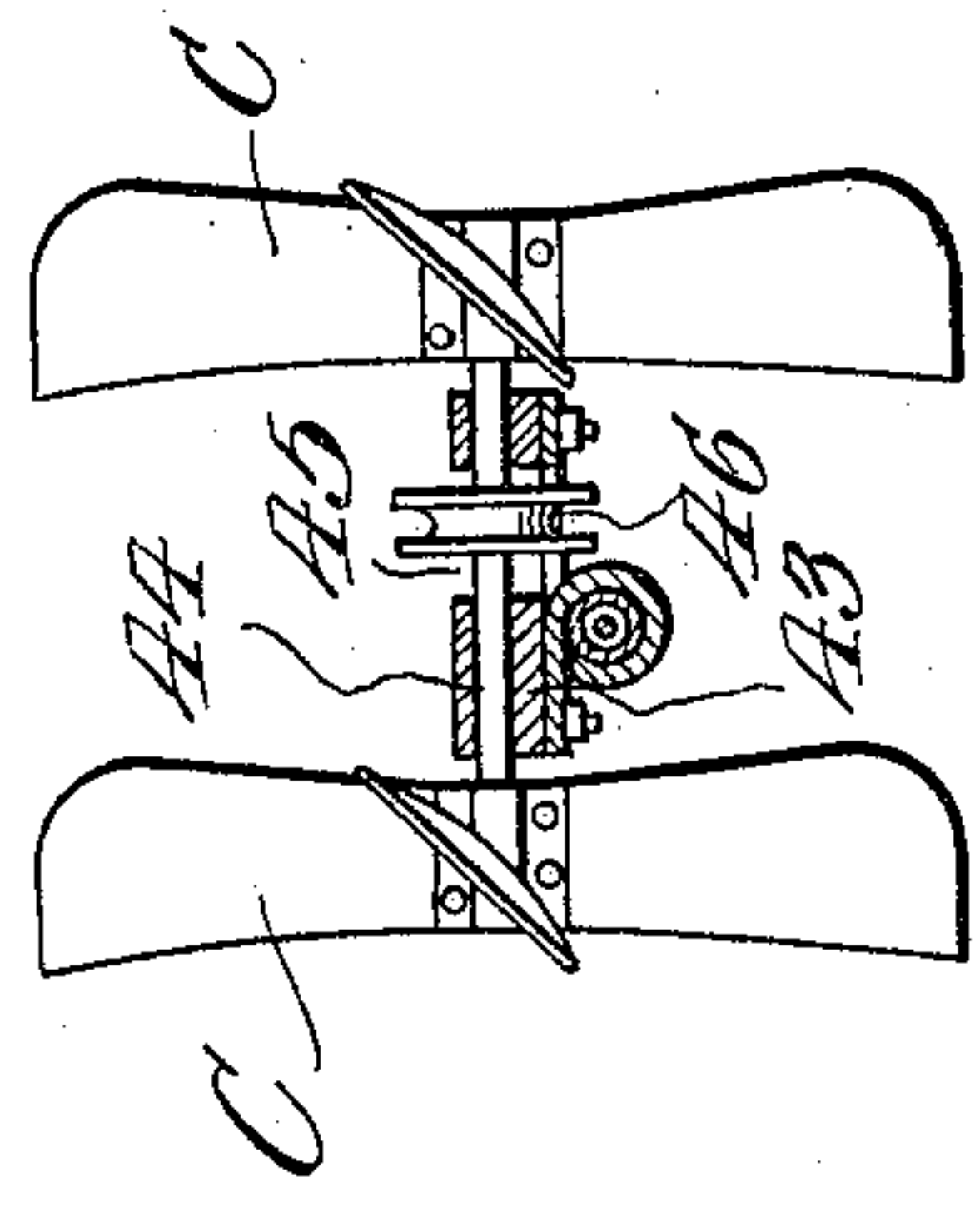
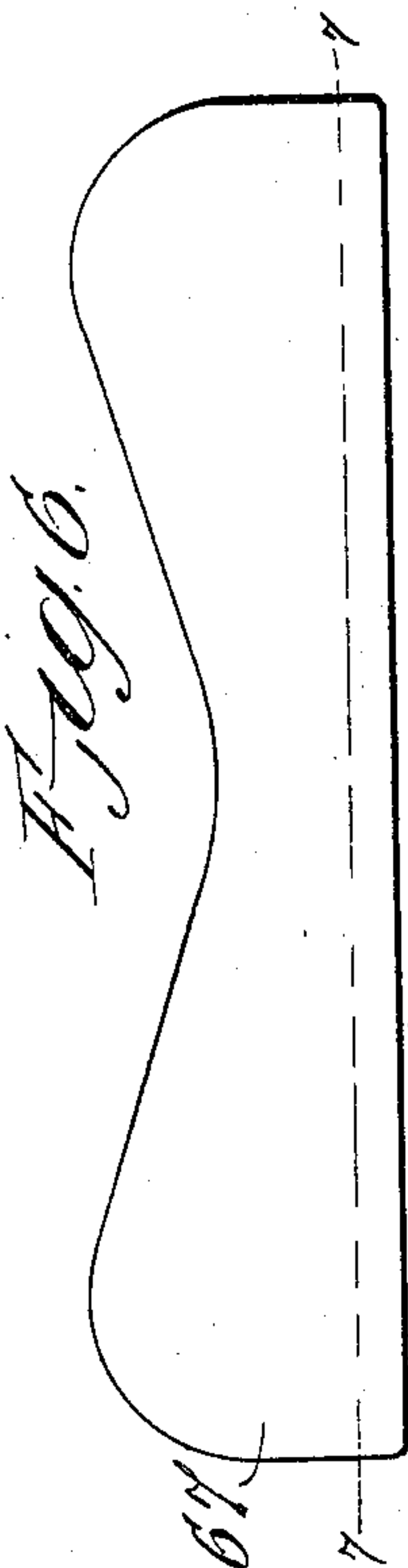
