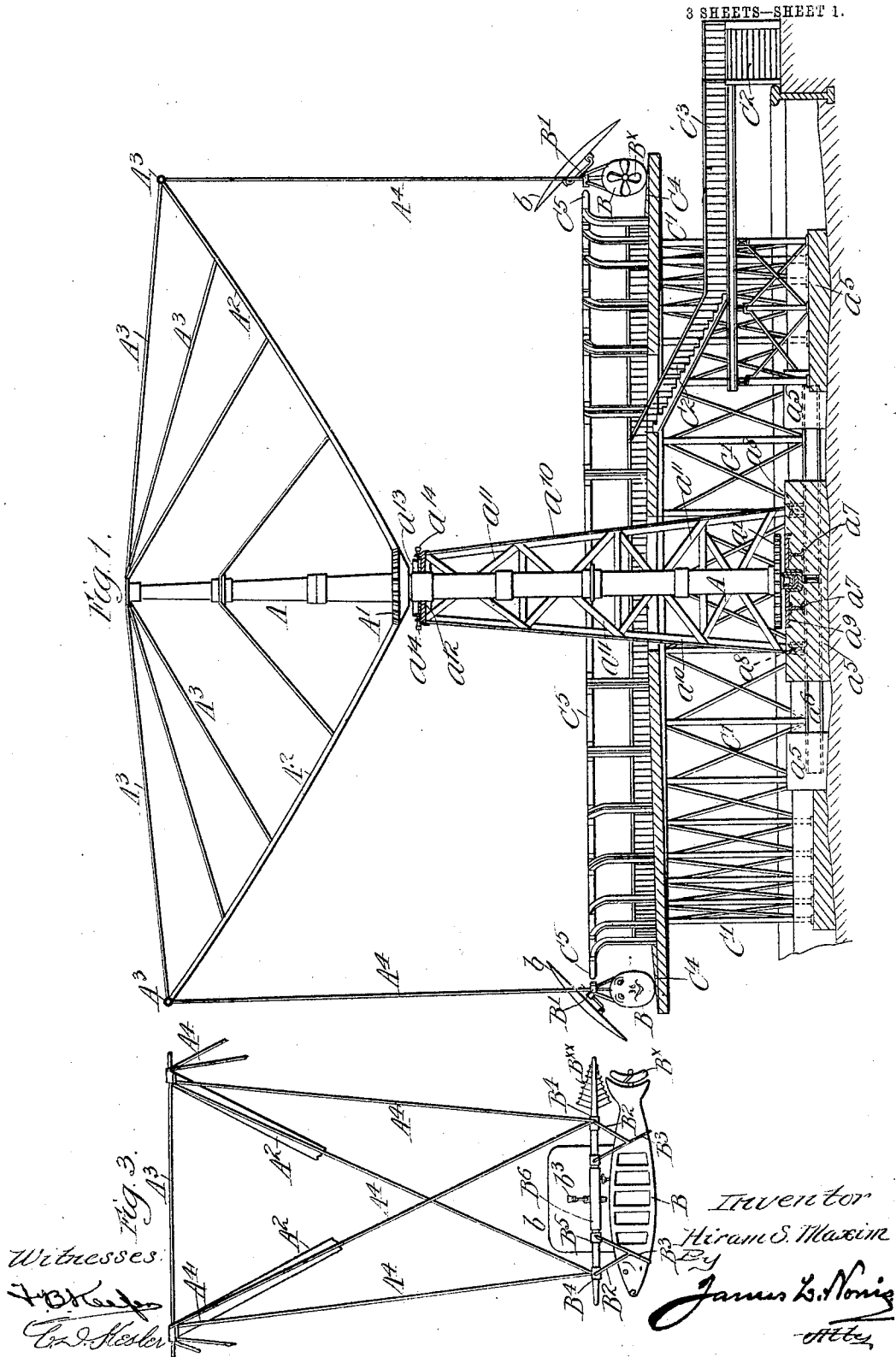


H. S. MAXIM.
ROUNDAABOUT.

APPLICATION FILED APR. 4, 1904.

