N. C. SORENSEN.

AEROPLANE PROPELLING WHEEL.

APPLICATION FILED JULY 24, 1911.

1,032,162.

Patented July 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

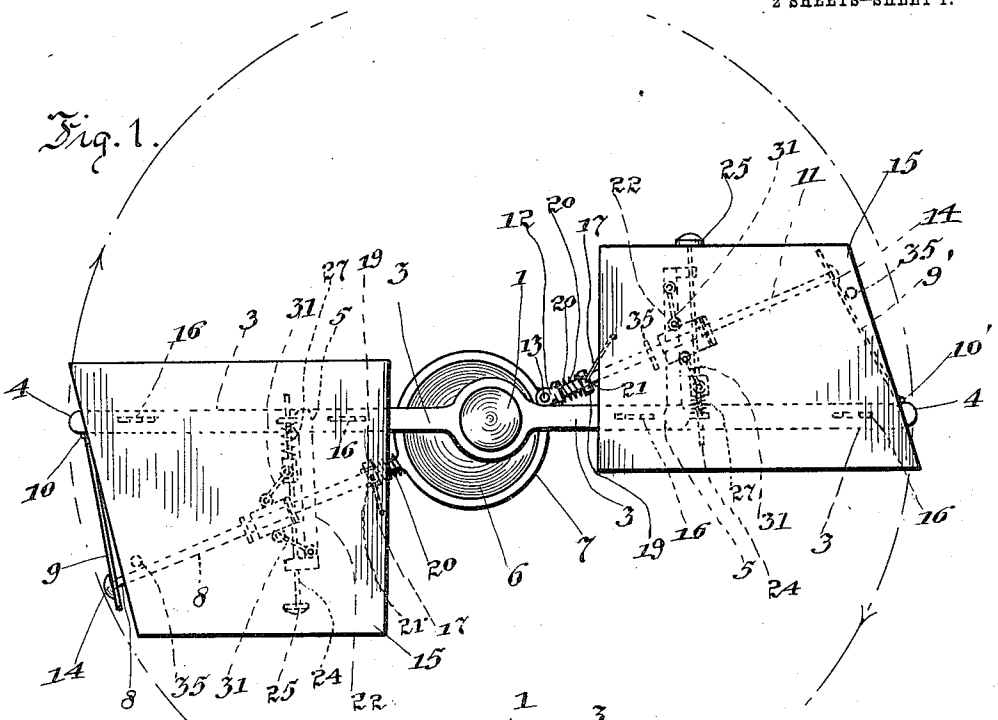
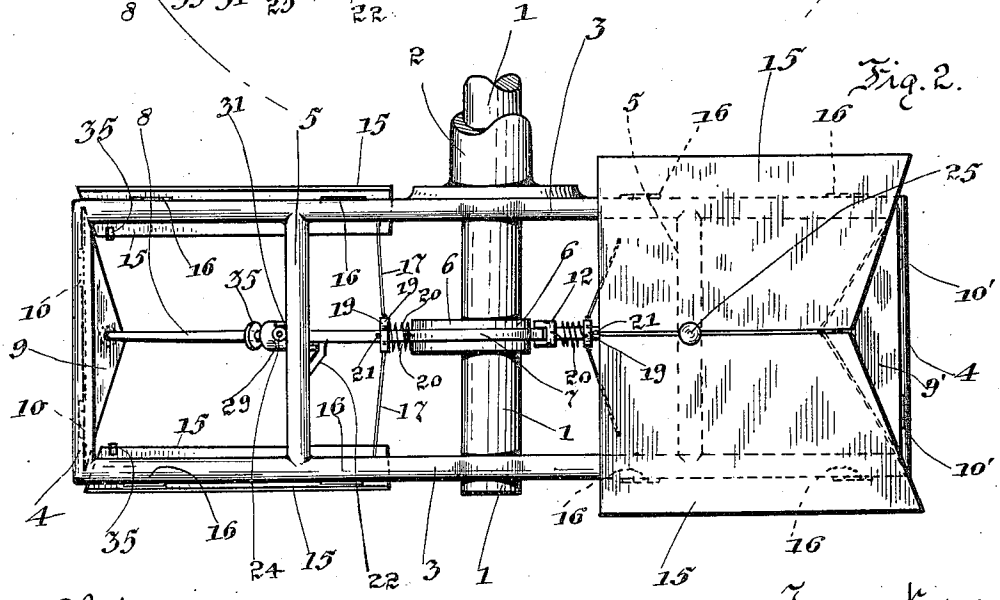


