D. G. HARKINS.

AEROPLANE PROPELLING MEANS.

APPLICATION FILED MAR. 29, 1921.

1,407,272. Patented Feb. 21, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

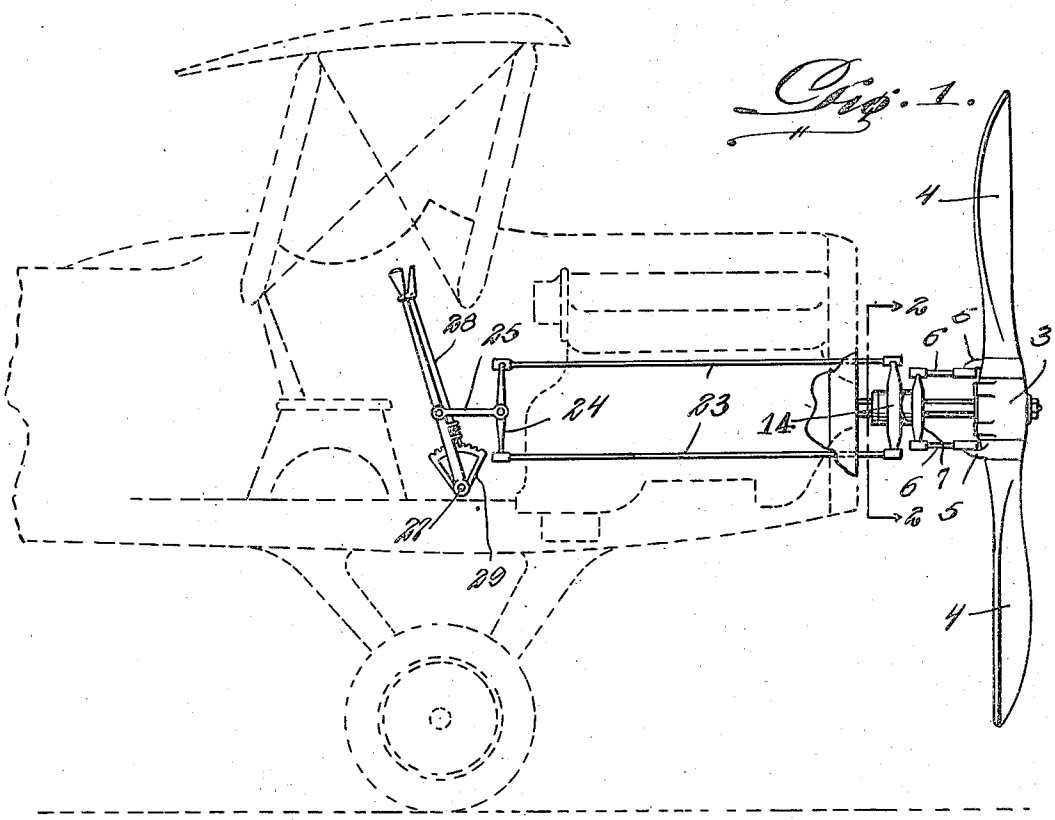
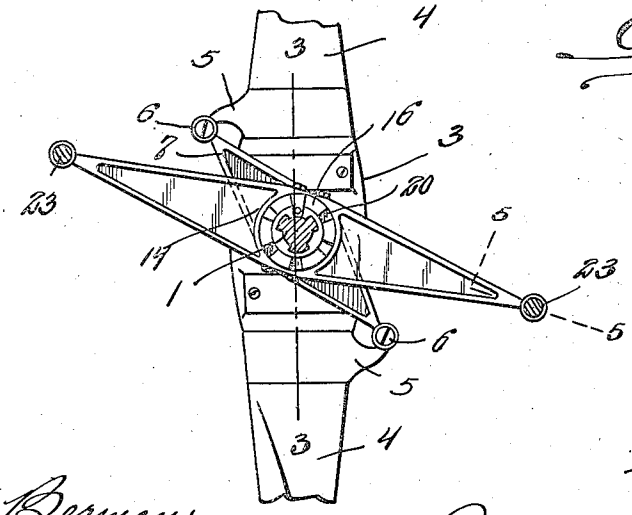