3 SHEETS—SHEET 1.



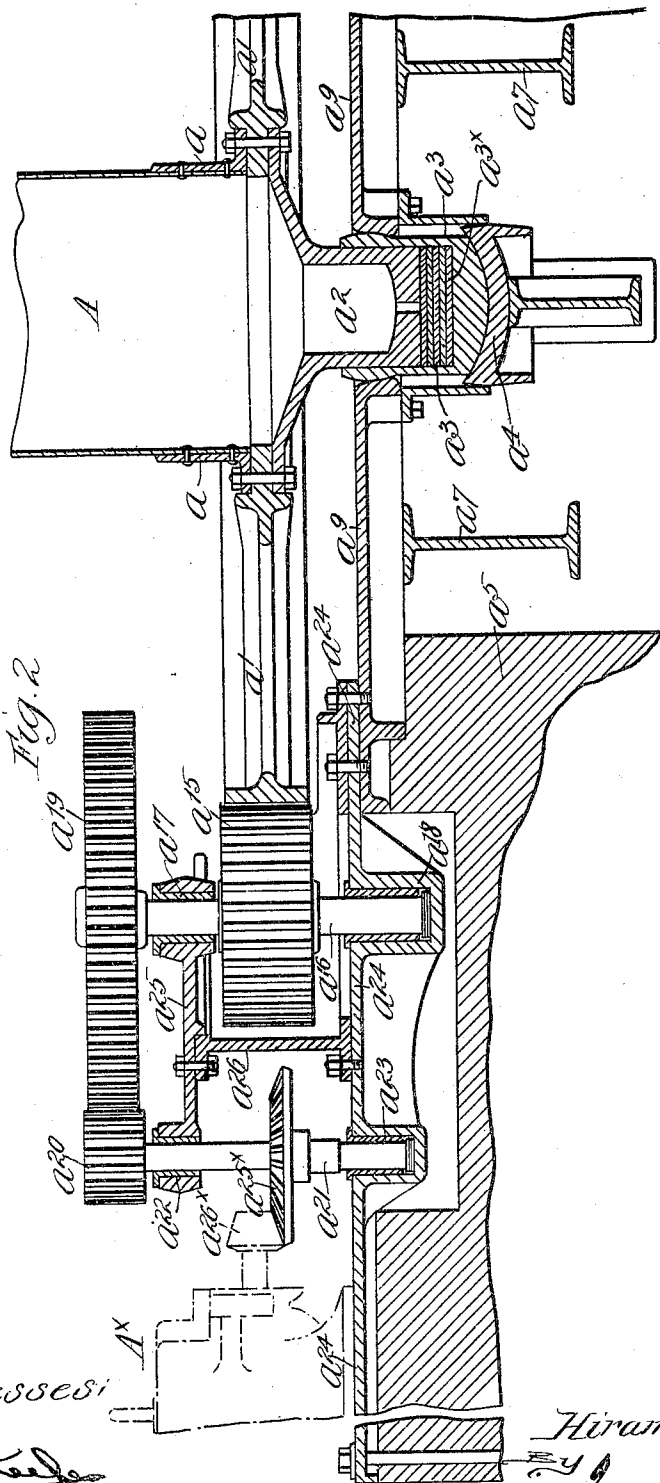
No. 804,147.

PATENTED NOV. 7, 1905.

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3 SHEETS—SHEET 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF WEST NORWOOD, ENGLAND.

ROUNABOUT.

No. 804,147.

Specification of Letters Patent.

Patented Nov. 7, 1905

Application filed April 4, 1904. Serial No. 201,587.

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, a subject of the King of Great Britain, residing at Thurlow Lodge, Norwood Road, West Norwood, in the county of Surrey, England, have invented certain new and useful Improvements Relating to Roundabouts, of which the following is a specification.

