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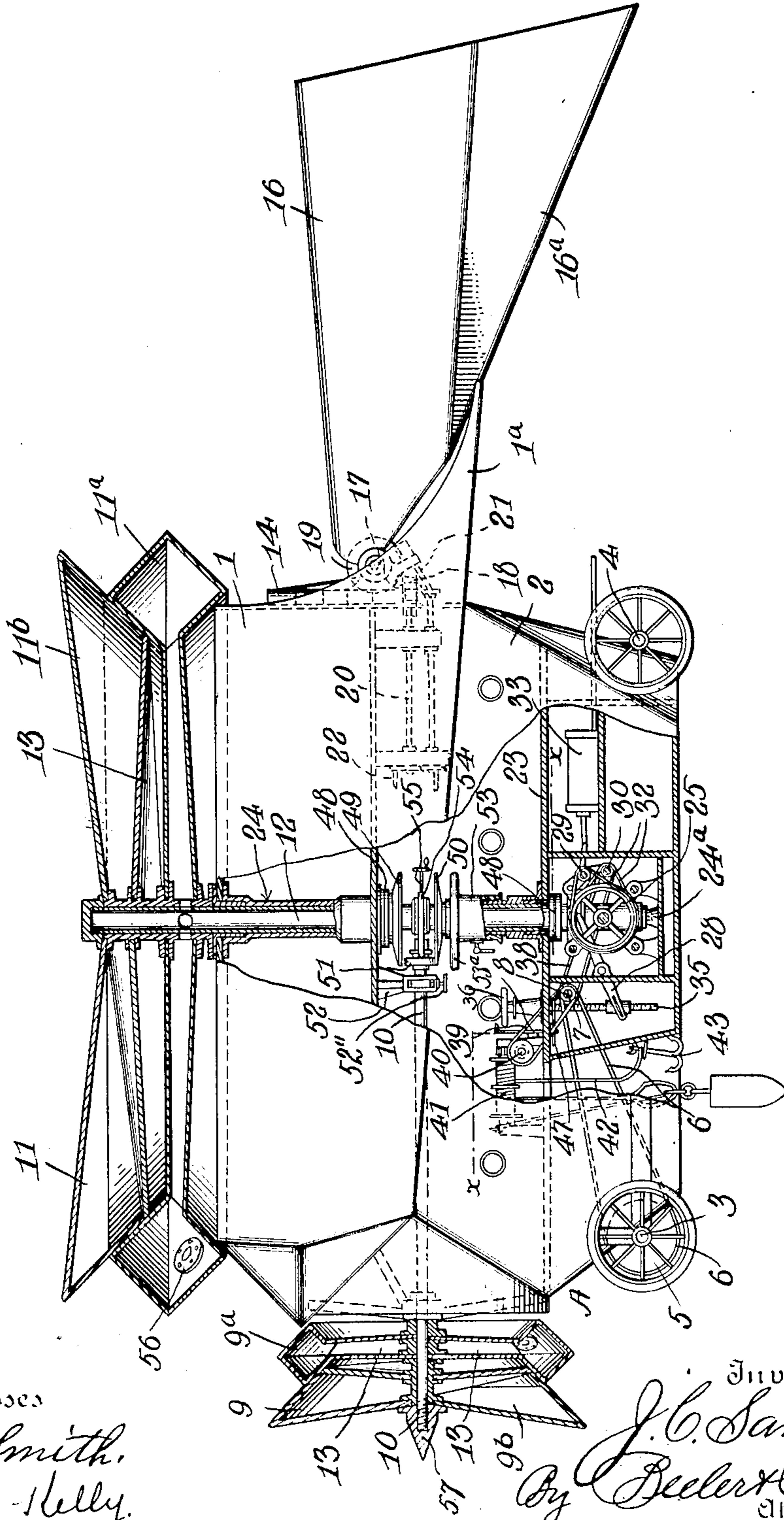
J. CH. SANDRIK.
AIR SHIP.

PATENTED MAY 19, 1908.

APPLICATION FILED NOV. 1, 1907.

5 SHEETS—SHEET 1.

Fig. 1.



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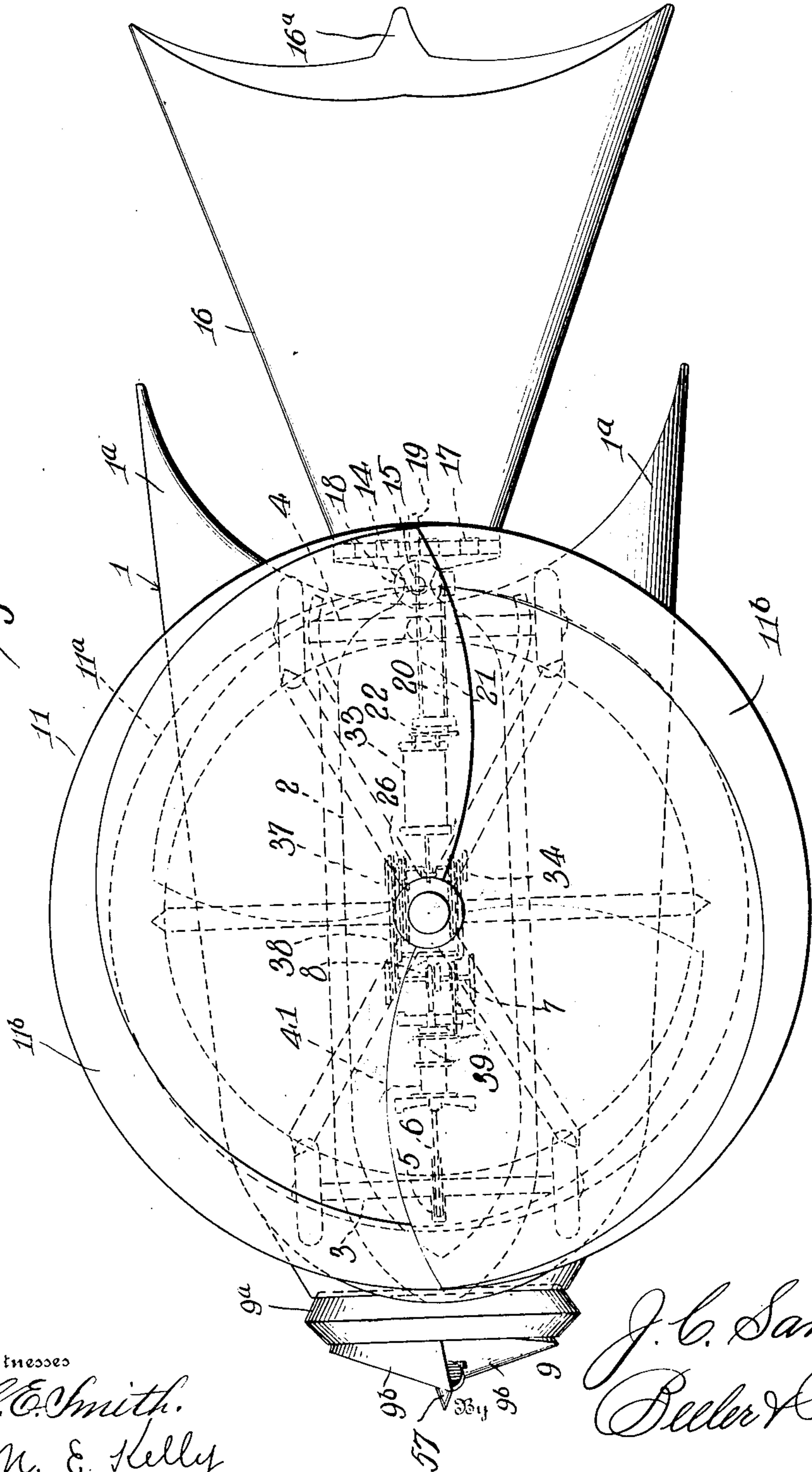
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5 SHEETS—SHEET 2.