Fig. 2.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

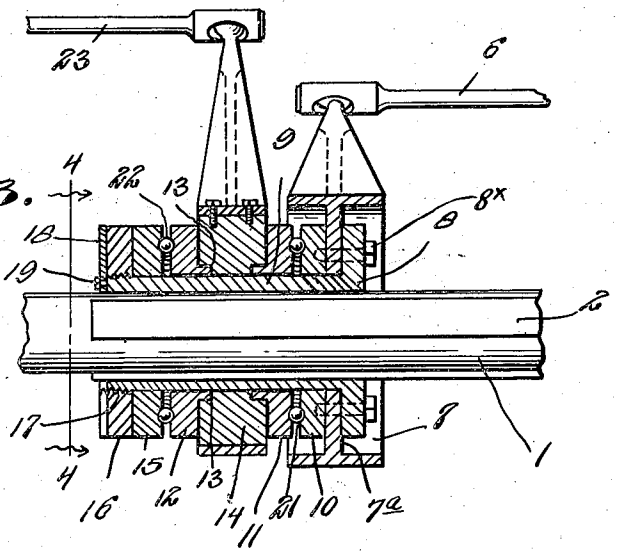
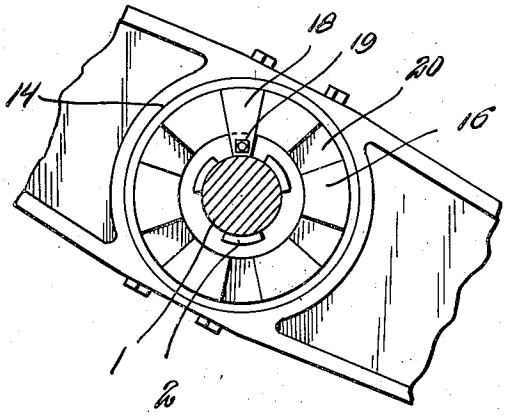


Fig. 4.



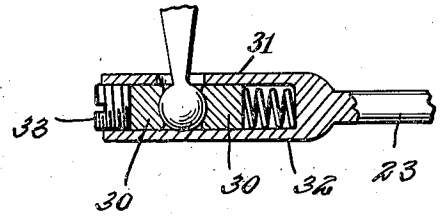


Fig. 5.

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UNITED STATES PATENT OFFICE.

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AEROPLANE PROPELLING MEANS.

1,407,272. Specification of Letters Patent. Patented Feb. 21, 1922.

Application filed March 29, 1921. Serial No. 456,596.

To all whom it may concern:

Be it known that I, DONALD G. HARKINS, a citizen of the United States, residing at Canton, in the county of Haywood and State of North Carolina, have invented new and useful Improvements in Aeroplane Propelling Means, of which the following is a specification.

The object of my present invention is the provision of improved aeroplane propelling means embodying such a construction and relative arrangement of elements that an aviator is enabled to positively and accurately vary the pitch of the propeller blades as conditions require in "taking off," flying and landing.

To the attainment of the foregoing, the invention consists in the improvement as hereinafter described and definitely claimed.

In the accompanying drawings, forming part of this specification:—

Figure 1 is a view showing my improvement in side elevation as properly applied to an aeroplane.

Figure 2 is a transverse section on the line 2—2 of Figure 1.

Figure 3 is a longitudinal section on the line 3—3 of Figure 2.

Figure 4 is a transverse section on the line 4—4 of Figure 3.

Figure 5 is an enlarged detail section taken in the plane indicated by the line 5—5 of Figure 2.

Similar numerals of reference designate corresponding parts in all of the views of the drawings.

The engine shaft 1 of the aeroplane is provided with longitudinal ribs 2, and on said shaft is appropriately fixed a propeller hub 3. Connected to the said hub 3 in such manner that they are capable of being turned about their axes are propeller blades 4 on the inner portions of which are lateral arms 5. Coupled to the extremities of the said arms 5 and extending rearwardly therefrom are connecting rods 6, the rear end portions of which are coupled to a cross-head 7 which for the sake of lightness and strength is of I-form in cross-section as best shown in Figure 3 and has a web 7^a. An annular disk 10 is opposed to the rear side of the said web 7^a. Keyed on the shaft 1 in rear of the cross-head 7 is a sleeve 9 with a flange 8 at its forward end; said flange 8 being opposed to the front side of the web 7^a to receive headed and threaded screws 8^x which extend through the flange 8 and web 7^a and strongly connect the same together and to the disk 10. It will be manifest from the foregoing that the cross-head 7 and the sleeve 9 and the parts connected therewith are susceptible of adjustment endwise of the shaft 1, notwithstanding they are caused in all positions to positively turn with the shaft when the latter is rotated.

The sleeve 9 is exteriorly of circular form in cross-section, and loosely receiving the said sleeve are collars 11 and 12 with opposed and spaced flanges 13 on their inner portions. Interposed between the collars 11 and 12 and loosely receiving the sleeve 9 and the collar flange 13 is a cross-head 14, preferably, though not necessarily of I-form in cross section as illustrated. The said cross-head 14 does not rotate but is designed to be manipulated for the adjustment of the sleeve 9 lengthwise of the shaft 1. Surrounding the sleeve 9 in rear of the collar 12 is a collar 15 which is backed by an adjustable member 16 through the medium of which wear may be taken up when occasion demands. The said adjustable member 16 is threaded at 17 on the rear end portion of the sleeve 9, and is held against casual movement or loosening by a locking plate 18, detachably connected at 19 to the sleeve 9 and designed to be disposed in one of the circular series of recesses 20, provided in the rear face of the member 16, Figure 4. Arranged in a race between the annular disk 10 and the collar 11 are anti-friction balls 21, and similarly arranged in a race between the collar 12 and the collar 15 are anti-friction balls 22. At its ends the cross-head 14 is coupled to the forward end portions of connecting rods 23. The rear end portions of said rods 23 are coupled to the ends of a rod 24, Figure 1, which is connected through the medium of a link 25 with a hand lever 26, fulcrumed at 27 on the fuselage of the aeroplane. The said lever 26 is equipped with a detent 28 for cooperation with a segmental rack 29 fixed on the fuselage. This provision is designed to enable an aviator to first adjust the blades about their common axis, and then adjustably fix said blades.