This invention relates to the kind of contrivance or roundabout in which there is a central rotary shaft driven by an appropriate motor or motors and having at or near its upper end a series of radial arms from the free ends of which cars are suspended, said cars being made to resemble what flying-machines are supposed to be like. The said cars are suspended by long rods and are capable of swinging freely to and fro with respect to the central shaft, the period of vibration being governed by the same laws that govern the swinging of an ordinary pendulum. If it be assumed that the speed of rotation of the cars around the said central shaft is sufficient to enable centrifugal force to throw the cars outward to such an extent that their suspension-rods lie at an angle of forty-five degrees to the vertical shaft, then so long as the speed of rotation is uniform the cars would (if not otherwise influenced) travel in a circle whose radius would be equal to the distance existing between the cars and the central shaft added to the distance the cars were thrown outwardly or away from the central shaft by the centrifugal force. If the suspension-rods were made of sufficient length to enable the period of vibration of the cars to correspond with the period of their rotation about the central shaft, then by arranging the said shaft at an inclination the cars would be caused to travel in a path that would be higher on one side than the other, and as a consequence somewhat peculiar movements would be imparted to the cars during their travel. Such an arrangement is not, however, always practicable, and it is one of the chief objects of my present invention to obtain these peculiar movements of the cars without necessitating the inclination of the shaft. For this purpose the cars are provided with aeroplanes so constructed and arranged that they can be moved during the rotation of the cars. The movement of the aeroplanes may be effected by artificial screw-propellers—that is to say,

screw-propellers so arranged on the cars as to revolve by the movement of the cars through the air and to drive suitable mechanism, such as tangent screws engaging with worm-wheels, connected by cranks or the like with the aeroplanes. If the diameter and pitch of the screw-propellers are such that the rotation of the worm-wheel is in unison with the natural period of vibration of the cars considered as pendulums, said cars will after a few revolutions in their circular travel around the vertical shaft be swung outward and upward until their suspending-rods assume a position of, say, forty-five degrees with respect to the said vertical shaft without experiencing any disturbing influence from the aeroplanes. If the aeroplanes are then rendered active, they may at first cause the car to move outwardly only a few feet beyond the forty-five degrees. Then when the maximum travel is reached in this direction the aeroplanes may be moved so as to depress the cars, or not lift them at all, when they will swing downward and inward with respect to the forty-five-degree position. Then of course if the aeroplanes are moved into their lifting position again the cars will be thrown outward, and by their outward momentum will mount considerably higher than they did at the first swing, so that by working the aeroplanes in harmony with the natural period of vibration it is possible to get an outward swinging motion through many degrees of arc, and as the cars are traveling in a circle at the same time the actual path that they describe in the air may be very complicated; but it is not always necessary that the period of rotation should correspond to the period of vibration. The outward and inward effect can always be produced, providing the aeroplanes exert a lifting effect while the cars are swinging outward and cease their lifting effect while said cars are swinging inward, or, for that matter, operate to depress the cars while they are swinging inward. The swinging motion imparted to the cars is not, it is to be observed, caused by a flapping of wings, but by the change of angle of the aeroplanes. In some cases it may be advantageous to provide for disconnecting the mechanism from the aeroplanes, so that they can be moved by hand. It would then be possible for a passenger in one of the cars to cause it to perform such evolutions

as are best suited to his taste. When the cars are at rest at the landing-stage of the roundabout, the aeroplanes lie approximately at an angle of forty-five degrees, so that when the said cars swing outward to their forty-five-degree position the aeroplanes are horizontal. This position of the aeroplanes relatively to the cars enables the aeroplanes to exert a retarding influence on the cars as the latter move toward the vertical shaft in assuming their position of rest, thus permitting the cars to come quietly to rest. As their speed slackens they swing inward toward the vertical shaft until they come into contact with an inclined top of the landing-stage. If the wind should be blowing, it is quite evident that some means must be used for preventing the cars from swinging inward too far. I provide for this contingency by having a circular rail or ring, which I term a "guard-rail," situated just above the landing-stage, against which guard-rail the cars, the suspension-rods, or the parts by which said rods are connected with the cars may strike as the cars swing inward. In order to permit of the cars traveling through the air at a rapid rate without experiencing unnecessary resistance from the air, they may be of boat shape or of such other shape that they will pass easily through the air, and they may be, furthermore, so shaped that the passengers will be protected from the wind caused by the rapid revolution of the cars. An advantageous shape to give to the cars is that of a fish or bird. It is necessary to provide means of instantly securing the cars when they come to rest and of holding them securely in a stiff and rigid manner while the passengers are entering or leaving them, for which purposes magnetically-controlled retaining devices will probably be found the most suitable. By this arrangement the holding and the release of the cars may be controlled by the man controlling the motive power, thus preventing confusion and danger in the starting and stopping operations.