Fig. 2.



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Fig. 4

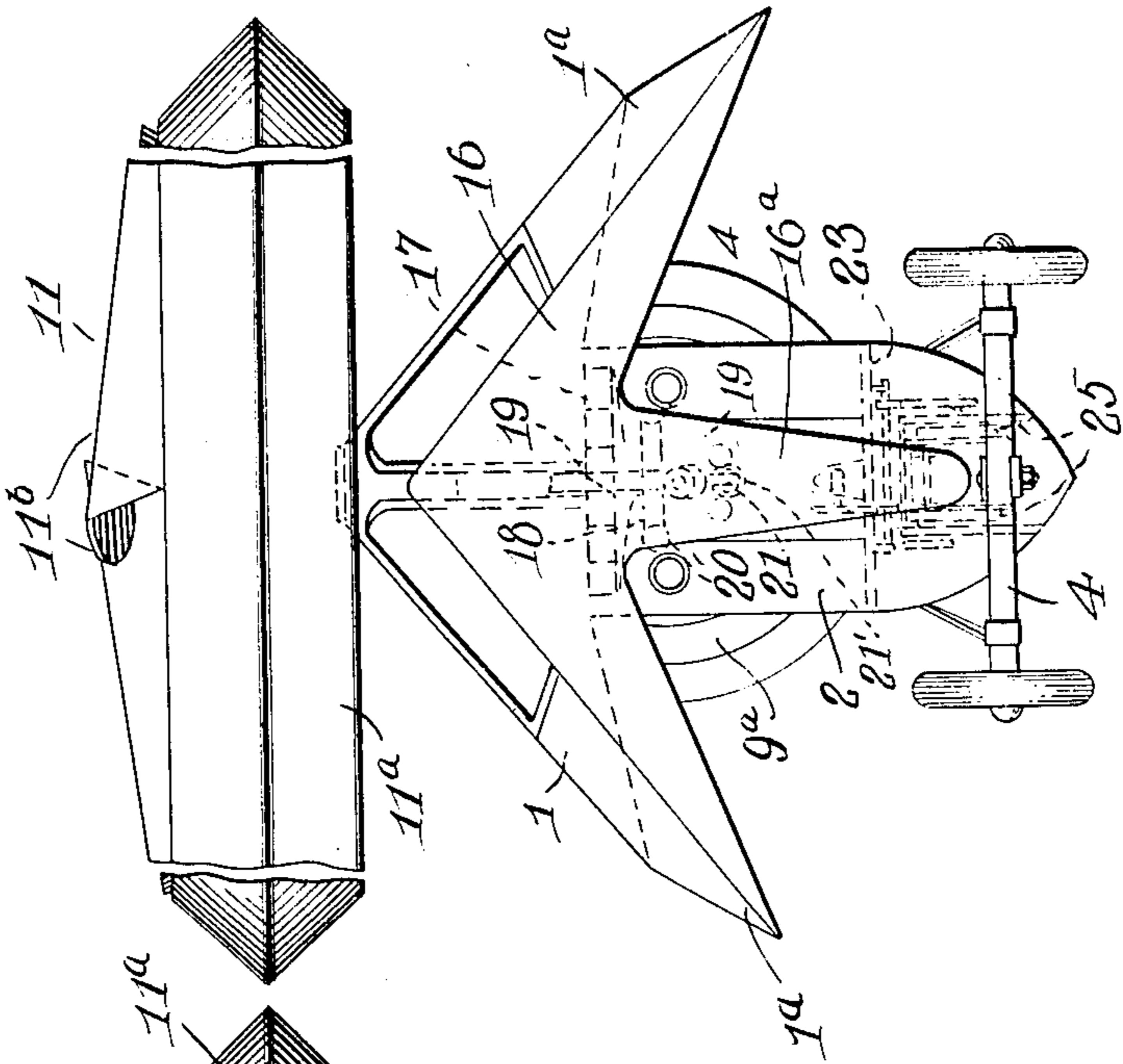
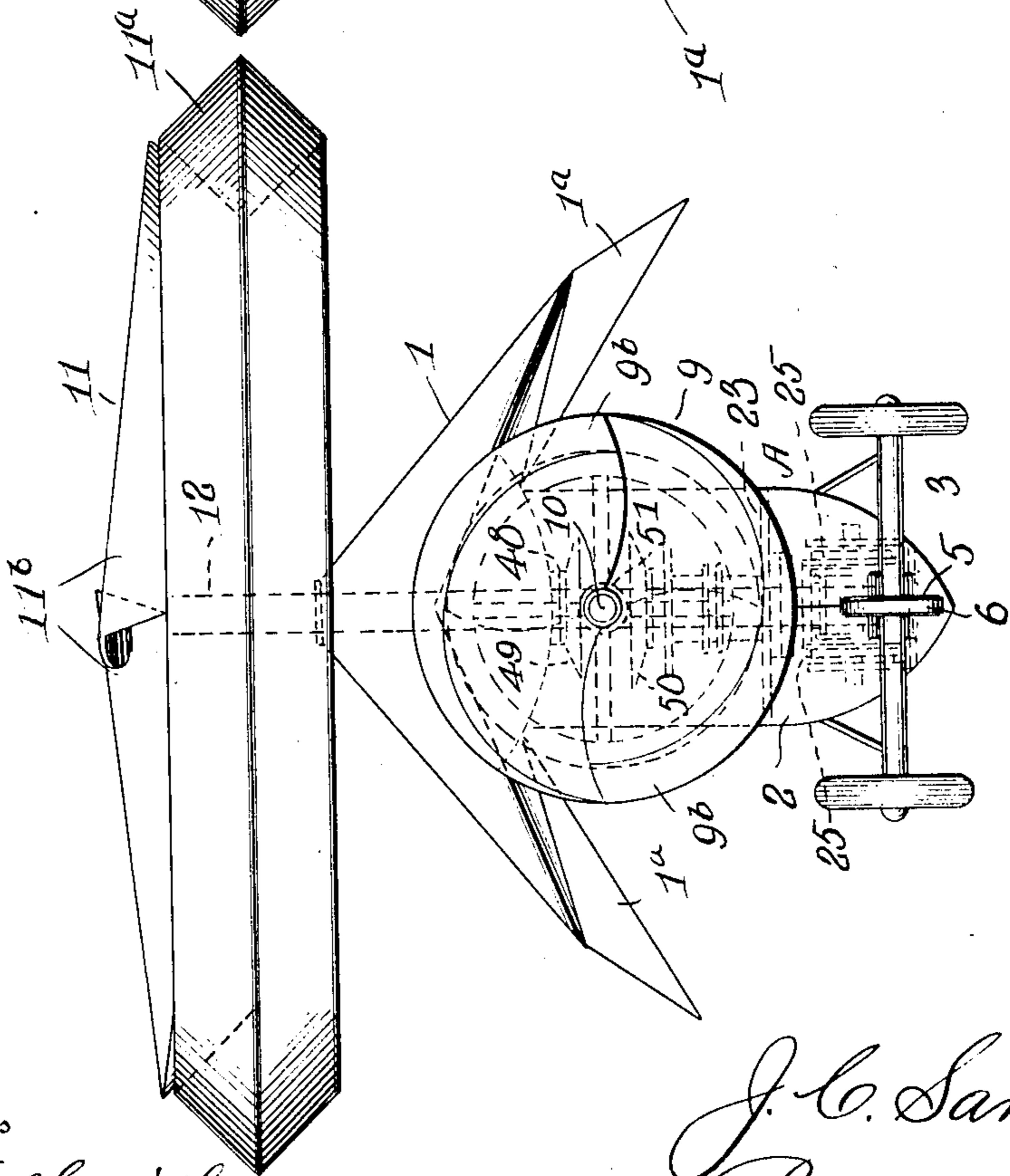