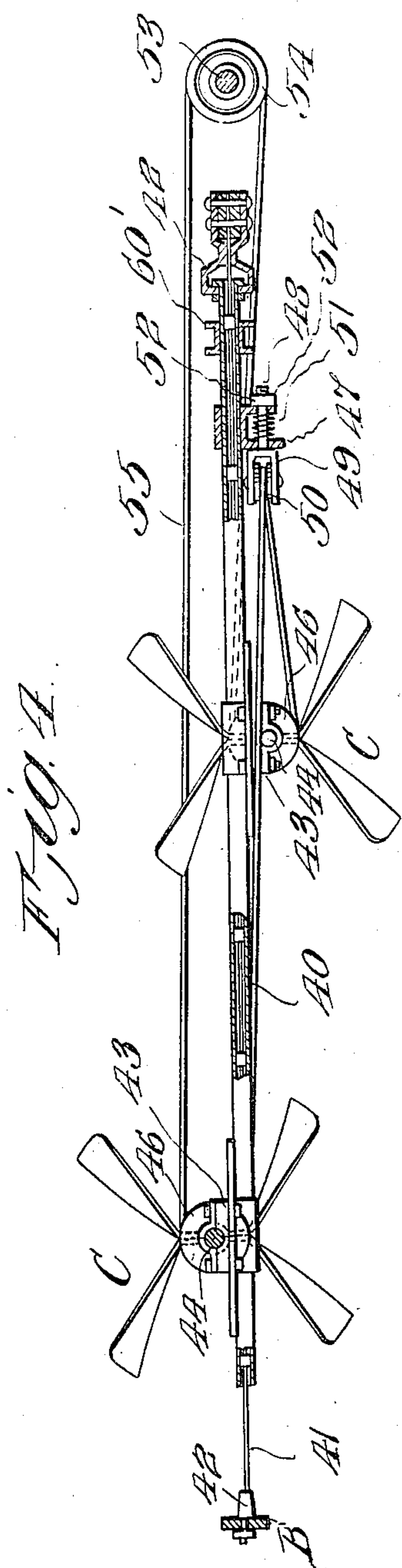
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4 SHEETS—SHEET 4.