Fig. 2.



Witnesses

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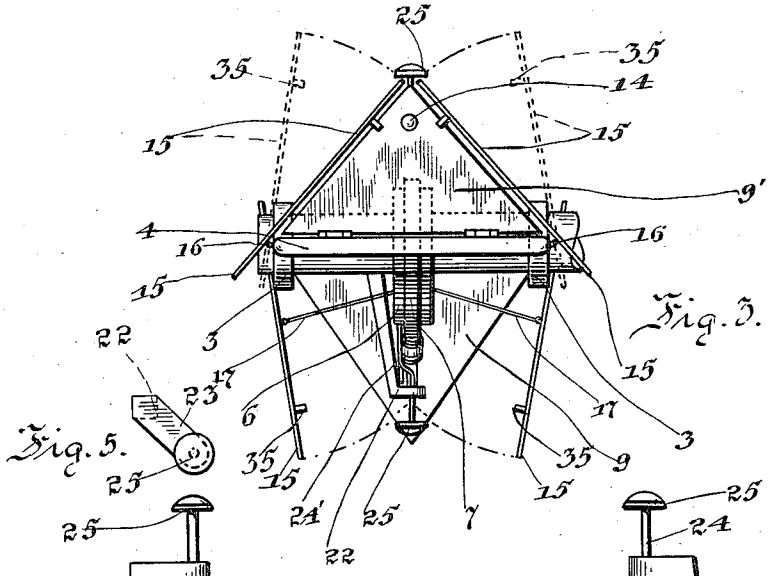

Fig. 3.

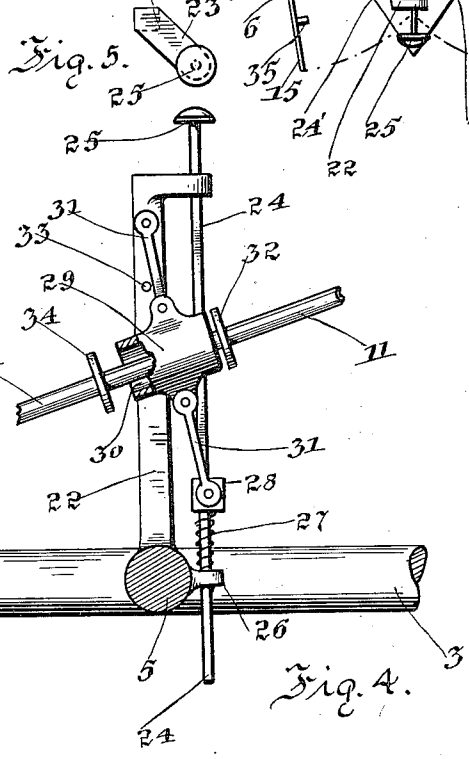

Fig. 4.

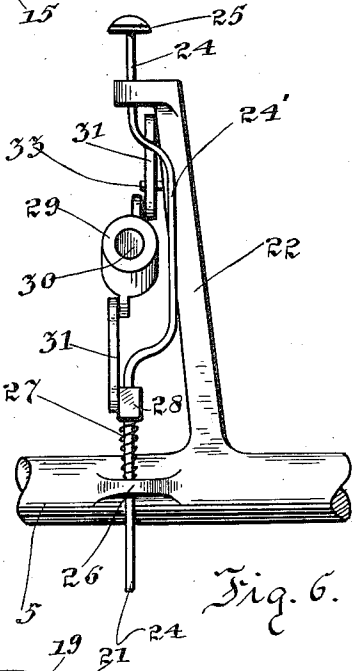

Fig. 6.