Fig. 3.



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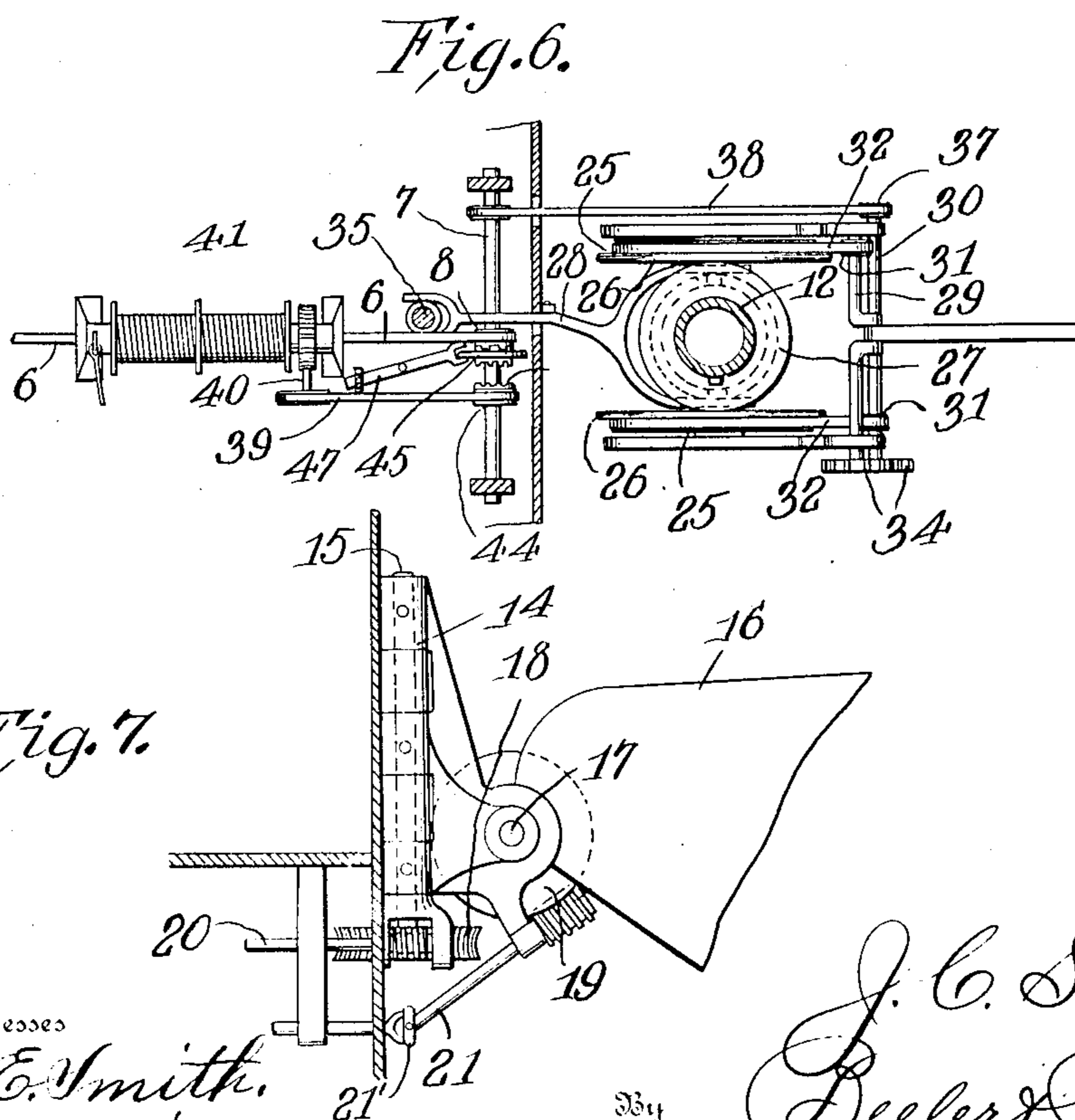
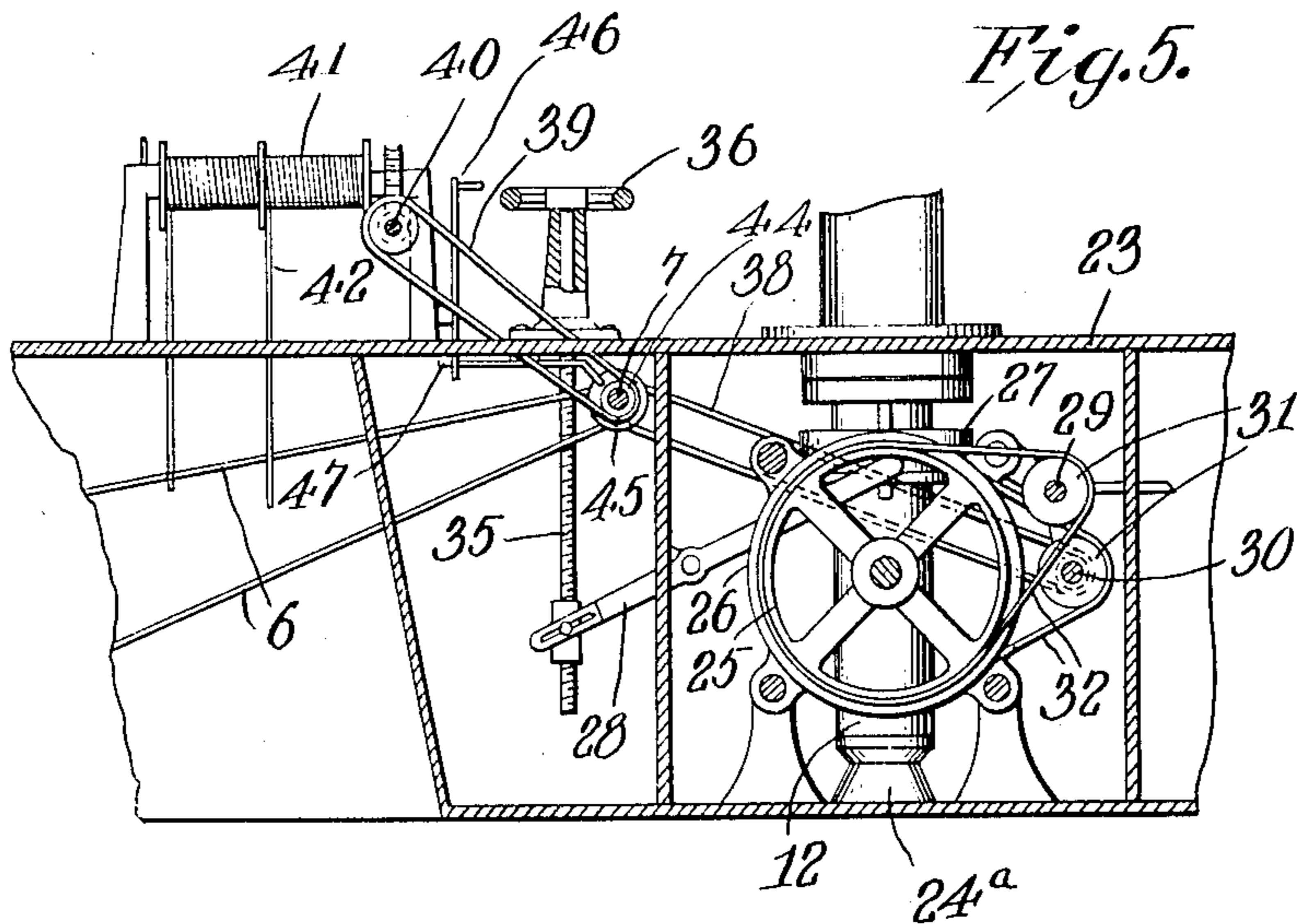
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5 SHEETS—SHEET 4.



Witnesses

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5 SHEETS—SHEET 5.