The four sets of couplings hereinbefore alluded to are preferably of the ball and socket type best shown in Figure 5; the socket sections 30 of each coupling being movably arranged in a housing 31, and subject to the action of a spring 32 and a screw

33 for adjusting the sections 30 and regulating the tension of the spring 32.

In the practical use of my improvement it will be apparent that an aviator is enabled to positively and nicely vary the pitch of the blades 4 and adjustably fix said blades at various angles, and this without subjecting any of the parts to strain and without interfering in any measure with the rotation of the propeller through the medium of the shaft 1. It will also be apparent that my improvement is simple and compact, and, as a whole, is well adapted to withstand the usage to which aeroplane parts are ordinarily subjected.

Having described my invention, what I claim and desire to secure by Letters-Patent, is:—

1. In aeroplane propulsion, the combination of a shaft having a longitudinal rib, a propeller hub fixed to said shaft, propeller blades carried by the hub and adjustable about their axes, a sleeve mounted on the shaft to turn therewith and be moved longitudinally thereof and having a flange at its forward end, a cross-head of I-form having its web surrounding the shaft and opposed to said flange, an annular disk surrounding the shaft and opposed to the rear side of the cross-head web and connected to said web and the flange on the sleeve, rods connecting the propeller blades and said cross-head, spaced flanged collars loosely surrounding the sleeve in rear of the said annular disk, anti-friction balls interposed between the said disk and the forward collar, a cross head loosely surorunding the sleeve and the flanges of the collars and interposed between said collars, a collar disposed in rear of the rear flanged collar, anti-friction balls interposed between said collars, an adjusting member threaded on the rear portion of the sleeve and arranged in rear of the third-named collar and having a circular series of seats in its rear side, a locking plate detachably connected to the sleeve and removably arranged in one of said seats of the adjusting member, and means connected with the second-named cross-head whereby an aviator is enabled to adjust and adjustably fix the blades.

2. In aeroplane propulsion means, the combination of a shaft, a propeller hub fixed thereto, propeller blades carried by the hub and adjustable about their axes, a sleeve mounted on the shaft to turn therewith and to be moved endwise thereof, a cross-head carried by said sleeve, connecting rods between the propeller blades and said cross-head, a cross-head loosely receiving the sleeve and connected with the sleeve to move the same lengthwise of the shaft, and means for adjusting and adjustably fixing the last-named cross-head relatively to the propeller hub.

3. In aeroplane propulsion means, the combination of a shaft, a propeller hub fixed thereto, propeller blades carried by the hub and adjustable about their axes, a sleeve mounted on the shaft to turn therewith and to be moved endwise thereof, a cross-head carried by said sleeve, connecting rods between the propeller blades and said cross-head, a cross-head loosely receiving the sleeve and connected with the sleeve to move the same lengthwise of the shaft, and means for adjusting and adjustably fixing the last-named cross-head relatively to the propeller hub; said means including connecting rods extending rearwardly from said cross-head, a connection between the rear portions of said rods, a lever, means between the said connection and the lever, and means for adjustably fixing said lever.

4. In aeroplane propulsion means, the combination of a shaft, a propeller hub fixed thereto, propeller blades carried by the hub and adjustable about their axes, a sleeve mounted on the shaft to turn therewith and to be moved endwise thereof, a cross-head carried by said sleeve, connecting rods between the propeller blades and said cross-head, a cross-head loosely receiving the sleeve and connected with the sleeve to move the same lengthwise of the shaft, and means for adjusting and adjustably fixing the last-named cross-head relatively to the propeller hub; the second-named cross-head being interposed between flanged collars retained on the sleeve.

5. In aeroplane propulsion means, the combination of a shaft, a propeller hub fixed thereto, propeller blades carried by the hub and adjustable about their axes, a sleeve mounted on the shaft to turn therewith and to be moved endwise thereof, a cross-head carried by said sleeve, connecting rods between the propeller blades and said cross-head, a cross-head loosely receiving the sleeve and connected with the sleeve to move the same lengthwise of the shaft, and means for adjusting and adjustably fixing the last-named cross-head relatively to the propeller hub; the second-named cross-head being interposed between flanged collars retained on the sleeve; and the collars being adjustably locked against movement endwise of the sleeve.

In testimony whereof, I affix my signature.

DONALD G. HARKINS.