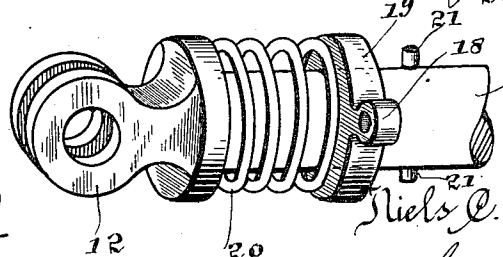

Fig. 7.

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# UNITED STATES PATENT OFFICE.

NIELS C. SORENSEN, OF CHICAGO, ILLINOIS.

## AEROPLANE-PROPELLING WHEEL.

1,032,162. Specification of Letters Patent. Patented July 9, 1912.

Application filed July 24, 1911. Serial No. 640,211.

*To all whom it may concern:*

Be it known that I, NIELS C. SORENSEN, a subject of the King of Denmark, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Aeroplane-Propelling Wheels, of which the following is a specification.

My invention relates to improvements in propelling wheels for aeroplanes or other flying machines, the object of the invention being to provide a propelling wheel of this class which shall be strong and durable and efficient in operation.

The invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which,

Figure 1 is a side elevation of a propelling wheel embodying my invention, Fig. 2 is a top plan view of the propelling wheel, Fig. 3 is an end elevation thereof, Fig. 4 is an enlarged detail elevation showing wing locking means employed in the propelling wheel, Fig. 5 is a detail top plan view showing a portion of said locking means, Fig. 6 is an enlarged view showing the wing locking means taken at right angles to that shown in Fig. 4, and Fig. 7 is a detail perspective view showing a portion of the wing operating mechanism employed in the propelling wheel.

The preferred form of construction as illustrated in the drawings comprises a stationary horizontally disposed shaft 1 which may be secured in the frame of the aeroplane in any suitable manner. Rotatably mounted upon the shaft 1 and suitably connected with the aeroplane motor is a driving sleeve 2 which is formed integral with or rigidly connected to the propelling wheel frame 3 as clearly illustrated in Fig. 2. The frame 3 is provided with two parallel side members which are arranged parallel to each other and diametrically with reference to the shaft 1, there being an enlarged central portion in each side member forming bearings in which the shaft 1 is journaled. Transverse end members 4 are provided in the frame 3, the joints between said end members and the side members of the frame being brazed or otherwise rigidly constructed. Transverse members 5 arranged intermediate the end members 4 and shaft 1 span the space between the side members 3, the ends thereof being rigidly secured to said side members as illustrated in Fig. 2. The frame 3 is preferably formed of steel tubing for lightness and rigidity, but other constructions may be employed, as for instance, members having L-shaped and T-shaped cross sections. Formed integral with the shaft 1 and arranged centrally between the side members of the frame 3 is an eccentric 6 on the periphery of which is mounted an eccentric strap 7 as illustrated in Fig. 2.