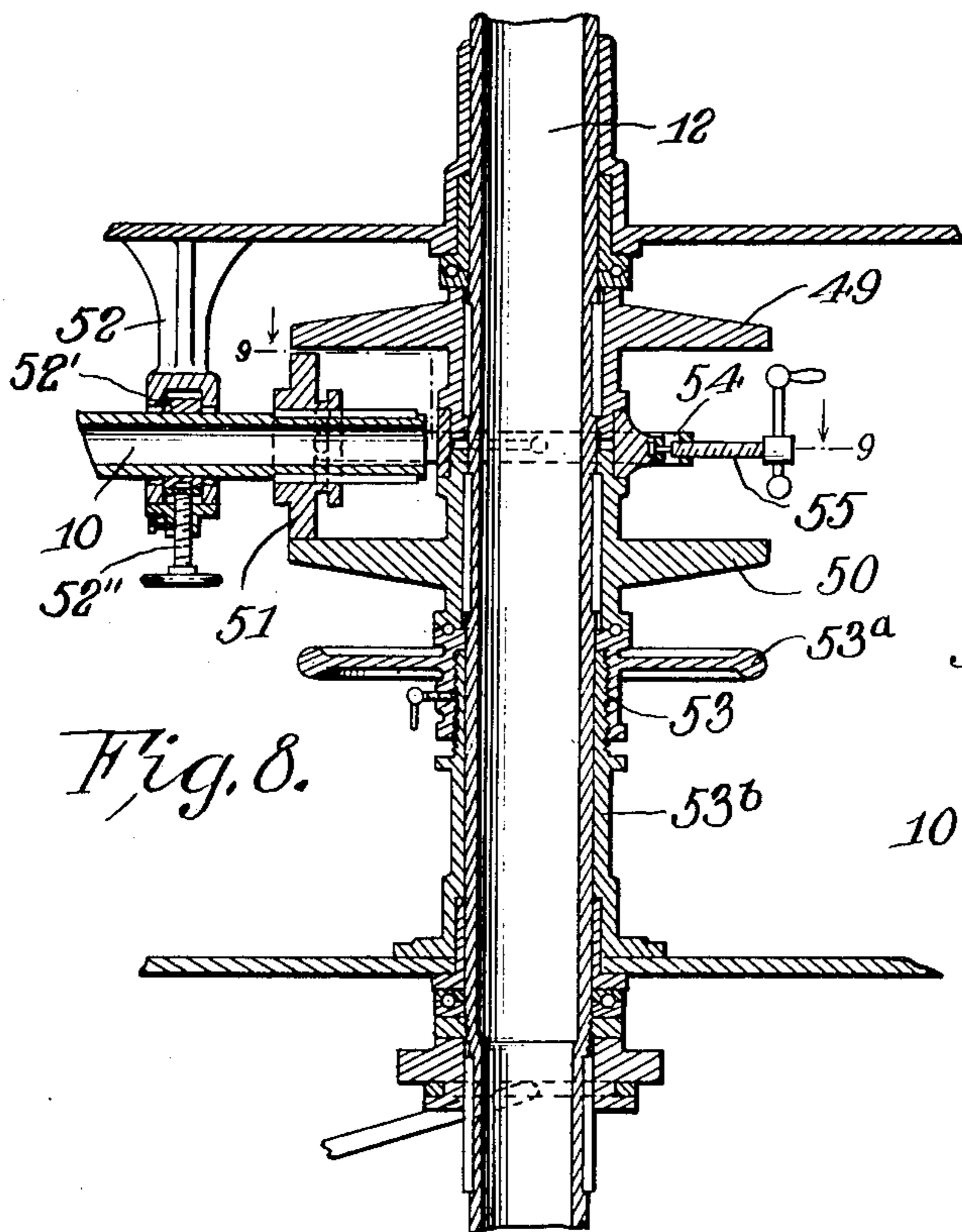


Fig. 8.

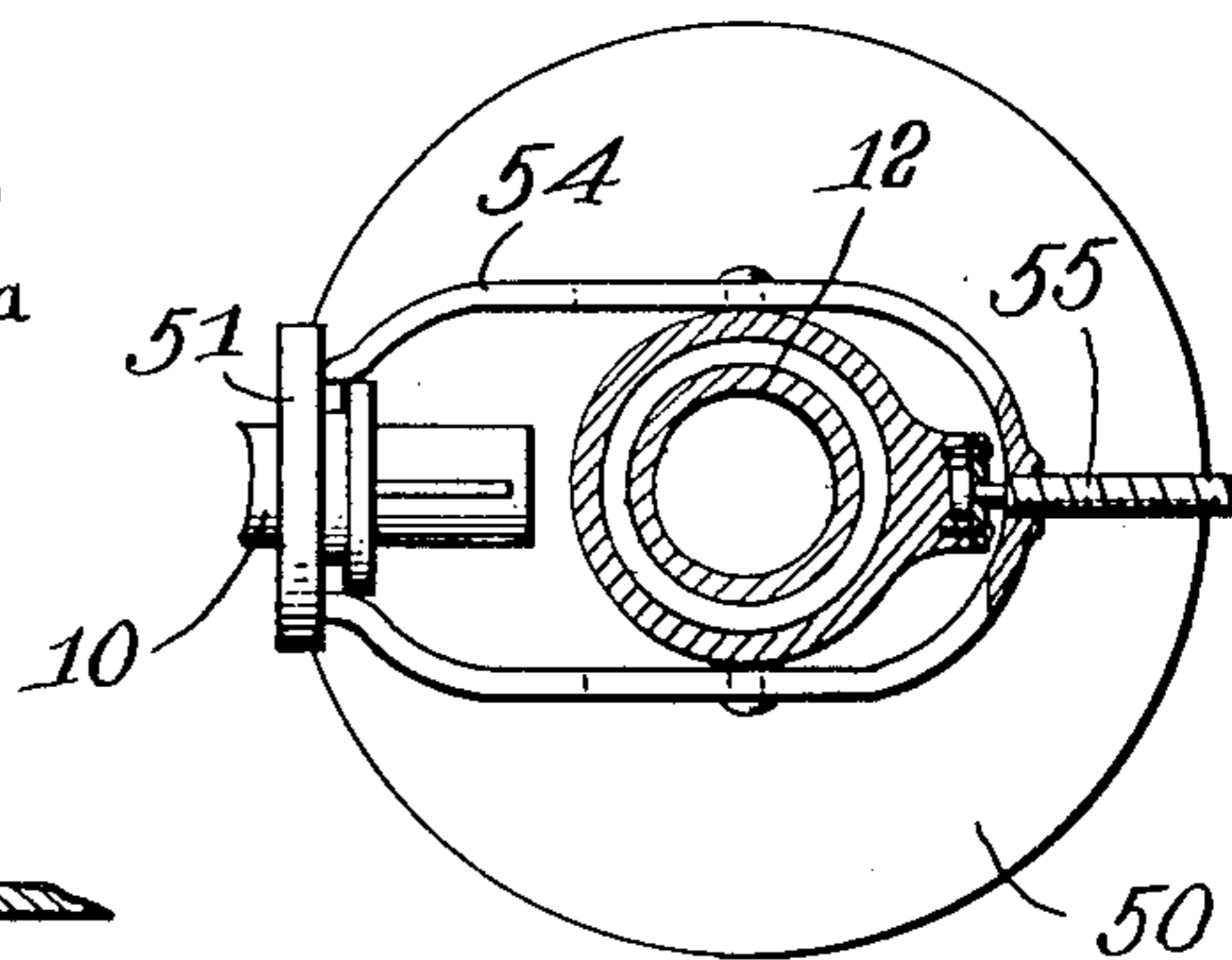


Fig. 9.

