W. H. LEINWEBER.

PROPELLER.

APPLICATION FILED JUNE 10, 1918.

1,401,992.

Patented Jan. 3, 1922.

4 SHEETS—SHEET 1.

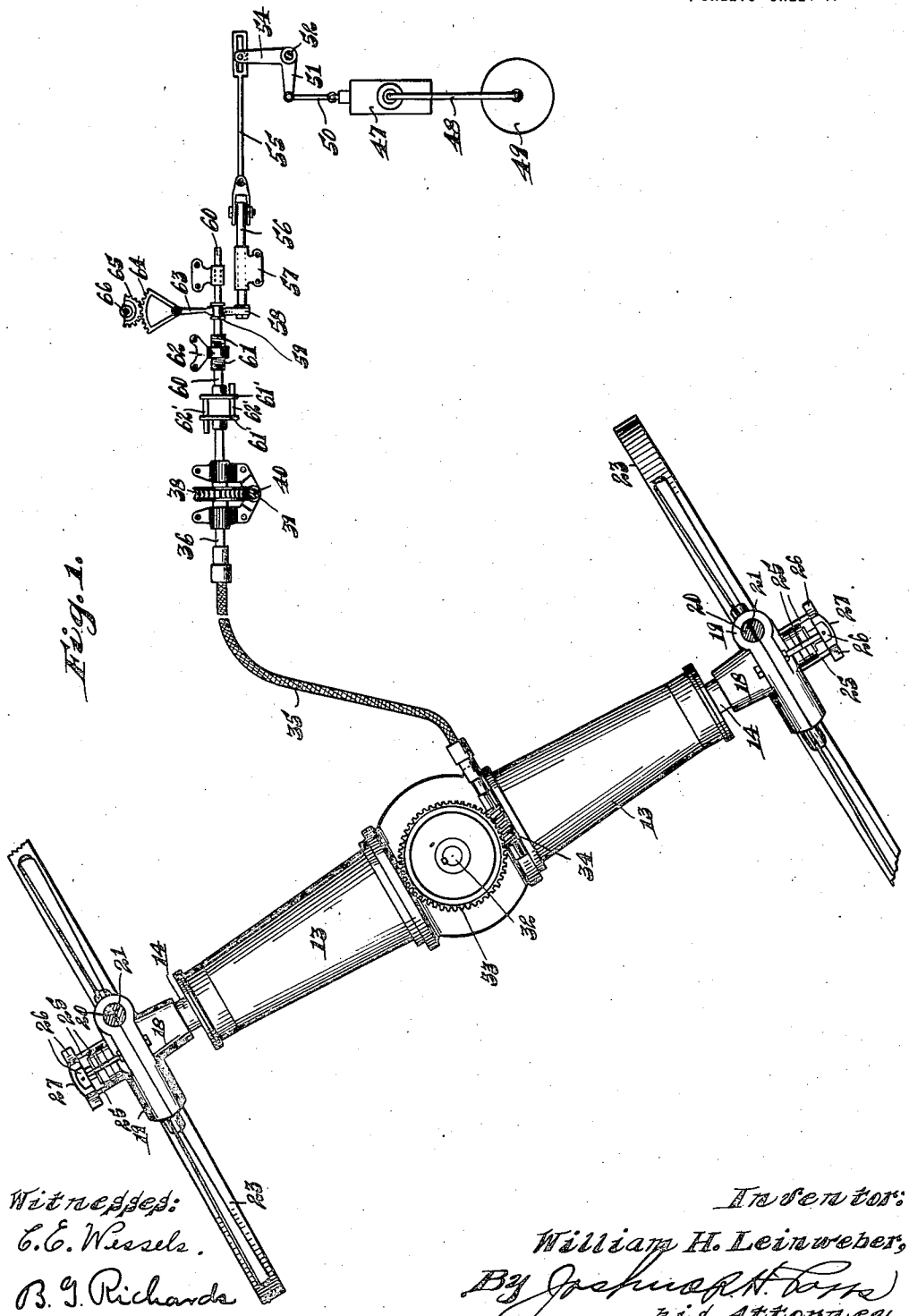


Fig. 1.