From the construction thus far described it is evident that when the frame 3 is revolved about the stationary shaft 1 that the arm 8 projecting from one side of the eccentric strap 7 will move longitudinally with reference to the side members of the frame 3, consequently an end wing 9 which is operated by said arm will be oscillated during the revolution of the wheel. It will be observed that the wing 9 is pivoted by means of hinges 10 to an end member 4 of the frame 3. To a point in the strap 7 diametrically opposite the arm 8 is pivoted an arm 11 by means of a bifurcated lug 12 and a pin 13 passing through the latter and said strap, the object of this construction being to permit a slight oscillation of the arm 11 during the revolution of the wheel. Were it not for the pivotal construction of the arm 11 the device would be inoperative unless the arms 8 and 11 were formed of flexible material. An end wing 9′ is pivoted by means of hinges 10′ to the end of the frame 3 opposite the wing 9 as illustrated in Fig. 1. The arms 8 and 11 pass through apertures provided in the end wings 9 and 9′ and are provided with heads 14 for engaging the outer surfaces of said wings as illustrated in Figs. 1 and 3. Due to the centrifugal force of the wings 9 and 9′ during the revolution of the propelling wheel said wings constantly engage the heads 14, the extreme positions of said wings being illustrated in Fig. 1. The main wings 15 of the propeller are pivoted by means of hinges 16 to the side members of the frame 3 and are adapted to oscillate freely thereon. These wings are rectangular in form with the exception of the outer ends which are preferably inclined so as

to be more nearly in co-incidence with the circle of rotation as indicated by dotted lines in Fig. 1.

The principle of operation of this propelling wheel is that when one set of wings is closed or in operative position during a part of the revolution that other and similar wings will be opened or in inoperative position during the remaining portion of the revolution, thus providing a propelling wheel of the paddle wheel type which will be more positive in its operation than a helical propelling wheel as ordinarily used. In Figs. 1 and 2 the end wing 9 and the adjacent main wings 15 are shown in open or inoperative position, thus permitting the free passage of air therethrough. In these figures the end wing 9′ and the adjacent main wings 15 are shown in closed or operative position which effects a reactionary or upward movement upon the shaft 1 during the revolution in the direction indicated by arrows in Fig. 1.

In order to control the opening and closing of the main wings 15 connecting links 17 are provided the inner ends of which are pivoted to perforated lugs 18 provided on sliding collars 19. Interposed between the sliding collars 19 and the inner ends of the arms 8 and 11 are helical compression springs 20 provided for a purpose to be described hereinafter. Stops 21 which project radially from the arms 8 and 11 are provided to limit the movement of the sliding collars 19 in one direction. It is apparent from this construction that when the arms 8 and 11 are moved longitudinally relative to the frame 3 to which the main wings 15 are pivoted that the angularity of the links 17 will constantly change and consequently cause said wings to open or close depending upon the direction of movement of said arms.

It being important to hold the main wings 15 in closed position for imprisoning air during a certain portion of the revolution, mechanism is provided to lock said wings in closed position as will be presently described. Said mechanism comprises a standard 22 which is centrally located on each transverse member 5 as indicated by dotted lines in Fig. 1. The free extremity of the standard 22 is provided with a perforated lug 23 in which a rod 24 having a head 25 is mounted for sliding movement. The rod 24 extends substantially parallel with the standard 22 and the end thereof opposite the head 25 is passed through a perforated lug 26 extending laterally from the transverse frame member 5, this construction being clearly shown in Figs. 4 and 6. The rod 24 is normally held in an elevated position by means of a helical spring 27 surrounding said rod and abutting the lug 26 at one end and a block 28 at the other, said block being formed integral with or rigidly secured to said rod adjacent the lower end thereof. An off-set portion 24′ is formed in the rod 24 to provide clearance for a sliding sleeve 29 having a large opening or aperture 30 through which either the arm 8 or 11 is passed. The sleeve 29 is connected by means of a pair of links 31 to adjacent the upper end of the standard 22 and to the block 28, the construction being such that a collar 32 provided on the arms 8 and 11 exterior to the sleeve 29 will abut the adjacent end of said sleeve and cause the same to move from the normal position as shown in dotted lines in the left of Fig. 1 to the position shown in the right of Fig. 1 and in Fig. 4, whereupon said sleeve is locked by contact with a stop pin 33 projecting from the standard 22. It will be observed that due to the upward pressure of the spring 27 acting upon the links 31 that the sleeve 29 will not again be moved until a collar 34 similar to the collar 32 contacts with the other end of said sleeve. The links 31 in the position shown in Fig. 4 are slightly out of line and the upward pressure of the spring 27 causes the uppermost of said links to press slightly against the stop 33. In this position of the rod 24 the head 25 on said rod contacts with the free edges of the main wings 15 for maintaining the same in closed position as shown in Fig. 3. Said wings will continue to assume the closed position until the collar 34 on the inside of the sleeve 29 contacts with the latter and throws the links 31 out of alinement, whereupon the spring 27 will automatically move the rod 24 and head 25 upwardly for the releasement of the wings 15 which are immediately opened. As aforesaid the opening and closing of the main wings 15 is effected by means of the links 17 which extend from said wings to the sliding collar 19. This collar is normally held in contact with the diametric stop pin 21 by means of the action of the helical compression spring 20, but during the time that the wings 15 are held in closed position by means of the head 25 on the rod 24 the collar 19 is forced from engagement with the pin 21 by the outward movement of the arm 11, thus compressing the spring 20. Upon releasement of the wings 15 by the disengagement of the head 25 the connecting links 17 will immediately begin to open said wings and the collar 19 be brought again into its normal position by the expansion of the spring 20.