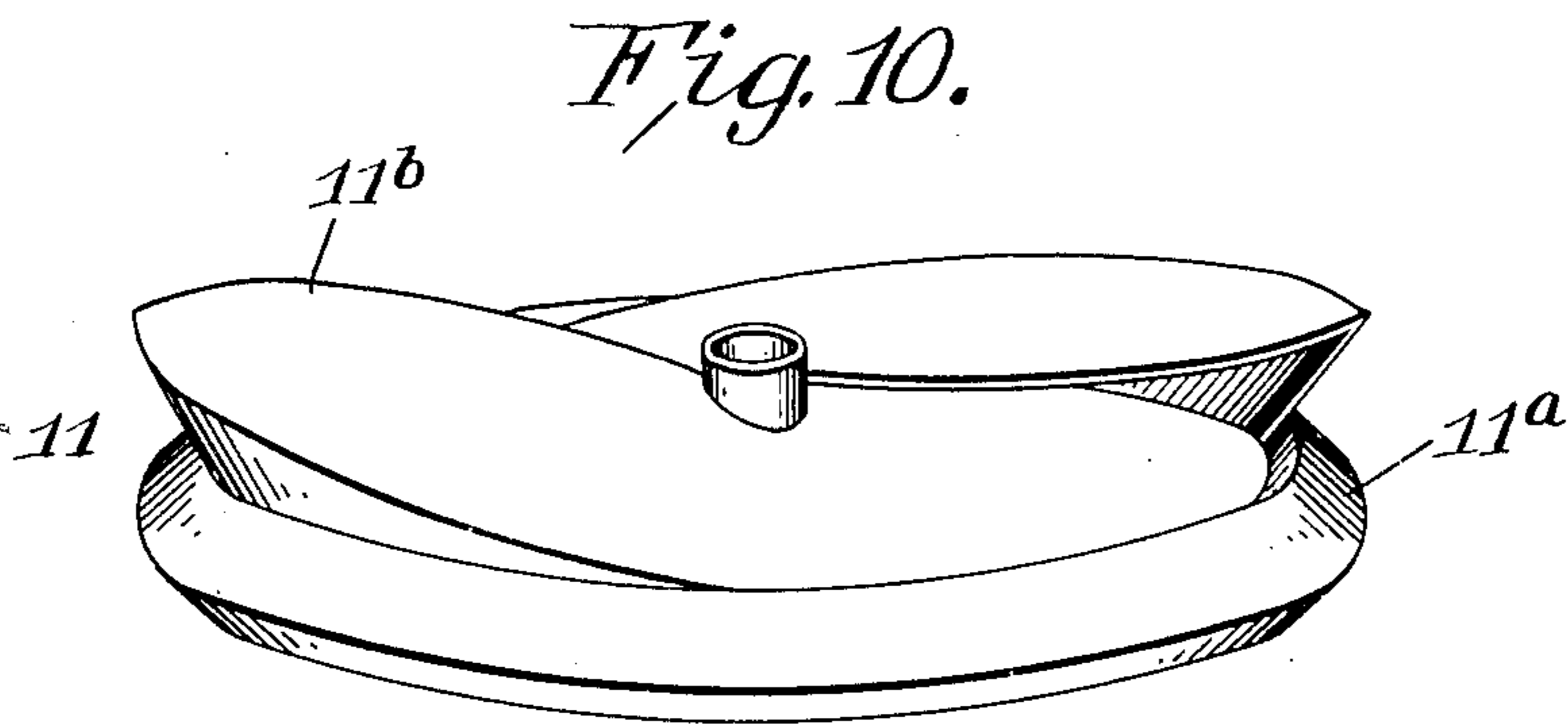


Fig. 10.

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UNITED STATES PATENT OFFICE.

JULIUS CH. SANDRIK, OF SOUTH BETHLEHEM, PENNSYLVANIA.

AIR-SHIP.

No. 888,267.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed November 1, 1907. Serial No. 400,231.

To all whom it may concern:

Be it known that I, JULIUS CH. SANDRIK, a subject of the King of Hungary, residing at South Bethlehem, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in Air-Ships, of which the following is a specification.

This invention relates to aerial navigation and consists of an air-ship of the dirigible type, embodying many desirable improvements conducive to increasing the practicality of this class of machines.

One of the objects of the invention is to devise an air-ship which is constructed peculiarly in order that it may be useful for commercial as well as military purposes.

Another aim in the practical embodiment of the invention is to provide special mechanism for operating the air-ship, which admits of absolute and perfect control thereof when in the air, including variation in direction of flight at will, decrease or increase in speed according to the desire of the operator, and descent and ascent under the influence of suitable operating mechanism.

An advantageous feature of the invention resides in the arrangement of the controlling mechanism, whereby a single operator may readily direct the movement of the machine should conditions necessitate, and whereby a single motor carried by the ship is adapted to operate all of the power driven mechanism carried thereby.

The invention resides also in various other details of construction which are described and fully illustrated.

For a full understanding of the construction of the invention and the operation thereof under actual conditions of service, reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a side elevation (partially broken away and in section to show internal structure and mechanism) of an air-ship comprising the invention. Fig. 2 is a top plan view, dotted lines showing arrangement of certain parts within the air-ship. Fig. 3 is a front elevation. Fig. 4 is a rear elevation. Fig. 5 is an enlarged elevation of part of the operating mechanism. Fig. 6 is a horizontal section on the line $x-x$ of Fig. 1 looking downwardly. Fig. 7 is a detail view of the means for actuating the rudder. Fig. 8 is an enlarged vertical section of the driving mechanism. Fig. 9 is a partial

transverse section on the line 9—9 of Fig. 8, and Fig. 10 is a perspective view showing the form of the propellers.

Corresponding and like parts are referred to in all the views of the drawings, and indicated in the description by the same reference characters.

