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SELF STABILIZING AIRSHIP

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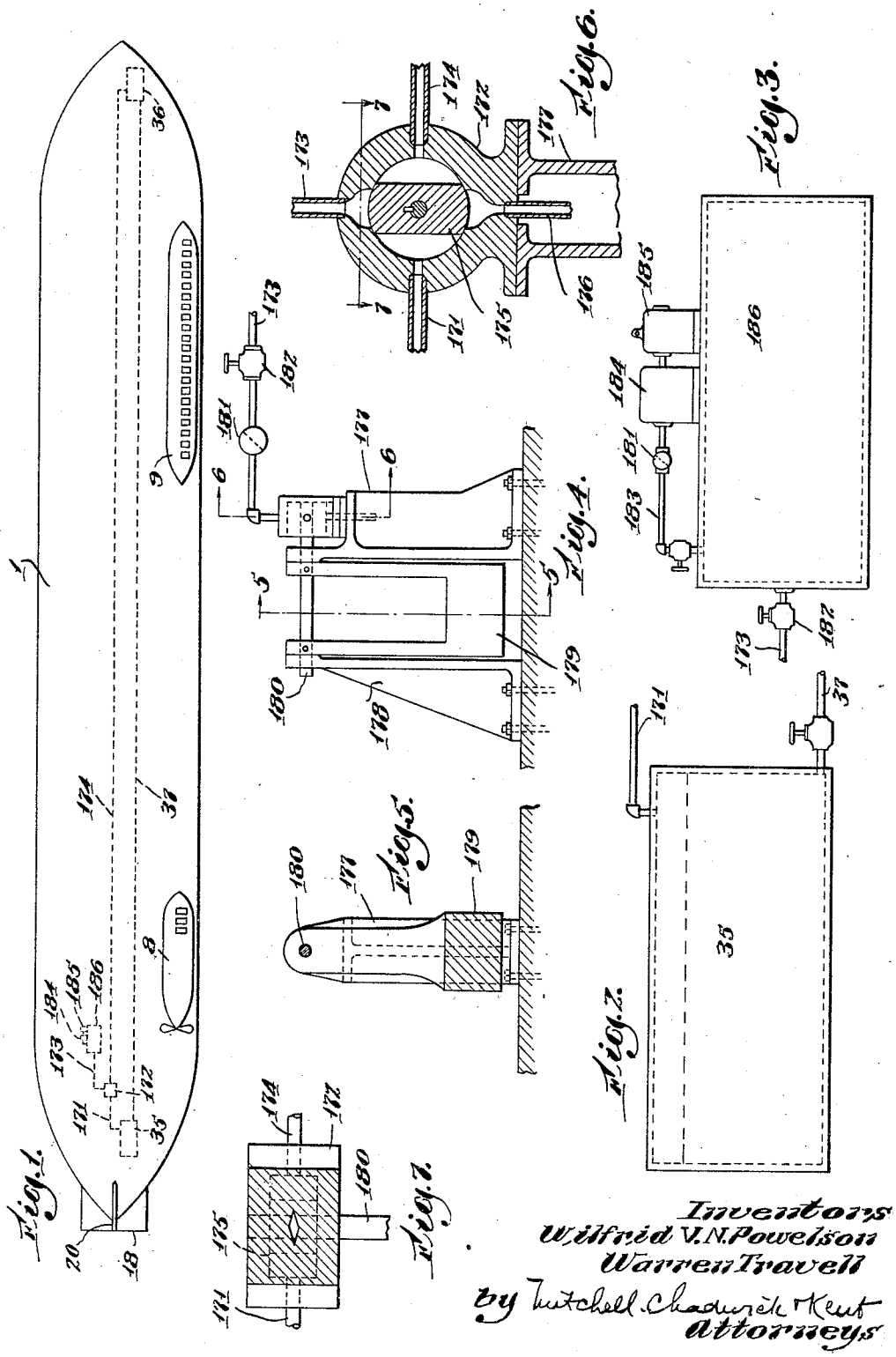

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UNITED STATES PATENT OFFICE

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SELF-STABILIZING AIRSHIP

Original application filed September 6, 1921, Serial No. 498,605. Divided and this application filed March 17, 1931. Serial No. 523,248.

This invention pertains to self-stabilizing airships. More particularly, it pertains to an airship of the lighter-than-air variety in which provision is made for automatic stabilization of the ship in response to deviations from a predetermined normal posture. One feature of the invention comprises stabilization, rapidly and efficiently, by means of compressed air.