In order that my said invention may be clearly understood and readily carried into effect, I will describe the same more fully with reference to the accompanying drawings, in which—

Figure 1 is a general diagrammatic sectional elevation of my machine or roundabout. Fig. 2 is a longitudinal section of the lower part of the rotary shaft, showing its footstep-bearing and the driving-gear on a larger scale. Fig. 3 is a side elevation of one of the cars, showing the mode of connecting the same with the suspension-rods. Fig. 4 is a cross-section of one of said cars, showing the movable aeroplane connected therewith. Fig. 5 is a longitudinal section of the rear end of one of said cars, showing the mode of connecting the said aeroplane with the shaft of the screw-pro-

PELLER for actuating said aeroplane therefrom. Fig. 6 is a detail plan showing one of the magnetic contrivances for securing the cars in their position of rest during the ingress or egress of passengers.

A is the central rotary shaft. B B are the suspended cars, of which there may be any appropriate number, and C is the landing-stage. The said shaft A is preferably made of mild steel in several tubular sections or lengths bolted or otherwise firmly secured together at their ends, the sections at the upper part of said shaft gradually diminishing in diameter. The lower end of the shaft is provided with a flange a , Fig. 2, to which is bolted or otherwise connected a spur-wheel a' and a flanged footstep a^2 of cast-steel. This footstep has a central hollow cylindrical portion with a slightly conical margin where it joins the flanged periphery. Surrounding the said cylindrical portion of the footstep is a sleeve a^3 , containing washers a^{3x} and having its lower end and upper margin convexly curved from the same center of curvature, the lower end of said sleeve resting upon a correspondingly-curved concave block a^4 , which is supported by an iron beam or girder embedded in the concrete floor of the structure. In order to obtain a firm bed or base for the structure, several blocks of masonry a^5 are embedded in the concrete to support girders a^6 , upon which latter cross-girders a^7 a^7 a^8 a^8 rest. The girders a^7 support a bed-plate a^9 , having a central concave cavity where it embraces the convex margin of the said footstep-sleeve a^3 . To the girders a^8 are bolted or otherwise rigidly connected the lower ends of upright angle-irons a^{10} a^{10} , which are suitably braced by cross-bars a^{11} . At the upper ends of the upright angle-irons a^{10} is a plate a^{12} , through which the central shaft A extends, said plate receiving a bearing-block a^{13} for the said shaft A. This bearing-block is held in the proper central position relatively to the said shaft by adjustable screws a^{14} , which are supported in flanges or lugs at the margin of the plate a^{12} . Above the said bearing-block is rigidly secured to the shaft A a steel hub A' , from which radiate the series of suspension-arms A^2 , of which only two are shown in the drawings. These arms are connected to the said shaft and to each other by tension-rods A^3 . From the free ends of the said arms A^2 depend rods A^4 , to the lower ends of which the cars B are attached, as hereinafter explained. The said landing stage or platform C is circular and is supported by stanchions C' at a suitable height above the ground, said platform being reached by stairways C^2 and landings C^3 . The floor of the said platform is preferably made outwardly inclined at its margin C^4 , so that when the cars are at rest they will lie at the top of said incline and be to some extent supported thereby.