Generally describing the invention, and referring particularly to the drawings, the letter A indicates the body of the air-ship which is composed of an upper rigid balloon section 1 filled with gas, and a lower body portion 2 designed to contain the operator or operators, passengers, and main operating mechanisms employed in actuating and controlling the air craft. The body A is preferably made of light metal, such as aluminum, reinforced when necessary and desirable to secure a rigid and substantial structure. The upper balloon section 1 is of peculiar shape essential to the invention and consists of a central portion from which extend in opposite directions wings 1^a, which incline downwardly and rearwardly, the whole section tapering toward its front end as clearly shown in Fig. 2. The body section 2 is located beneath the section 1, and is of much less width so that wings 1^a projecting oppositely from the section 1 are adapted to be acted upon by the air column beneath the same, and buoyed up thereby, especially in the forward movement of the machine, when the wings 1^a virtually constitute forwardly and upwardly inclined aeroplanes, the advantages of which are obvious.

Mounted upon the section 2 of the body A, in any suitable manner, are axles 3 and 4 having ground wheels upon which the air-ship rests when not in flight, the front axle 3 having an intermediate sprocket 5 connected by a sprocket chain or belt 6 with a motor driven shaft 7, upon which is arranged suitable clutch mechanism to be described hereinafter, and which is adapted to connect the sprocket gear 8 on said shaft 7 for rotation with the shaft, whereby when the machine is supported upon the ground wheels, it may be moved from place to place of its own power, by actuation of the front axle 3 and wheels thereon.

Located at the front end of the ship is the vertical propeller 9, carried by the shaft 10, while in a central position and above the body A is disposed the horizontal lifting propeller 11 mounted upon a main power shaft 12. Both of the propellers 9 and 11 afore-

said are of the same peculiar form embodying a circular chamber 9^a and 11^a, respectively, and a plurality of blades 9^b and 11^b, respectively. The chambers 9^a and 11^a are each
 5 formed by circular plates connected at the inner and outer portions and arranged to form a body of somewhat square form in cross section, providing an annular enlarged space or chamber, as readily apparent. The
 10 chambers 9^a and 11^a are filled with gas and the provision thereof is advantageous in that each propeller is thereby comprised of a buoyant body upon which are arranged the
 15 blades, surrounded partly by the propeller body so as to act upon the air to lift the air ship and propel it forwardly and upwardly. The blades of the propellers are inclined arcu-
 20 ately and form rotatable inclined planes acting in conjunction with the air as above stated. Suitable spokes 13 beneath the blades and secured to the bodies of the pro-
 25 pellers connect the chambers 9^a, 11^a of the latter with the hub portions thereof and thus afford a very substantial structure for each propeller.