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B. G. Richards

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By Joshua R. H. Potts
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4 SHEETS—SHEET 2.

Fig. 2.

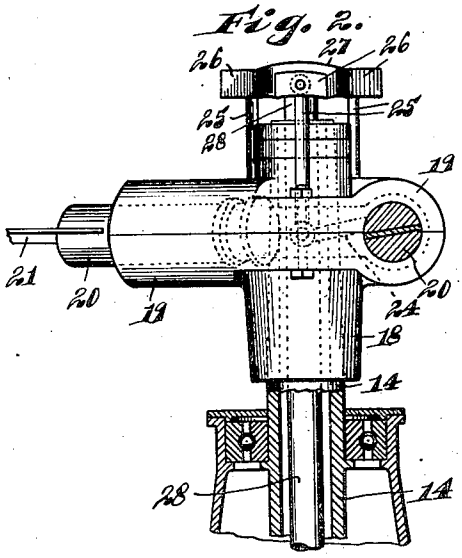
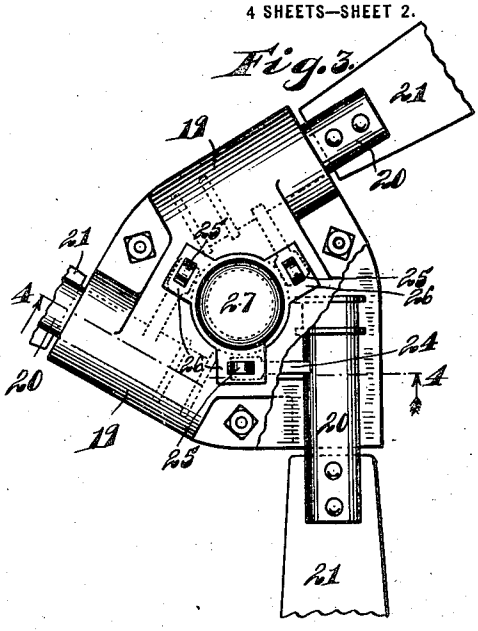


Fig. 3.



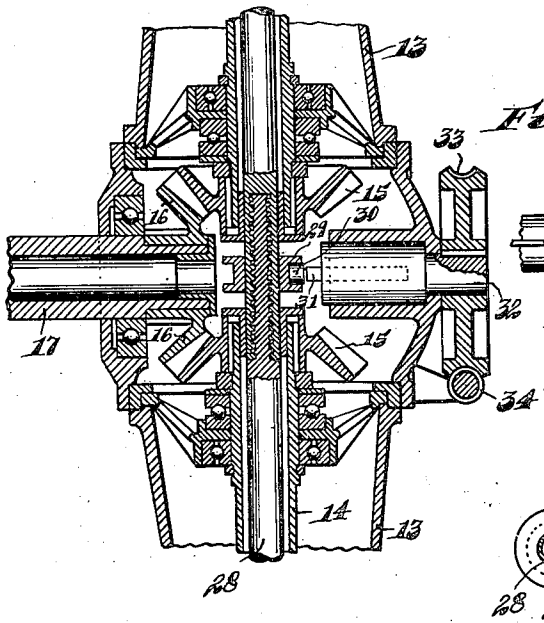
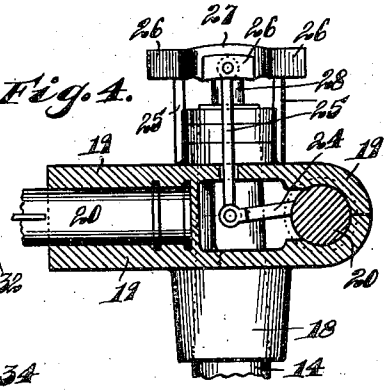


Fig. 4.



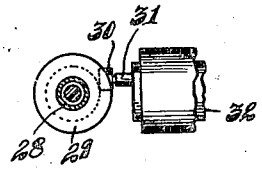


Fig. 5.