C^5 is the circular guard-rail, which occupies such a position that it will prevent the cars from swinging inward too far by the action of the wind or otherwise. This guard-rail is supported by uprights having outwardly-curved upper ends, the intervals between said uprights being provided with fencing to prevent persons from passing onto the inclined margin of the platform. Gates or the like under the control of attendants would be provided at suitable points in said fencing to enable the passengers to pass through on their way to and from the cars. Each of the said cars has a longitudinal bar B' , which I term a "spreader-bar," arranged above it and connected therewith by rods $B^2 B^3$, which are provided at their upper ends with clamping-pieces $B^4 B^5$, by means of which they are joined to said spreader-bar B' . There are preferably four suspension-rods A^4 for each car, said rods being arranged as indicated in Fig. 3—that is to say, two of the suspension-rods of one of the arms A^2 and two of the suspension-rods of another adjacent arm A^2 are respectively connected to the clamping-pieces B^4 , so that the rods of each car form the sides of a quadrilateral figure with diagonals that cross one another. The said rods thus permit free outward swinging motion of the cars, but effectually prevent tangential movement thereof relatively to the circle of revolution. As it is necessary for the clamping-pieces to be accurately adjusted on the bar B' , I make them capable of sliding thereon and furnish them with bolts or other devices for enabling them to be firmly held to the said bar after having been adjusted. Each spreader-bar B' has a large soft-iron bar B^6 , Fig. 6, attached thereto, and at suitable intervals around the guard-rail C^5 powerful electromagnets C^6 are provided in such position that when the cars are brought to rest the bars B^6 will be in the vicinity of the said electromagnets, so that when the latter are energized by an electric current passing around their coils the said magnets will exert a powerful attractive force on said bars, and thus hold the cars firmly in a stationary position while the passengers are entering and leaving the cars. When the cars are ready to start again, the electric circuit through the magnet-coils is broken, thereby releasing said cars.

$b b$, Figs. 4 and 5, are the aeroplanes, one of which is provided on each car. Each aeroplane is slightly curved and has comparatively sharp edges and a thick middle portion. It may be of rectangular shape or may be made in the form of a bird's wing. Each aeroplane is connected with the bar B' of the car by means of a strong metal bar b' , having a bracket b^2 , which is clamped around the said bar B' in such a position that the aeroplane lies in a plane at an inclination of about forty-five degrees relatively to the vertical longi-

tudinal plane of the car when the latter is at rest. The ends of the said bar b' are turned upward and are connected with lugs b^3 on the under side of the aeroplane by pivot-pins, thus permitting said aeroplane to turn at right angles with respect to its normal plane—i. e., in the direction of the length of the car. When the said aeroplanes are to receive their motion automatically, they may be each connected by a rod b^5 , Fig. 5, to a bell-crank lever b^6 , situated within the car, said lever being eccentrically coupled at b^{10} by a rod b^7 to a toothed crank-disk b^8 , which is mounted on a transverse shaft b^9 . This crank-disk receives motion from a worm b^{11} , carried by the shaft of the screw-propeller B^x . As the cars travel through the air the said propellers are revolved by the air, and thereby impart motion, through the above-described mechanism, to the aeroplanes, thus bringing about the inward and outward swinging motion of the cars during their revolution around the central shaft, as already explained. If it be desired to render the aeroplanes capable of moving about their pivots by hand instead of automatically, the rod b^5 may be disconnected from the bell-crank lever b^6 and be actuated by a person in the car, as aforesaid.

When a large and long body, such as one of the aforesaid cars, is being projected through the air endwise, the atmospheric resistance it experiences gives rise to a force at the front end thereof greater than at the rear end, which force tends to divert the body from its course. I therefore provide my cars with a large wide tail B^{xx} in order to counteract the aforesaid diverting tendency. This tail may be mounted on a rearward extension of the car or on the bar B' thereof, said extension or tail being suitably bent, as shown in Fig. 6, to direct the rear end of the car outward and the fore end inward during the movement of the cars about the axis of revolution.

The aforesaid spur-wheel a' at the bottom of the shaft A gears with a spur-pinion a^{15} , Fig. 2, which is keyed to a short vertical shaft a^{16} , mounted in bearings $a^{17} a^{18}$. At the upper end of the shaft a^{16} is keyed a toothed wheel a^{19} , that gears with a toothed pinion a^{20} , keyed to another vertical shaft a^{21} , which is arranged parallel to the shaft a^{16} and mounted in bearings $a^{22} a^{23}$. The lower bearings a^{18} and a^{23} of the two shafts $a^{16} a^{21}$ are located in a sole-plate a^{24} , which is bolted to the aforesaid bed-plate a^3 . The upper bearings $a^{17} a^{22}$ are situated in a plate a^{25} , which is carried by a bracket a^{26} , bolted to the said sole-plate a^{24} . The said shaft a^{21} also has keyed to it a bevel-wheel a^{25x} , with which gears a bevel-pinion a^{26x} , driven by the motor A^x , that is bolted to the said sole-plate a^{24} .