With reference to the propulsion means for the air ship, as above described, it will be noted that the blades of the propellers overlap each other, the overlapping portions be-
 30 ing spaced from one another. The air entering the spaces at the inner sides of the blades, during the rotation of the propellers is confined in such spaces by reason of the fact that the outer portions of the blades are formed
 35 with downwardly extending flanges, which in coöperation with the circular body of each propeller close the spaces aforesaid. The confinement of the air in the spaces at the inner sides of the propeller blades compresses
 40 such air to a certain extent, during the passage thereof from the propeller at points beneath the propeller 11, or at the inner side of the propeller 9. The above action with re-
 45 spect to the air increases the effective force of the propeller means materially.

At the rear end of the machine is arranged a movable bracket 14, pivoted for movement about a vertical axis 15, and supporting a rudder 16. The rudder 16 is pivotally connected
 50 at 17 with the bracket 14 and is movable independently with reference thereto about a horizontal axis, as shown in the drawings. To the pivot member 15, forming the axis of the bracket 14, and to the similar member 17,
 55 forming the axis about which the rudder 16 has vertical movement, are secured the worm gears 18 and 19, respectively. Horizontal operating shafts 20 and 21 are mounted in suitable bearings in depending brackets in
 60 the section 2 of the body A, and each one has a worm arranged to coöperate with an adjacent one of the gears 18 and 19, whereby when one of the shafts is turned by the handle 22 applied thereto, the worm gear in en-
 65 gagement with its worm will be actuated, to

cause pivotal movement of the rudder about a vertical or horizontal axis according to which gear is operated. The rudder 16 may by this means be inclined in either direction in a horizontal plane, or similarly adjusted in
 70 a vertical plane. Inclination of the rudder 16 by movement in a horizontal plane will of course cause the air-ship to turn to the right or left, and inclination by movement in a
 75 vertical plane will assist in causing the machine to ascend or descend according to the direction of such inclination. The rudder 16 is of peculiar form comprising a concavo-convex body tapering and inclining upwardly
 80 toward its front end, and provided upon its under concave side with a longitudinal depending fin 16^a which gradually increases in size toward its rear extremity, this conducing
 85 to the effectiveness of the rudder in the action thereof upon the air to direct the flight of the machine when the rudder is adjusted horizontally, and serving to steady the ship when in motion.

The body section 2 of the ship is divided into upper and lower compartments by a
 90 horizontal partition which forms a floor 23. The upper compartment will be used for reception of the operator and passengers. A vertical tubular bearing 24 passes through the upper section 1 above the upper com-
 95 partment of the section 2 of the ship, and in it is journaled the vertical shaft 12 which extends below the floor 23 and has its lower end mounted in a suitable bearing 24^a at the base of the section 2. At opposite sides of the
 100 shaft 12, and below the floor 23, are two belt wheels 25 having integral gears 26, the latter adapted to engage with a clutch gear 27 splined to the shaft 12 and movable vertically into and out of engagement with gears 26 by
 105 means of a shifting lever 28. The wheels 25 are mounted in a suitable framework, in which are also mounted upper and lower transverse shafts 29 and 30 respectively. Each of the shafts 29 and 30 has a small belt
 110 wheel 31 thereon connected by a belt 32 with the large belt wheel 25. The upper shaft 29 has a crank directly connected with the motor 33 and driven thereby, said motor being of any suitable class, preferably of the
 115 explosive type. The shaft 29 is geared to the shaft 30 by gears 34 and drives the shaft 30 in a reverse direction, so that the belt wheels 25 are similarly driven. As aforesaid, the wheels 25 have gears 26 with which the clutch
 120 gear 27 is adapted to engage, the latter being driven in one direction by the wheels 25 and gears 26, and the shaft 12 and propeller 11 being operated thereby. When the lever 28 is operated by the threaded rod 35 having
 125 the handle 36 connected with an end thereof, the gear 27 may be adjusted in engagement with the gears 26 of wheels 25 and the propeller 11 will thus be operated.

On one end of the lower shaft 30 is a belt 12

pulley 37 connected by a belt 38 with the driven shaft 7, which is operated by this means, said driven shaft being connected in the manner before described with the front axle 3 to impart motion to the latter when it is desired to move the machine from one place to another after it has alighted. A short belt 39 is connected with the shaft 7 and with a short shaft 40 arranged near one end of a drum 41, the latter being mounted for rotation in suitable standards secured to the floor 23 of the machine. The shaft 40 is connected by suitable gearing with the drum 41 so that the anchor rope 42 of the anchor 43 may be readily wound upon or unwound from the drum by rotation of the latter. The belt 39 passes about a small belt wheel 44 on the shaft 7 and between said belt wheel 44 and the sprocket gear 8 is arranged a laterally shiftable clutch 45 which may be thrown into coöperation with either the gear 8 or the wheel 44 whereby to actuate the sprocket chain 6 or the belt 39, respectively. The clutch 45 is controlled by a vertically arranged lever 46 pivoted to a support above the floor 23 and having its lower end passing through the floor and connected with a horizontal lever 47 which is directly connected with the clutch element 45, the latter being of any conventional type.

From the foregoing it will be apparent that motion may be imparted to the axle 3, or to the drum 41 from the shaft 7.

It is contemplated that the power shaft 12 which carries the horizontal propeller 11 shall be provided with suitable end thrust bearings 48 located at a suitable point below the floor 23 and below the bottom of the section 1 of the body of the machine.