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4 SHEETS—SHEET 3.

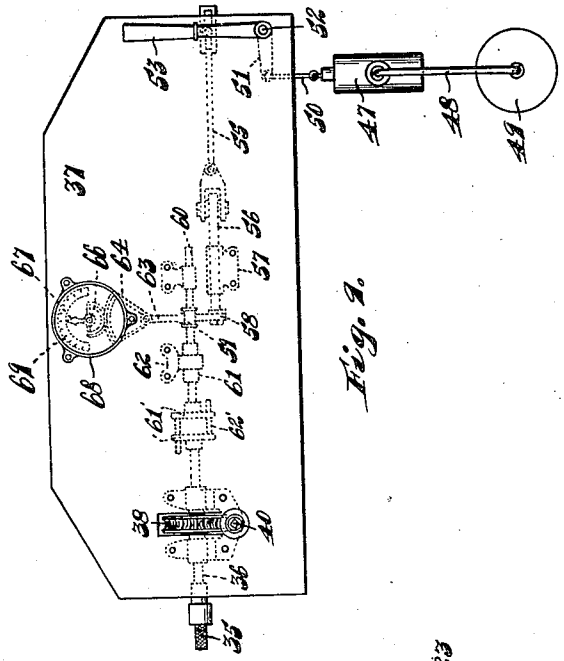


Fig. 5.

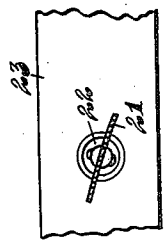


Fig. 8.

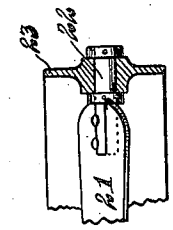


Fig. 7.

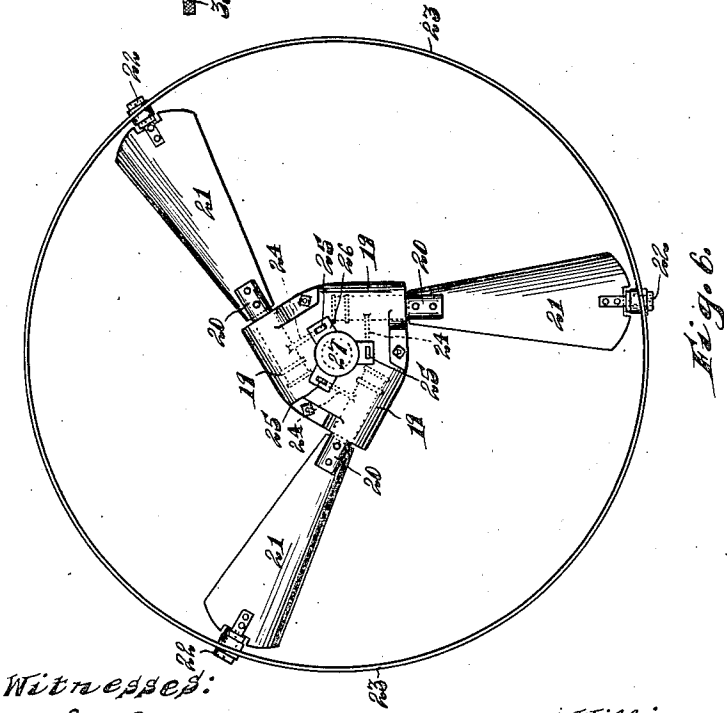


Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 11.