From the foregoing description it is apparent that the wing locking mechanisms mounted on the arms 8 and 11 are identical in construction and due to the action of the eccentric 6 operate alternately. Simultaneously with the opening and closing of the main wings 15 the end wings 9 and 9′ are opened and closed. These end wings are

held in the closed position by means of inwardly projecting studs 35 provided on the main wings 15, the time of closing the latter being such that the end wings will be in proper position for engagement with said studs as illustrated in Figs. 1 and 3.

The operation of the propelling wheel is as follows: Assuming that the parts of the wheel are in the position shown in Fig. 1, then upon further rotation of said wheel in the direction as indicated by arrows in said figure the first action to take place will be the elevation of the head 25 in the right of said figure by the contact of the collar 34 on the inner end of the sleeve 29. This action so moves the links 31 as to permit the free elevation of the rod 24 by the expansion of the spring 27. The wings at the right of Fig. 1 upon opening due to the outward pressure of the connecting links 17 causes the simultaneous disengagement of the studs 35 with the end wing 9′ whereupon the latter will fly outwardly by centrifugal force. Upon the completion of one-half a revolution the wings will be fully opened as shown at the left of Fig. 1. In order to close the wings again the eccentric strap 7 must move sufficiently on the eccentric 6 to effect the return movement of the arm 11, whereupon the connecting links 17 will draw the wings 15 toward each other. When the free edges of said wings assume contiguous positions the collar 32 comes in contact with the outer end of the sleeve 29 and moves the latter inwardly into the position shown in Fig. 4, thus causing the head 25 to lock the free edges of the wings 15 in the position as shown in Fig. 3. The rod 24 is automatically held in locking position by means of the spring 27 as hereinbefore described.

The construction and arrangement of the various parts of the propelling wheel is such that the movement of the various parts is effected without friction or vibration.

A propelling wheel for aeroplanes as set forth is comparatively simple of construction and highly efficient in its operation.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I therefore do not wish to be limited to the precise details of construction as set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. An aeroplane propeller comprising a central stationary shaft, a frame mounted for rotation upon said shaft and comprising spaced side members, a sleeve projecting from one side of one of said side members and rotatably mounted upon said shaft, an eccentric rigidly formed on said shaft intermediate said side members, an eccentric strap on said eccentric, arms extending from said eccentric strap to approximately the ends of said frame, folding wings provided on the ends of said frame and connected with the ends of said arms, a pair of foldable wings mounted on each end of said side members of said frame, and means connecting said arms with said pairs of wings for opening and closing the latter, substantially as described.

