W. H. CLARK.

WHEEL PROPELLER.

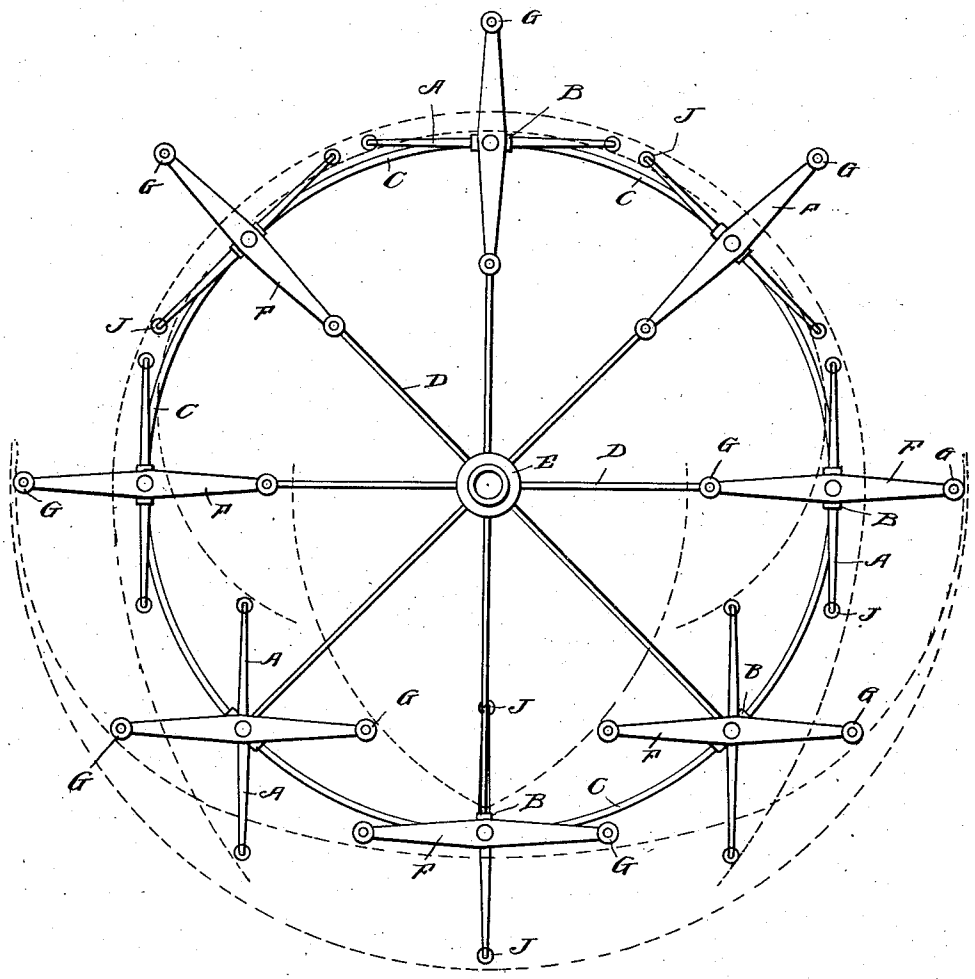
APPLICATION FILED JUNE 1, 1910.

1,009,473.