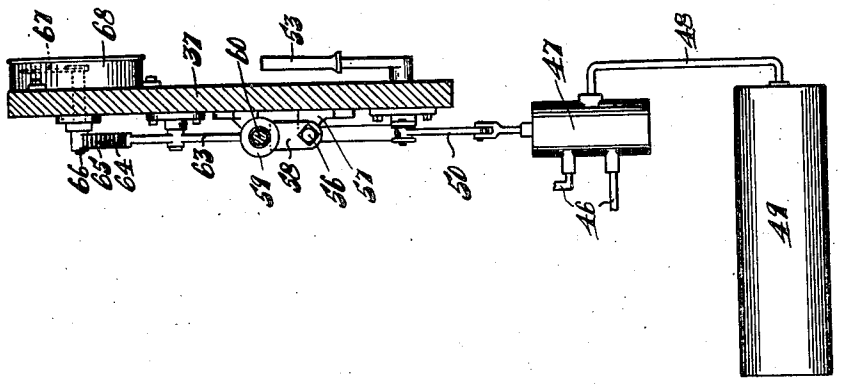
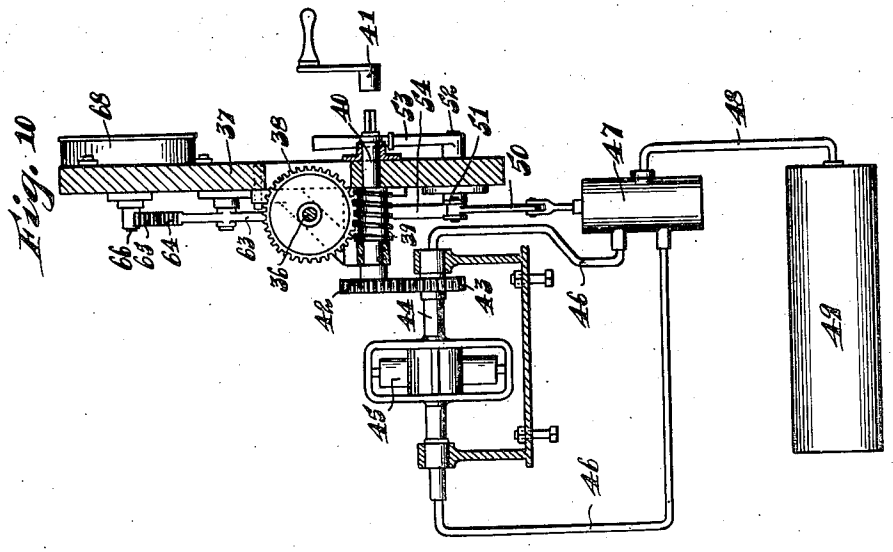


Fig. 10



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM H. LEINWEBER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO CONTINENTAL AIR CRAFT & TRANSPORTATION COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ARIZONA.

PROPELLER.

1,401,992. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed June 10, 1918. Serial No. 239,168.

To all whom it may concern:

Be it known that I, WILLIAM H. LEINWEBER, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

My invention relates to improvements in propellers, and more particularly to means for adjusting the pitch of the propeller blades at any time while in or out of 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,

Fig. 1, is a face view illustrating a propeller mechanism embodying the invention,

Fig. 2, an enlarged detail section, partially in elevation, illustrating a portion of the propeller mechanism,

Fig. 3, a top plan view corresponding with Fig. 2,

Fig. 4, a section taken on line 4—4 of Fig. 3,

Fig. 5, a detail view illustrating the connection employed in adjusting the propeller blades,

Fig. 6, a plan view of the propeller proper,

Fig. 7, a detail section illustrating the mounting of the outer end of one of the propeller blades,

Fig. 8, a section at right angles to Fig. 7,

Fig. 9, a view of the dash or mounting board illustrating means for controlling the adjustments of the propeller blades,

Fig. 10, a transverse section through said mounting board, and

Fig. 11, another transverse section through said mounting board.