993,297.



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UNITED STATES PATENT OFFICE.

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AIRSHIP.

993,297.

Specification of Letters Patent.

Patented May 23, 1911.

Application filed April 9, 1910. Serial No. 554,389.

To all whom it may concern:

Be it known that I, ROBERT P. HALL, a citizen of the United States of America, residing at Searchlight, in the county of Clark and State of Nevada, have invented new and useful Improvements in Airships, of which the following is a specification.

This invention relates to air ships, and the invention in its broad sense is applicable to machines that are either lighter or heavier than air.

For the purpose of illustration I have chosen to show the invention as applied to an air ship equipped with gas tanks to assist in ascending, but mechanical propulsion means are also provided to assist in rising and in directing the course of flight.

The invention has for its objects to provide an air ship of a construction whereby it will be adapted to passenger traffic, the construction and arrangement of parts being such as to provide the necessary accommodations for this purpose.

A further object of the invention is to provide simple and improved propulsion means consisting of propellers driven by mechanical motive power and adapted for adjustment to guide the machine in its flight upward, laterally or at an angle to the horizontal, as may be desired.

A further object of the invention is to construct an air ship which shall be particularly adapted to alight upon the water and which, when necessary, shall be capable of being navigated upon the water.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the invention may be resorted to when desired.

In the drawings,—Figure 1 is a top plan view of an air ship constructed in accordance with the invention. Fig. 2 is a sectional side elevation of the same. Fig. 3 is a sectional elevation taken on the line 3—3 in Fig. 2. Fig. 4 is a detail view of a set of

propellers and the supporting and adjusting means for the same. Fig. 5 is a detail view, showing a pair of propellers in connection with the supporting means for the same. Fig. 6 is a plan view of one of the plates from which the propellers are constructed. Fig. 7 is a sectional view taken on the line 7—7 in Fig. 6. Fig. 8 is a perspective detail view of a portion of one of the propellers.

In the construction of the improved air ship, a suitable frame structure is provided in the making of which metal such as steel and aluminum, wood and other materials may be employed, said frame structure, which is generally designated by 1, being adapted to support a series of gas tanks 2, 2 which are preferably of cylindrical shape; said tanks being disposed in pairs, and said pairs being arranged in vertical series, as will be clearly seen in Fig. 3. These cylindrical gas tanks are internally reinforced, as indicated in Fig. 3, by spokes 3 radiating from a hub 4 and connected by longitudinal brace bars 5, whereby the tanks are strongly braced against collapse from any cause. For further security some of the gas tanks are inclosed within casings 6, and others, especially the bottom ones and the pair arranged nearest the top are provided with internally braced rectangular extensions 7. The entire series of gas tanks are strongly secured together by means of the frame structure, the tanks in each pair being suitably spaced apart so as to leave room for certain purposes to be hereinafter set forth. Midway of the series, the tanks are also separated by a horizontal space, indicated at 8, said space being specially provided for the purpose of affording ample passage accommodation.

The lowermost tanks 2 are preferably beveled adjacent to their ends, as shown at 9 in Fig. 2, so as to present the appearance of twin boat hulls which, if the machine should descend upon the water, will serve to float the structure and permit the same to be navigated. The space intermediate the bottom tanks 2 which is accessible by means of a stairway 10 from the floor 11 above is equipped with bearings 12 wherein a shaft 13 carrying a propulsion screw 14 is located, said shaft being capable of being driven from a motor 15 upon the floor 11, which is arranged intermediate the second series of tanks from the bottom. A stairway 16 leads

from the floor 11 to the main deck where accommodations are provided for passengers, separate compartments being provided to serve as staterooms, lavatories, dining room and the like. The space A intermediate the floor 11 and the main deck may be regarded as the engine room, where the motors for the propulsion of the craft are disposed. From the main deck 17 a stairway 18 leads to the upper deck 19, and stairways 20 lead from the latter to the observatory 21 and to the room 22 of the wireless operator, the wireless apparatus being shown at 23.