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a roundabout, the combination with

an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of horizontal bars situated above and secured to the cars, two clip-pieces adjustably mounted on said horizontal bar one near each end, four suspension-rods depending from the outer end of each radial arm, two of which rods of one arm and two rods of an adjacent arm are suitably connected with the pair of clip-pieces of one horizontal bar, means for enabling passengers to enter and leave said cars, means for restraining the extent of the inward movement of said cars toward the axis of rotation, means for holding the cars in and releasing them from their position of rest, and means for driving the said rotary shaft substantially as described.

2. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of a circular platform situated above the ground for the passengers to enter and leave the cars when they come to rest at the margin of said platform, an outwardly-inclined margin to said platform, a circular guard-rail carried by said platform in a position to restrain the extent of inward movement of said cars toward the axis of rotation, devices for exerting, when energized, a magnetic attractive force of sufficient power to firmly retain the cars in their position of rest during the times that the passengers are entering or leaving the cars, and means for driving the said rotary shaft substantially as described.

3. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of a circular platform situated above the ground for the passengers to enter and leave the cars when they come to rest at the margin of said platform, an outwardly-inclined margin to said platform, a circular guard-rail carried by said platform in a position to restrain the extent of inward movement of said cars toward the axis of rotation, electromagnets carried by said guard-rail, iron bars carried by the cars in a position to come opposite said electromagnets when the cars are at rest, means for driving said rotary shaft, and means for causing the said electromagnets to become energized or inactive at the will of the attendant controlling the means employed for driving the shaft substantially as described.

4. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of aeroplanes mounted on said cars, means for changing the angular position of said aeroplanes relatively to the horizontal, means for enabling passengers to enter and leave said cars, means for restraining the extent of the inward movement of said cars toward the axis

of rotation, means for holding the cars in and releasing them from their position of rest and means for driving the said rotary shaft substantially as described.

5. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of movable aeroplanes carried by said cars, screw-propellers on said cars, means for operatively connecting said propellers with said aeroplanes, means for enabling passengers to enter and leave said cars, means for restraining the extent of the inward movement of said cars toward the axis of rotation, means for holding the cars in and releasing them from their position of rest, and means for driving the said rotary shaft substantially as described.

6. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of aeroplanes pivotally mounted on said cars so as to be angularly movable in a longitudinal plane relatively to the cars, screw-propellers on said cars, means for operatively connecting said propellers with said aeroplanes, means for enabling passengers to enter and leave said cars, means for restraining the extent of the inward movement of said cars toward the axis of rotation, means for holding the cars in and releasing them from their position of rest, and means for driving the said rotary shaft substantially as described.

7. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of aeroplanes mounted on said cars at an inclination to the vertical longitudinal plane thereof and capable of pivotal movement in a plane at right angles to their plane of inclination, screw-propellers on said cars, means for operatively connecting said propellers with said aeroplanes for enabling the said propellers to rock the aeroplanes about their pivotal connections, means for enabling passengers to enter and leave the cars, means for restraining the extent of the inward movement of said cars toward the axis of rotation, means for holding the cars in and releasing them from their position of rest, and means for driving the said rotary shaft substantially as described.

8. In a roundabout, the combination with an upright rotary shaft, radial arms carried thereby and cars suspended from said arms; of aeroplanes mounted on said cars at an inclination to the vertical longitudinal plane thereof and capable of pivotal movement in a plane at right angles to their plane of inclination, screw-propellers on said cars adapted to revolve by the action of the air during the travel of the cars, means for operatively connecting said propellers with said aeroplanes for enabling the propellers to rock the aero-

planes about their pivotal connections, means
for enabling the aeroplanes to be disconnected
from the screw-propellers to permit of their
being rocked by hand, means for enabling
5 passengers to enter and leave the cars, means
for restraining the extent of the inward
movement of said cars toward the axis of ro-
tation, means for holding the cars in and re-
leasing them from their position of rest, and

means for driving the said rotary shaft sub- 10
stantially as described.

In testimony whereof I have hereunto set
my hand, in presence of two subscribing wit-
nesses, this 8th day of March, 1904.

HIRAM STEVENS MAXIM.

Witnesses:

D. W. MELLERSH JACKSON,

T. SELBY WARDLE.