The preferred form of construction, as illustrated in the drawings, comprises a tubular casing 13 having two tubular shafts 14 rotatably mounted therein, in axial alinement with each other. At its inner end each of the shafts 14 carries a bevel gear 15 meshing with a bevel gear 16 on the end of a tubular shaft 17 projecting centrally into the casing 13 from one side thereof, and whereby shafts 14 will be rotated in opposite directions by shaft 17, while permitting of angular adjustments of casing 13 on shaft 17. At its outer end each of the shafts 14 carries a hub or head 18, having three tangentially arranged bearings 19 therein. A bearing head 20 is rotatably mounted in each of the bearings 19 and carries a propeller blade 21 having a stud or pintle 22 at its outer end, pivoted in a corresponding rim 23, as shown, and whereby the angularity or pitch of the propeller blades 21 is rendered adjustable. Each of the bearing heads 20 carries a rocker arm 24 connected by a link 25 with a corresponding arm 26 on a central head 27 secured to the end of an operating shaft 28, slidably mounted in the corresponding tubular shaft 14. The respective shafts 28 are swiveled together at their inner ends so as to permit of rotation in opposite direction but to compel longitudinal movement together. A grooved collar 29 is fixed to the shafts 28 at their juncture, and a roller 30 is arranged to travel in the groove in said collar. The roller 30 is mounted at the inner end of a pin or arm 31 mounted eccentrically on the inner end of a shaft 32 carrying a worm wheel 33 meshing with a worm 34, arranged to be driven by a flexible shaft 35, as shown, said shaft 35 permitting of angular adjustments of the casing 13, as will be readily understood.

The other end of flexible shaft 35 is operatively connected with a rigid shaft 36 mounted on a dash or controlling board 37, as indicated. Shaft 36 carries a worm wheel 38 meshing with a worm 39 on a shaft 40 extending transversely through board 37, and equipped with a crank 41 whereby said shaft 40 may be operated to adjust the angularity or pitch of the propeller blades 21 while in or out of operation, as desired.

Shaft 40 is also connected by a gear 42 with a gear 43 on a motor shaft 44 driven by a reversible air motor 45. Motor 45 is supplied with air through pipes 46 from a two-way valve 47, supplied with compressed air through a pipe 48 from a compressed air tank 49, the arrangement being such that by manipulations of valve 47 the motor 45 may be rotated or driven in either direction, as desired.

Valve 47 is connected by a link 50 with a rocker arm 51 on a rocker shaft 52 on the control board 37, said rocker shaft 52 being

provided with an operating handle 53, as indicated, to permit of manual operation of valve 47 when desired. Shaft 52 also carries another rocker arm 54 having a slot and pin connection with a link 55 connected with a guide rod 56, slidable in a bracket 57 secured to board 37, as shown. Rod 56 carries a finger 58 operating in a grooved collar 59 on a shaft 60 also mounted on board 37. Shaft 60 carries a screw-threaded hub or enlargement 61 threaded in a bracket 62 secured to board 37, as best shown in Fig. 1, and shaft 60 is mounted in axial alinement with shaft 36, as shown. The adjacent ends of shafts 36 and 60 are equipped with face plates 61′ carrying pins 62′ operating loosely through holes in the opposite plates, and whereby shafts 60 and 36 will be caused to rotate together, but shaft 60 is free for longitudinal movement with respect to shaft 36. A lever 63 is also operatively connected with the grooved collar 59 and carries a segmental gear 64 meshing with a segmental gear 65 on a shaft 66 carrying an indicator finger 67 and arranged in a casing 68 equipped with a graduated scale 69, as shown. By this arrangement, when the motor 45 is thrown into operation by means of the handle 53, and the propeller blades 21 have been adjusted through a predetermined angle, shaft 60, rotating with shaft 36 and traveling longitudinally by virtue of the screw-threads 61 will move rocker arm 54 to rock the shaft 52 to close the valve 47, thus preventing too great angular adjustments of the propeller blades in either direction. The indicator finger 67 and its cooperating parts constitute a degree meter to indicate and register the degree of angularity of the propeller blades for the guidance of the operator.

The construction set forth is especially adapted for use on airships, where it is frequently desirable to adjust or vary the thrust or effect of propellers while the same are in operation or are being angularly adjusted to vary the direction of their thrust. The specific arrangement of parts is a simple and effective one for the purpose.

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 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. In apparatus of the class described a blade pivoted to permit change of pitch thereof, both power driven and manually operated means to change the pitch of said blade, and means to automatically limit the extent of operation of said first mentioned means.