Patented Nov. 21, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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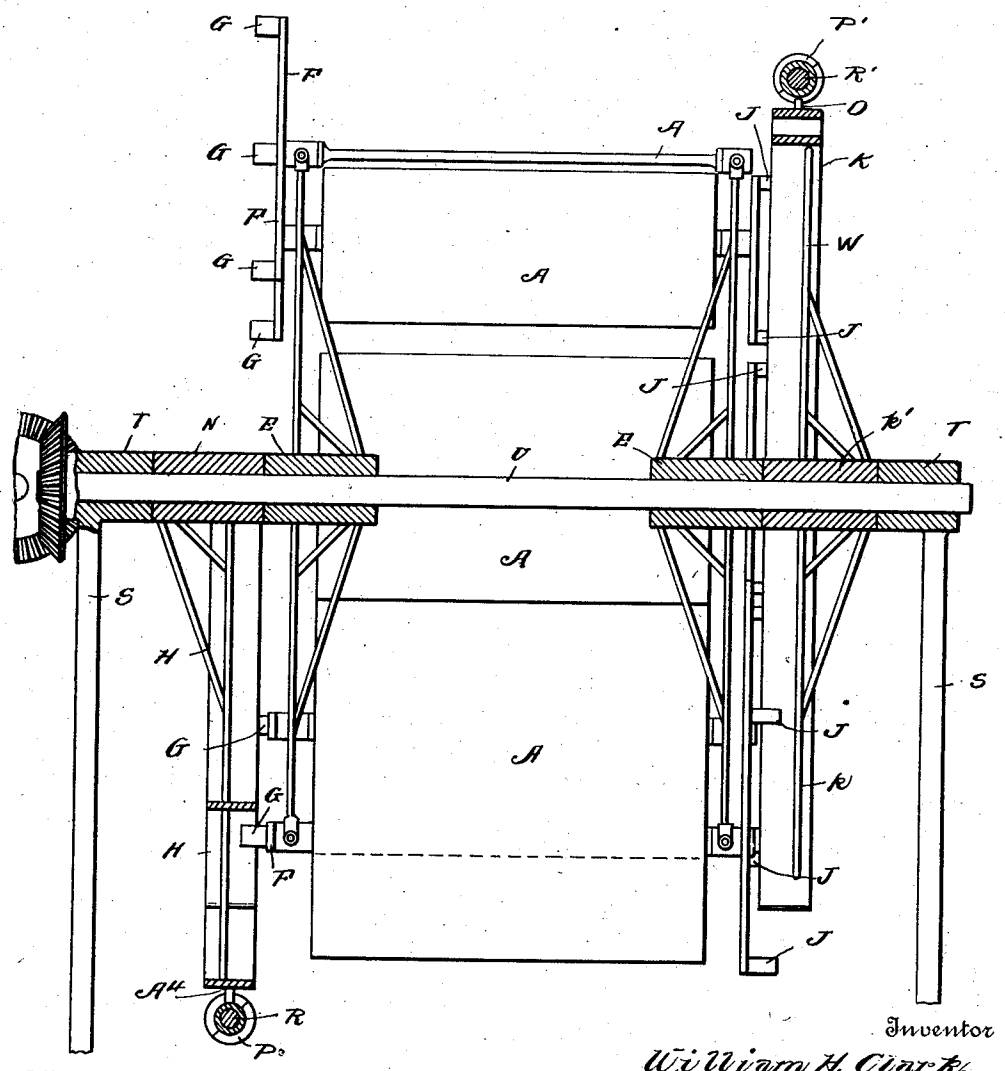
3 SHEETS—SHEET 2.

Fig 2.