Hitherto, air ships have not employed stabilizing means, although their advantages have been numerous and obvious, this because the stabilization means hitherto known have been cumbersome and heavy. The present invention makes possible stabilization by simple apparatus having comparatively little weight and functioning automatically without appreciable lag. One object of the invention—to stabilize an airship in flight in a simple and efficient way—is thereby attained.

In the accompanying drawings, forming a part hereof:

Figure 1 is a side elevation of an airship having a system of stabilizing in which ballast is shifted under automatic control;

Figure 2 is a side elevation on a larger scale of one of the ballast tanks;

Figure 3 is a side elevation also on a larger scale of a motor driven air compressor with air tank;

Figure 4 is an end view of the actuating-member, with air valve;

Figure 5 is a sectional view of the actuating-member, on line 5—5 of Figure 4;

Figure 6 is a sectional view of the air valve on line 6—6 of Figure 4; and

Figure 7 is a sectional view of the same on a line 7—7 of Figure 6.

The several figures of the drawings show apparatus for stabilizing the airship by shifting liquid, which may be liquid fuel, under automatic control. The tanks 35 and 36 are connected to each other by pipe 37 for the flow of liquid and by air pipes 171 and 174 to the air valve 172. From this latter, pipe 176 is an outlet, and pipe 173 runs between the air valve and the compressed air tank 186. Conveniently located and connected with this tank is the compressor 184 driven by motor 185. The pipe lines are equipped with suitable cut-off valves 182 and check valves 181. A heavy actuating member 179 swings freely in the vertical longitudinal plane of the airship from the shaft 180 to which is also fastened the rotor 175 of the valve 172.

The apparatus is simple in its operation and needs little explanation. When the bow of the airship is depressed for any reason, the supporting frame 177 swings to the left as regards the actuating-member, which remains vertical. Referring to Figure 6, the outer valve piece 172 rotates in a clockwise direction, permitting compressed air to pass from the port 173 to pipe 174 and thence to tank 36; but before this passage of air takes place, the valve makes a connection between pipe 171 and the exhaust 176, thus permitting compressed air to escape from tank 35.

The entrance of air into tank 36 and the escape of air from tank 35 causes liquid to flow from tank 36 to tank 35 through the connecting pipe 37, thus shifting weight from the bow to the stern and producing a stabilizing effect. The reverse of this operation takes place when the stern end of the airship is depressed. These port and exhaust openings are connected so that the size of the opening for passage of air varies with the amplitude of the swing of the actuating-member. Accordingly the greater the divergence of the airship from its normal position, the quicker will be the action of the stabilizer toward restoring it to its normal position. The diamond-shaped port in the rotor 175, seen in Figure 1, makes this possible.

Obviously modifications may be made from time to time without departing from the inventive thought. Thus it is possible to employ in place of actuating-member 179 equivalent apparatus serving to control the compressed air system. Obviously another gas may be employed in place of the compressed air, although the latter is cheap and entirely suitable. In the preferred species of the invention the tanks 35, 36 are located toward the extreme ends of the airship, but any position on opposite sides of a plane passing transversely through the center of the airship will tend to produce the same result.

The subject matter of this application has

been divided out of our copending application 498,605, filed September 6, 1921 for "Airships." It is intended that the patent to be based on the present application shall cover, by suitable expression in the appended claims, whatever features of patentable novelty are contained in the species herein set forth of the generic invention therein disclosed.

Although the invention is herein described as it may be particularly applied to an airship, it is obvious that it is applicable broadly and with equal effect to any ship wholly immersed in a fluid medium, as, for example, a submarine.

We claim:

1. In equipment for stabilizing a bouyant ship wholly immersed in a fluid medium, the combination with a liquid fuel supply system of the ship of means for automatically transferring liquid fuel from one to another of the various tanks of said system, said tanks being located in differing relation to a medial plane of the ship, whereby the said transfer alters the angle at which the ship tends to come to rest; said transfer means comprising a system of pipes connecting the various tanks, a supply of compressed air, suitable tanks, piping, and valves therefor, and an automatic control actuated by changes in the relative elevation of two of the parts thereof.

2. In equipment for stabilizing a bouyant ship immersed in a fluid, the combination of two tanks for liquid attached to said ship, located in differing relations to a medial plane of the ship, whereby liquid flow from one to the other alters the angle at which the ship tends to come to rest; piping connection for said flow; liquid therein; a supply of compressed air and piping connections for it to control the liquid flow; and an automatic valve actuated by tipping of the ship and having a port with diverging sides whereby the area of valve opening is graduated to increase faster than its linear extent of opening increases with the tipping of the ship.

Signed at San Bernardino, California, this eleventh day of November, 1930.

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