2. In apparatus of the class described a blade pivoted to permit change of pitch thereof, means to change the pitch of said blade, means to automatically limit the extent of operation of said first mentioned means, said automatic means having two co-operating rotatable alined shafts, one of which is held against longitudinal movement, and the other of which is longitudinally movable.

3. In apparatus of the class described a plurality of blades, each pivoted to permit change of pitch thereof, power driven means to change the pitch of said blades while in operation and movable means to automatically limit the extent of operation of said first mentioned means.

4. In apparatus of the class described a blade pivoted to permit change of pitch thereof, means to change the pitch of said blade comprising a motor and a pair of connected rotatable shafts one of which is longitudinally movable with relation to the other, means on said movable shaft to impart longitudinal movement to it when it is rotated, and means operated by the longitudinal movement of said movable shaft to limit the extent of operation of said motor.

5. A propeller mechanism comprising a driving shaft; a tubular casing mounted on the end of said driving shaft, said shaft extending thereinto; hollow shafts in said casing in alinement with each other and perpendicular to said driving shaft; bevel gears connecting said hollow shafts with said driving shaft; adjusting shafts within said hollow shafts and swivelled together; means for longitudinally moving said adjusting shafts; angularly adjustable propeller blades at the ends of said hollow shafts; and operative connections between said propeller blades and said adjusting shafts, substantially as described.

6. A propeller mechanism comprising a driving shaft; a tubular casing mounted on the end of said driving shaft, said shaft extending thereinto; hollow shafts in said casing in alinement with each other and perpendicular to said driving shaft; bevel gears connecting said hollow shafts with said driving shaft; adjusting shafts within said hollow shafts and swivelled together; means for longitudinally moving said adjusting shafts; a hub at the outer end of each of said hollow shafts; bearing hubs movably mounted substantially tangentially in said hubs; propeller blades secured to said bearing hubs; and an operative connection between said adjusting shafts and said bearing hubs, substantially as described.

7. A propeller having a blade pivoted to

change the pitch thereof, a motor connected to operate said blade, and automatically acting means for limiting the extent of operation of said motor to prevent too great angular adjustment of the blade in either direction, substantially as described.

8. A propeller having a plurality of blades pivotally mounted to permit of changing the pitch thereof; a motor connected to adjust said blades simultaneously; and means for automatically limiting the extent of operation of said motor to prevent too great angular adjustment of the blade in either direction, substantially as described.

9. A propeller having a plurality of blades, pivotally mounted to permit of changing the pitch thereof, in combination with a motor connected to adjust said blades simultaneously, and means for automatically cutting off the operating force from the motor.

10. An air screw having a plurality of blades pivotally mounted to permit of changing the pitch thereof, a motor connected to adjust said blades, simultaneously, means for automatically and manually limiting the extent of operation of said motor to prevent too great angular adjustment of the blades in either direction, and means associated with said first mentioned means to indicate the amount of angular adjustment of said blades, substantially as described.

11. The combination with a propeller for aircrafts having an adjustable propeller blade, of a motor arranged to adjust said blade, and means operatively actuated by said motor to indicate the degree of adjustment of said blade, whereby the angularity of said blade may be adjusted a small amount with precision or a larger amount quickly to enable perfect control in aircraft operation.

12. The combination with a propeller having adjustable propeller blades, of a motor arranged to adjust said blades; a degree meter operatively connected with said motor to indicate the degree of adjustment of said blades; and means for automatically limiting the extent of operation of said motor to prevent too great angular adjustment of the blade in either direction, substantially as described.

13. In apparatus of the class described, a blade pivoted to permit change of pitch thereof, means to change the pitch of said blade, means to automatically limit the extent of operation of said first mentioned means, said automatic means comprising two co-operating rotating alined shafts, one of which is held against longitudinal movement, and the other of which is longitudinally movable, and connections between the said shafts and the pitch changing means.

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

WILLIAM H. LEINWEBER.

Witnesses:
JOSHUA B. H. POTTS,
HELEN F. LILLIS.