

frame supports the car 5, and has the vertical shaft 7, which supports the frame 8, of the sail 9, in a vertical plane. Said sail frame 8, comprises the bearing 11, mounted to slide on the boom bar 13, so that said frame 8, is supported for transverse oscillatory movement with respect to the main frame 3. The rudder frame 15, is mounted to oscillate transversely on the vertical shaft 16, in said frame 3. Said sail frame 8, is provided with flexible connectors 17, which extend around the pulleys 18, at the outer ends of said boom 13, to the rotary drum 19, in the car 5, and, the flexible connectors 21, extend from the rudder frame 15 around the pulleys 24, to the rotary drum 25, in said car. Said drums 19, and 25, are respectively provided with the hand wheels 27, and 28, whereby, said sail and rudder may be independently adjusted to different angles with respect to the longitudinal axis of the balloon.

Although I have shown the balloon provided with a sail and rudder which are adjustable with respect to the longitudinal axis of the balloon, at the will of the operator, as above described, so as to receive wind pressure in variable angular relation, it is to be understood that the balloon may be propelled in the manner described, without the employment of such adjunctive devices and solely by the wind pressure upon the balloon itself, and in this connection it may be observed that the envelop 1, is rendered more effective for its progressive movement by having its exterior converged toward its stern.

The rotary body 30, whose mass may be in any desired proportion to the mass of the balloon, is carried by the shaft 31, which normally extends substantially horizontal and parallel with the longitudinal axis of the balloon, and consequently parallel with the normal direction of traverse of the balloon. Said shaft 31, is mounted to rotate in the bearings 33, of the gimbal frame 34, and the latter is provided with oppositely extending trunnions 35, having a common axis of oscillation extending transversely above the center of gravity of said wheel and frame. Said trunnions 35, are journaled in the bearings 38, and so constructed and arranged that the oscillatory movement of said body is limited to approximately fifteen degrees. Said bearings are supported by the car, and may be adjusted and secured in variable relation with the longitudinal axis of the balloon, by any convenient means. The rotation of said body 30, may be effected and controlled by any convenient means. However, in the form indicated, said wheel comprises the armature of an electric motor having the field frame 40, carried by the gimbal frame 34, and said motor is energized by suitable connections with the source of power 41, controlled

by the switch mechanism indicated at 42. It is to be understood that said body 30, may be rotated at variable speed, to produce and control its gyroscopic effect, so that said effect may be opposed to any force tending to turn the balloon from a path coincident with its longitudinal axis, and, that consequently any wind pressure upon the balloon, so received as to tend to change the plane of rotation and direction of the axis of said body 30, may be opposed by the gyroscopic effect of said wheel, so that such wind pressure may be utilized to effect the forward movement of the balloon in a direction oblique with respect to the direction of the wind, if desired, the direction of propulsion being also variably determinable, at the will of the operator, by adjustment of the angular relation of said sail and rudder with respect to the longitudinal axis of the balloon.

I do not desire to limit myself to the precise details of construction and arrangement herein described, as various modifications may be made therein without departing from the essential features of my invention, as defined in the appended claims.

I claim:—

1. In a balloon, the combination with levitating means; of a rotary body having its axis substantially horizontal; and means supporting said axis, permitting free but limited oscillatory movement thereof in a direction parallel with said axis; whereby wind pressure tending to turn the balloon from a predetermined direction of traverse, may be opposed by the gyroscopic effect of said rotary body, so that such wind pressure may be utilized to propel the balloon in directions oblique to the direction of the wind pressure.

2. In a balloon having its longitudinal axis substantially horizontal, the combination with levitating means; of a rotary body having its axis substantially horizontal and disposed transversely with respect to the longitudinal axis of the balloon; and means supporting the axis of said body, permitting free but limited oscillatory movement thereof in altitude; whereby, wind pressure tending to turn the balloon from a predetermined direction of traverse, may be opposed by the gyroscopic effect of said rotary body, so that such wind pressure may be utilized to propel the balloon in directions oblique to the direction of the wind pressure.

3. In a balloon having its longitudinal axis substantially horizontal, the combination with levitating means; of a rotary body having its axis substantially horizontal; means supporting said axis, normally preventing azimuthal movement thereof while permitting free but limited altitudinal oscillatory movement thereof; whereby, wind pressure tending to turn the balloon from a predetermined direction of traverse, may be opposed by the gyroscopic effect of said rotary body.