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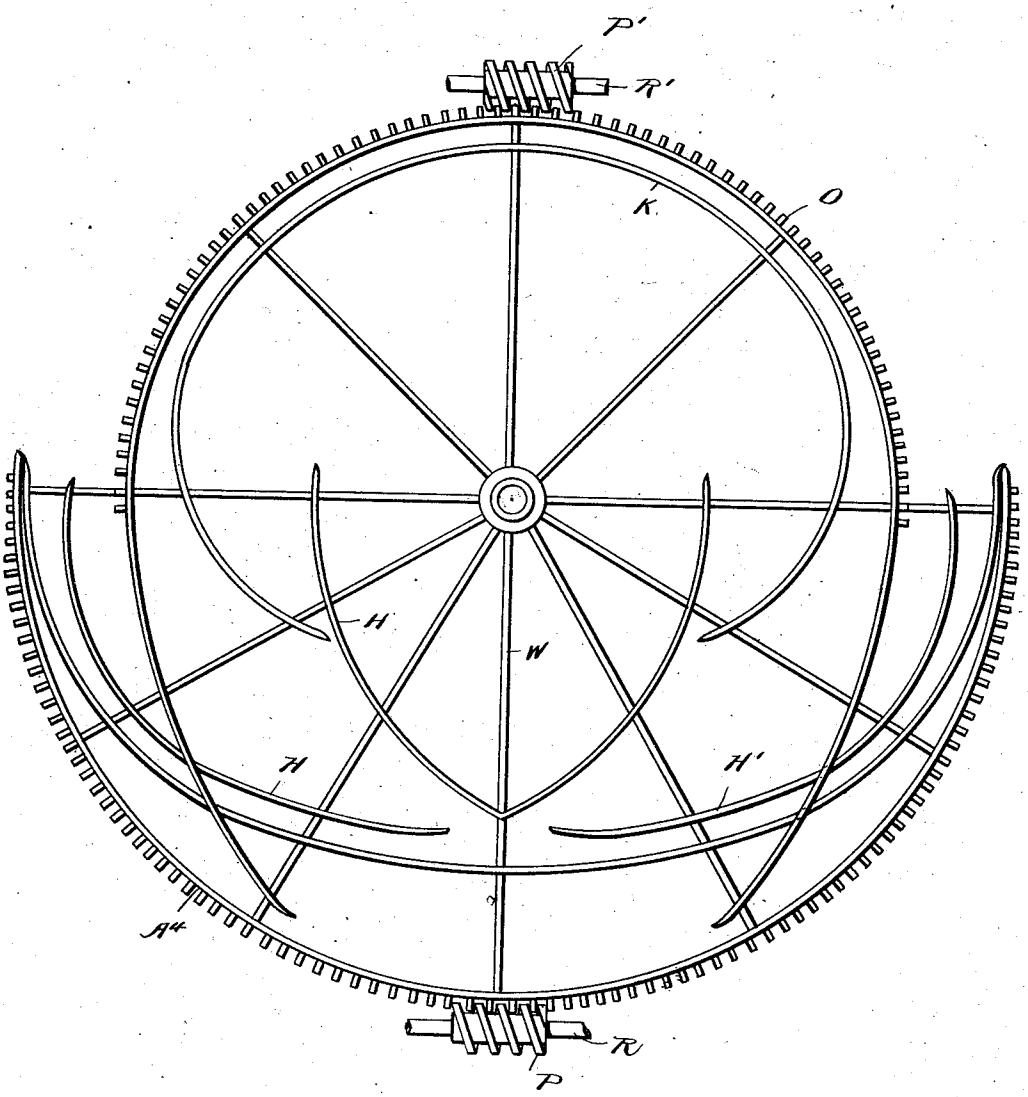
3 SHEETS—SHEET 3.

Fig. 3.



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WHEEL-PROPELLER.

1,009,473. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed June 1, 1910. Serial No. 564,431.

To all whom it may concern:

Be it known that I, WILLIAM H. CLARK, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Wheel-Propellers, of which the following is a specification.

This invention relates to wheel propellers especially adapted and intended for use on flying machines, and more particularly relates to that type of such propellers in which the paddles or blades are guided by means of guides or tracks, the blades being provided with rollers which follow the tracks and cause a corresponding inclination or change of position of the blades with respect to the line of travel. The guides are so arranged and constructed that during the upper half of the revolution of the wheel the paddles travel in a course tangential to the line of rotation, and during the lower half of the revolution are brought gradually to a radial position with respect to the circle of revolution, to effect the driving action. The guides or tracks which control the position of the blades are capable of adjustment so that the paddles, in addition to the horizontal pressure, may be guided to produce vertical pressure to any desired extent, which will be useful particularly in changing the altitude of the machine to which the wheel is applied.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of the wheel, the guides being indicated diagrammatically. Fig. 2 is a cross section of the wheel and guides, parallel to the axis of the wheel. Fig. 3 is a side view of the adjustable guides, the wheel being omitted.

Referring specifically to the drawings, A indicates blades or paddles which may be made of any material suitable to the medium in which the wheel is to operate. These paddles swing freely in bearings B which are equally spaced on circular rims C, these rims being held in position by braced spokes D attached at their inner ends to hubs E fast on the shaft U.

The pivot or trunnion at one end of each paddle A is provided with an arm *j*, outside of the bearing B, and this arm is located in a plane parallel to that of the paddle and extends at a right angle to the axis of the paddle. This arm carriers rollers J at its opposite ends. The trunnion at the other end of the paddle has an arm F arranged at a right angle to the plane of the paddle, and this arm has rollers G at its opposite ends. The arms *j* operate to guide the paddle during what is normally the upper half of the revolution of the wheel, and the arms F act to guide the paddle during the lower half of the revolution of the wheel.