Wedge-shaped or tapering auxiliary gas containers 24 and 25 extend forwardly and rearwardly from the frame structure of the device, the said containers being illustrated as being provided with tubular wells 26 and 27 through which elevator cars 28 and 29 may be lowered or raised, as may be required, for the purpose of taking on or discharging passengers, provisions, fuel or the like. These elevator cars are provided with hoisting ropes 30, 31, each being operated by a windlass 32, 33 driven by a suitable motor 34, 35.

An auxiliary gas tank 36, which is supported upon the uppermost gas tanks 2 where it is anchored in such a manner as to be readily detached or cast off, is equipped with a netting 37 serving to support a parachute of large dimensions, said parachute, which is shown at 38, being suitably folded and accommodated in the space between the two uppermost gas tanks, as will be best seen in Fig. 2. In the event of accident to the craft causing it to descend with more than desirable rapidity, the gas tank 36 may be cast loose, and it will ascend, carrying with it the parachute which will quickly become expanded or unfolded, the guy ropes of said parachute being connected with the frame structure of the machine, the descent of which will thus be checked.

Extending laterally from the sides of the main frame structure are frames B, of rectangular shape, said frames being for the support of the propellers, any desired number of which may be employed. The frames may be supported in parallel relation to each side of the main frame structure, and any suitable bracing or reinforcement may be resorted to to sustain them in the desired position for operation. The propellers and the individual supporting means for the propellers being identical throughout, the description of one set of propellers will apply to all.

Each set of propellers includes a tubular shaft 40, as best illustrated in Figs. 4 and 5 of the drawing, said shaft being supported for rotation upon a wire cable 41 stretched between the inner and outer members of one of the frames B, the supporting cable 41 be-

ing connected at one end with a turn buckle 42 to enable the said cable to be placed under proper tension. Securely connected with the tubular shaft 40 are bearing plates or boxes 43, two such bearing members being supported or secured upon diametrically opposite sides of the tubular shaft 40 and affording a bearing for a transverse shaft 44 carrying a pair of propellers C which are oppositely disposed with reference to the tubular shaft. The plates or bearing members 43 are provided with slots 45 for the accommodation of grooved pulleys 46 one of which is mounted upon each shaft 44. The tubular shaft 40 is provided with a bracket member 47 where- in slides a bolt 48 having a terminal fork 49 in which a grooved pulley 50 is supported for rotation, said bolt being actuated by a spring 51 which is coiled between the bracket 47 and the nut 52 to force the pulley-carrying bolt away from the propeller-carrying shafts 44. The main frame structure of the machine carries counter shafts 53 equipped with pulleys 54, one of which is disposed in alinement with each of the tubular shafts 40, transmission bands, belts, chains or other flexible members 55 being guided over the pulleys 54, 46 and 50 passing from the pulley 54 over the pulley 46 of the distant propeller-carrying shaft 44, thence over the tension pulley 50, thence over the pulley 46 of the near propeller-carrying shaft 44 and back to the pulley 54, from which motion will thus be transmitted to both propeller-carrying shafts at diametrically opposite sides of the tubular supporting shaft 40. The flexible transmission member 55 will be kept under proper tension by the spring 51 actuating the bolt which carries the pulley 50, and the tension may be regulated by means of the nut 52.

It will be obvious that when all of the shafts 53 carrying the pulleys 54 are actuated, motion will be simultaneously transmitted to all of the propeller-carrying shafts. For the purpose of transmitting such motion, an endless chain 56 has been provided, the same being guided over sprocket wheels 57 upon the respective shafts 53 and over a sprocket wheel 58 upon a motor-driven shaft 59. Idlers or tighteners, one of which has been shown at 60, may also be employed, wherever desirable or necessary.