Not only are the several mechanisms before described, including the horizontal propeller 11, operated by the motor 33 but it is designed also to communicate motion to the horizontal propeller shaft 10 from the shaft 12 so that the propeller 9 is also actuated by the motor in the actual operation of the machine in flight. For the above purpose horizontal friction wheels 49 and 50 are mounted upon the shaft 12 in the upper compartment of the section 2 of the machine, said friction wheels being arranged to coöperate with a horizontally adjustable friction disk 51 upon the inner end portion of the shaft 10 adjacent to a supporting bracket 52 provided with a vertically adjustable bearing 52' for said shaft. The upper friction wheel 49 has a depending sleeve surrounding shaft 12 and both wheels 49 and 50 are rotatable with said shaft, the wheel 49 being rigidly keyed, while wheel 50 is splined to shaft 12 and vertically movable. The wheel 49 is arranged to coöperate with disk 51 normally, the latter being movable vertically into and out of engagement with the wheels 49 and 50 by means of a screw 52'' on bracket 52. A

tubular member 53 is internally threaded and is mounted upon a tubular bearing 53^b for the shaft 12. A handle 53^a for the member 53 is used to turn the same. Movement of the member 52' upwardly will raise the friction disk 51 sufficiently to engage the same with the wheel 49 and in this position the propeller 9 will be rotated in one direction. To stop the propellers 9 and 11 it is only necessary to turn the handle 53^a until the wheel 50 engages the disk 51, whereupon said wheel will act as a brake and accomplish the desired result. Should a reverse movement of the propeller 9 be required the member 52' is lowered by turning screw 52'' until the disk is disengaged from the wheel 49 and placed in engagement with the wheel 50 thus causing the disk 51 and shaft 10, which carries the propeller 9, to move in a reverse direction from that caused by engagement of parts 49 and 51.

By the provision of the means above described the shaft 10 may be operated in reverse directions by proper adjustment of the disk 51. Furthermore the disk 51 is slidable with reference to the frictional faces of the wheels 49 and 50 and may therefore be moved toward and from the central portions of said friction wheels, whereby the speed of the shaft 10 and its propeller 9 may be varied at will to decrease or increase the speed or progress of the machine when in flight. For adjusting the disk 51 horizontally a yoke 54 connected with the disk and a threaded operating member 55 for adjusting the position of the yoke are employed.

In the actual operation of the machine, in starting, the handle 36 is turned so as to operate the shifting lever 28 and cause engagement of the gear 27 with the gears 26 of the belt wheels 25. The main shaft 12 is thereby operated and the lifting propeller 11 will immediately cause the air-ship to ascend. At the same time the operating member 53 may be actuated so as to cause rotation of the vertical propeller 9 and the latter will cause a forward movement of the machine as it ascends, such forward movement assisting in the ascent by reason of the action of the air upon the undersides of the oppositely extending wings 1^a of the upper balloon section 1 of the ship. To facilitate ascension of the ship to the desired elevation the rudder 16 may also be properly adjusted. The operation of the various mechanisms in increasing the speed of the machine when in flight, facilitating descent of the machine, and for actuating the auxiliary internal mechanisms will be clear in view of the foregoing description. It will be obvious that the machine when used for military purposes, can readily contain bombs which may be dropped therefrom, and also any suitable weapons and firearms such as might be necessary for attack upon an enemy.

To increase the buoyancy of the machine, the rudder 16 comprises a hollow body filled with gas. Also, the propeller shafts are of hollow formation and gas is forced into the same from the spokes 13 by any suitable means employed for this purpose.

By the peculiar means employed for connecting the motor with the ground or traction wheels of the front axle 3 it will be apparent that the air-ship may be driven forwardly at considerable speed preliminary to flight thereof and the propellers will be assisted in lifting the machine by the air acting upon the wings 1^a, the undersides of which form aeroplanes as described hereinbefore. Of course after the machine has become elevated from the ground the front wheels on the axle 3 will not assist in propelling the machine forwardly and upwardly, and the rotation of said wheels with the axle aforesaid may be stopped by operation of the lever 46.

As before premised the spokes of the propellers are hollow so that gas forced into the bodies of the same may pass through the spokes to the propeller shafts, thereby increasing the buoyancy of the apparatus to a material extent. A suitable valve 56 is located at a convenient point upon the circular body of each propeller so that a pipe or conduit leading from a gas supply may be readily connected with the propellers in order to fill the same with hydrogen. The valve 56, or its equivalent, is preferably carried by a removable plate which when detached will admit of ready access to the interior of the propellers.

The lower shaft 21 of the rudder operating mechanism is connected with its worm by a universal connection 21', said connection admitting of constant coöperation of the gear 19 and the worm engaging therewith, in whatever positions the rudder may assume in its horizontal adjustment. The above described connection is of special advantage as it enables the operator to move the rudder 16 in vertical and horizontal directions, and in directions resulting from combinations of such movements. It is to be understood however that the several specific mechanisms herein illustrated and described are but suggestive of the broad applicability of the device, and the same may be varied as desired in actual practice so long as the spirit of the invention as defined by the following claims is not departed from.

At 57 I have indicated a removable cap or point. This cap is normally carried as an attachment to the horizontal shaft and is secured thereto by any suitable means adapted for ready detachment thereof. By removing said cap or point from the shaft, in its place may be secured an elongated fork or spear having a forward end adapted to

pierce the balloon or air ship of the enemy in times of war.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:—

1. In an air-ship, the combination of a hoisting propeller, a vertical shaft connected therewith, the shaft 10 and propeller 9, spaced friction wheels rotatable with the vertical shaft, a friction disk arranged to contact with said wheels and mounted on the shaft 10, means for adjusting the shaft 10 to cause said disk to engage either one of the friction wheels to rotate the shaft 10 in a predetermined direction, means for moving the disk across the operating faces of the friction wheels, and means for actuating one of the friction wheels to cause a braking coöperation thereof with respect to the disk.

2. In an air-ship, the combination of a hoisting propeller, a vertical shaft connected therewith, the shaft 10 and propeller 9, spaced friction wheels rotatable with the vertical shaft, a friction disk arranged to contact with said wheels and mounted on the shaft 10, an adjustable bearing for the shaft 10, a member for adjusting the bearing to cause the disk to engage with either one of the friction wheels, means for moving the disk toward and from the axes of the friction wheels, and an operating device connected with one of the friction wheels for moving the same so as to cause both friction wheels to engage the disk to thereby effect braking action relative thereto.

3. Propeller means for air ships consisting of a propeller comprising a circular buoyant body, and inclined blades applied to said propeller upon one side of the buoyant body thereof.

4. Propulsion means for air-ships comprising a propeller consisting of a buoyant body of circular conformation, and blades arranged at one side of and partially in the space surrounded by the body aforesaid, each of said blades being inclined arcuately and upwardly from the propeller body.

5. In combination with an air-ship, steering apparatus therefor including a rudder comprising a concavo-convex body provided with a depending fin extending from its concave side at a substantial right angle to the body.

6. A propeller for air ships comprising a circular gas chamber and spirally inclined blades extending upwardly from the space surrounded by said chamber.

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

JULIUS CH. SANDRIK.

Witnesses:

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