The rollers J project to travel in a guide K consisting of two rails or curved tracks which are parallel along most of their length, but which at the ends diverge or spread, as clearly shown in Fig. 3, to finally produce a space between the ends of the two rails substantially equal to the length of the arms *j*, thereby enabling the rollers on those arms to pass into and out of the guide with said arms in position at a decided angle to the rails. The rails forming the track are mounted at the ends of brace rods *k* projecting from a sleeve *k'* loose on the shaft U, and the guide may be turned, or adjusted angularly in a plane at a right angle to the axis, by means of a worm P′ on a shaft R′, engaging pin teeth O′ on the outer rail. This guide, as will be seen, controls the movement of the paddles during substantially the upper half of the revolution of the wheel, and causes said paddles to assume a tangential position during that period.

The rollers G carried by the arms F travel in the lower guide shown especially in Fig. 3. This guide comprises an outer rim A^4 and four members or rails H, H′ and H^2, the outer one H of which is continuous and curved to semi-elliptical form with its middle substantially equal to the radius of the wheel and its ends located at a greater radius or distance from the center. The upper or inner rail H^2 is reversely shaped, with its middle at the greatest distance from the center of rotation of the wheel, and its ends at a less distance. The two intermediate rails H′ are respectively located within the opposite ends of the outer rail and are substantially parallel thereto, the ends of all the rails being flared to allow the rollers to enter between the same. These rails and rim are supported by rods W extending from a sleeve N which is loose on the shaft U. During the normal lower half of the revolution of the wheel the rollers G enter the guide, one roller passing between the outer and intermediate rails H and H′, and the other roller passing along the outer side

of the inner rail H^2, and the curvature of the rails is such that the paddles, as the rollers proceed along the rails, are held or guided in a position at a right angle to the direction of flight or pressure.

The lower guide as a whole is capable of adjustment, by means of a shaft R which turns in bearings Q and has a worm P engaging a pin rack O on the outer rim A^4, which is a true semi-circle, and by these means the guide may be swung in either direction, thereby varying the angle of the blades with respect to the vertical, so that when the guide is swung one way the blades will exert a lifting force, and when swung the other way will exert a lowering force, in addition to the pressure produced in the line of flight, and thereby the altitude may be varied by changing the angles of the paddles, and the racks O and O′ are sufficiently long to allow the guides to be shifted or turned one fourth of the circumference either way.

As stated, the lower guides are located at one side of the wheel and the upper guides at the opposite side, and the lines of the guides are such that the rollers of the respective arms will enter one set of guides as they leave the other, and the control of the blades will accordingly be shifted from the upper guide to the lower guide and vice versa.

The shaft U to which the blades are connected may be operated by any suitable means, such for example as bevel gears V and appropriate driving devices, and the shafts R and R′ will be both turned at the same speed, so that both guides will be turned in unison.

By means of the shiftable or adjustable guides the angle of the blades during the power part of the stroke may be varied as desired. Thus in starting or rising, the guides will be adjusted to apply the pressure vertically, or at an angle to the horizontal, and as the machine progresses will be returned, or otherwise adjusted to the most efficient angle to produce the desired results with respect to both propulsion and elevation. The adjustable guides provide very simple and convenient means for the utilization, under the immediate control of the operator, of the pressure produced by the wheel, for the two purposes referred to, and in this respect has decided advantages, as applied to aerial navigation, over those devices which can only lift or only propel, and cannot do both and either.

The invention is not limited to the exact construction shown but various modifications may be made within the scope of the claims. Thus instead of being made in two parts located at opposite ends of the wheel, the guides can be made together, and located at one end of the wheel, and various other changes will suggest themselves to those familiar with the invention.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent is:—

1. The combination with a propeller wheel having a series of pivoted paddles, each paddle having a projecting arm at each end thereof, each arm projecting on both sides of the axis of the paddle, of guide tracks for the respective arms, at opposite ends of the wheel, to vary the angle of the paddles, each of said guide tracks having opposite rails to engage opposite ends of each arm.

2. The combination with a propeller having a series of pivoted paddles, each paddle having a projecting arm at each end thereof, each arm projecting on both sides of the axis of the paddle, of guide tracks for the respective arms, at opposite ends of the wheel, to vary the angle of the paddles, each of said guide tracks having opposite rails to engage opposite ends of each arm, each track being pivotally mounted at the axis of the wheel, and means to swing each track to vary its position in the orbit of the wheel.

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

WILLIAM H. CLARK.

Witnesses:

EVA M. BOWDEN,

STEELMAN J. ROCKWELL.