In Fig. 3 of the drawings, several propellers have been shown arranged in vertical planes so that the rotation of said propellers will serve to drive the vessel forwardly or rearwardly, according to the direction of rotation. It is obvious that if the tubular shafts 40 be rotated about their axes to tilt the propeller-carrying shafts 44 and the propellers, the propulsion will be in an inclined plane until the propeller shafts 44 assume a vertical position, when the movement will be either upward or downward, ac-

cording to the direction of rotation in which
 the propellers are presented. For the purpose
 of thus adjusting the propellers, each of the
 tubular shafts 40 is equipped with a pulley
 5 60', and a flexible member 61 is passed se-
 rially around the several pulleys 60', being
 wound once upon each of said pulleys, said
 flexible endless member 61 being connected
 with a windlass 62, by actuating which si-
 10 multaneous adjustment of the entire series of
 tubular shafts may be effected. It will be
 understood, however, that each of the frames
 B may be made to sustain two or more of
 the tubular shafts having propeller-carry-
 15 ing shafts connected therewith, in which
 event a separate steering gear as well as a
 separate driving gear will be provided for
 each series of tubular shafts that are ar-
 ranged approximately in the same vertical
 20 plane.

From the foregoing description, taken in
 connection with the drawings hereto an-
 nexed, the operation and advantages of this
 invention will be readily understood. It
 25 will be seen that I have designed an aerial
 craft which will be sustained in flight partly
 by the buoyancy of the gas contained in the
 tanks and partly by the motor-driven pro-
 pellers, which latter are capable of being
 30 adjusted for the purpose of governing the
 flight upwardly, downwardly or laterally,
 as may be desired. Rudder members or
 plates may be provided, as shown at 65, for
 the purpose of facilitating the turning of
 35 the machine, and for the adjustment of said
 rudder plates suitable means, such as crank
 shafts, may be provided. It is obvious that
 no limitation is made to the precise arrange-
 ment of parts herein set forth or to the pre-
 40 cise interior arrangement of the hull which
 may be subdivided into compartments on
 different plans from the one herein de-
 scribed. It is also desired to be understood
 that while no limitation is made with refer-
 45 ence to the particular construction of the
 propellers, I prefer to construct each pro-

peller of two blades 67, the form of which
 will be best understood by reference to Figs.
 6 and 7, said blades being composed of
 strips of specially rolled sheet metal, said 50
 sheets being relatively thick at the middle,
 as shown at 68, and tapering toward the
 ends, two such sheets of suitable shape and
 dimensions being riveted, bolted or other-
 wise secured together about a shaft 44, and 55
 the projecting ends of the sheets being bent
 divergently, as clearly seen in Fig. 8, so as
 to form the wings or blades of the propel-
 lers. Under this construction great strength
 is obtained without excessive weight which 60
 is obviously important. The improved
 craft, while primarily intended for aerial
 navigation may with equal efficiency be navi-
 gated upon the water, and it is indeed pre-
 ferred that the descent be made upon a 65
 lake, river or other sheet of water, where in-
 jurious impact of the surface with the frame
 structure of the tanks will be avoided.

Having thus described the invention, what
 is claimed as new, is:— 70

1. In an air ship, a frame structure and a
 plurality of cylindrical gas tanks arranged
 in pairs in vertical series, said tanks being
 spaced apart laterally and the lowermost
 tanks having beveled ends, in combination 75
 with a propeller-carrying shaft supported
 intermediate the lowermost tanks, and driv-
 ing means for said shaft.

2. In an air ship, a frame structure, a
 plurality of gas tanks, said tanks being ar- 80
 ranged in pairs and said pairs of tanks in
 vertical series, the tanks of each pair being
 spaced apart to afford intermediate accom-
 modations, and two pairs of the vertical
 series being likewise spaced apart to afford 85
 accommodation therebetween.

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

ROBERT P. HALL.

Witnesses:

C. F. PERKINS,

B. MACREADY.