2. A propelling wheel comprising a central non-rotatable shaft, a frame comprising spaced side members which are rotatably mounted upon said shaft, a sleeve formed integral with one of said side members and surrounding said shaft, an eccentric carried by said shaft intermediate said side members, an eccentric strap provided on said eccentric, arms extending from diametrically opposite points of said strap to adjacent the ends of said frame, wings mounted upon the ends of said frame connected with the ends of said arms whereby the same are oscillated during the rotation of the wheel, a pair of wings mounted on each end of said frame and adapted to swing in planes transversely thereof, links connecting the interior surface of each pair of wings with one of said arms, said pairs of wings being adapted to swing so that their free edges will be contiguous, and means for locking said free edges during a part of a revolution of said wheel, substantially as described.

3. A propelling wheel comprising a fixed shaft, a frame rotatably mounted on said shaft and comprising spaced side members, transversely extending end members connecting said side members, a sleeve surrounding said shaft in rigid relation with one of said side members, an eccentric provided on said shaft intermediate said side members, an eccentric strap rotatably mounted on said eccentric, an arm formed integral with said eccentric strap extending to approximately one end of said frame, a second arm pivoted to said strap at a point diametrically opposite said first-named arm and extending to approximately the other end of said frame, end wings hinged to the end of said frame and arranged in operative relation with said arms, a pair of main wings provided on each end of said frame and hinged to the side members thereof, said main wings being adapted to swing in planes transverse to said frame until their free edges are contiguous, means connecting said main wings with said arms, and wing locking mechanism interposed between said arms and the contiguous edges of said main wings, substantially as described.

4. In a propelling wheel, a fixed station-

ary shaft, a sleeve rotatably mounted upon said shaft, a rectangular frame also rotatably mounted upon said shaft and carrying said sleeve, said shaft passing through the center of said frame, the latter comprising parallel side members and transversely extending end members, an eccentric carried by said shaft centrally located between said side members, an eccentric strap carried by said eccentric, an arm formed integral with said eccentric strap extending radially therefrom to approximately one end of said frame, a second arm pivoted to said eccentric strap at a point thereon diametrically opposite said first mentioned arm and extending approximately to the other end of said frame, end wings hinged to said end transverse members through apertures in which said arms extend, a pair of main wings hinged to the side members of said frame at each end thereof, connecting links extending from said main wings to the adjacent arm, the connection of said links with their respective arms being resilient, the free edges of each pair of said main wings being adapted to meet, and mechanism for locking said meeting edges during a portion of the revolution of said wheel, substantially as described.

5. In a propelling wheel, a fixed stationary shaft, a sleeve rotatably mounted upon said shaft, a rectangular frame also rotatably mounted upon said shaft and carrying said sleeve, said shaft passing through the center of said frame, the latter comprising parallel side members and transversely extending end members, an eccentric carried by said shaft centrally located between said side members, an eccentric strap carried by said eccentric, an arm formed integral with said eccentric strap extending radially therefrom to approximately one end of said frame, a second arm pivoted to said eccentric strap at a point thereon diametrically opposite said first named arm and extending approximately to the other end of said frame, end wings hinged to said end transverse members through apertures in which said arms extend, a pair of main wings hinged to the side members of said frame at each end thereof, connecting links extending from said main wings to the adjacent arm, the connection of said links with their respective arms being resilient, the free edges of each pair of said main wings being adapted to meet, mechanism for locking said meeting edges during a portion of the revolution of said wheel comprising a standard formed integral with said frame, a slidable rod having a head at one end mounted in the free end of said standard and said frame for free movement, said rod passing between the meeting edges of said wings, said head being adapted to embrace the free edges of said wings when in their meeting position, a sleeve mounted upon said arm and adapted to be slid thereon by raised portions or collars provided on said arm at either end of said sleeve, connecting links extending between said standard and said rod, and a helical spring surrounding said rod and adapted to maintain the latter in a normally elevated position, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NIELS C. SORENSEN.

Witnesses:
W. C. SMITH,
JOSHUA R. H. POTTS.