P. LEVASSEUR.

AERIAL PROPELLER.

APPLICATION FILED JULY 25, 1918.

1,389,146.

Patented Aug. 30, 1921.

2 SHEETS—SHEET 1.

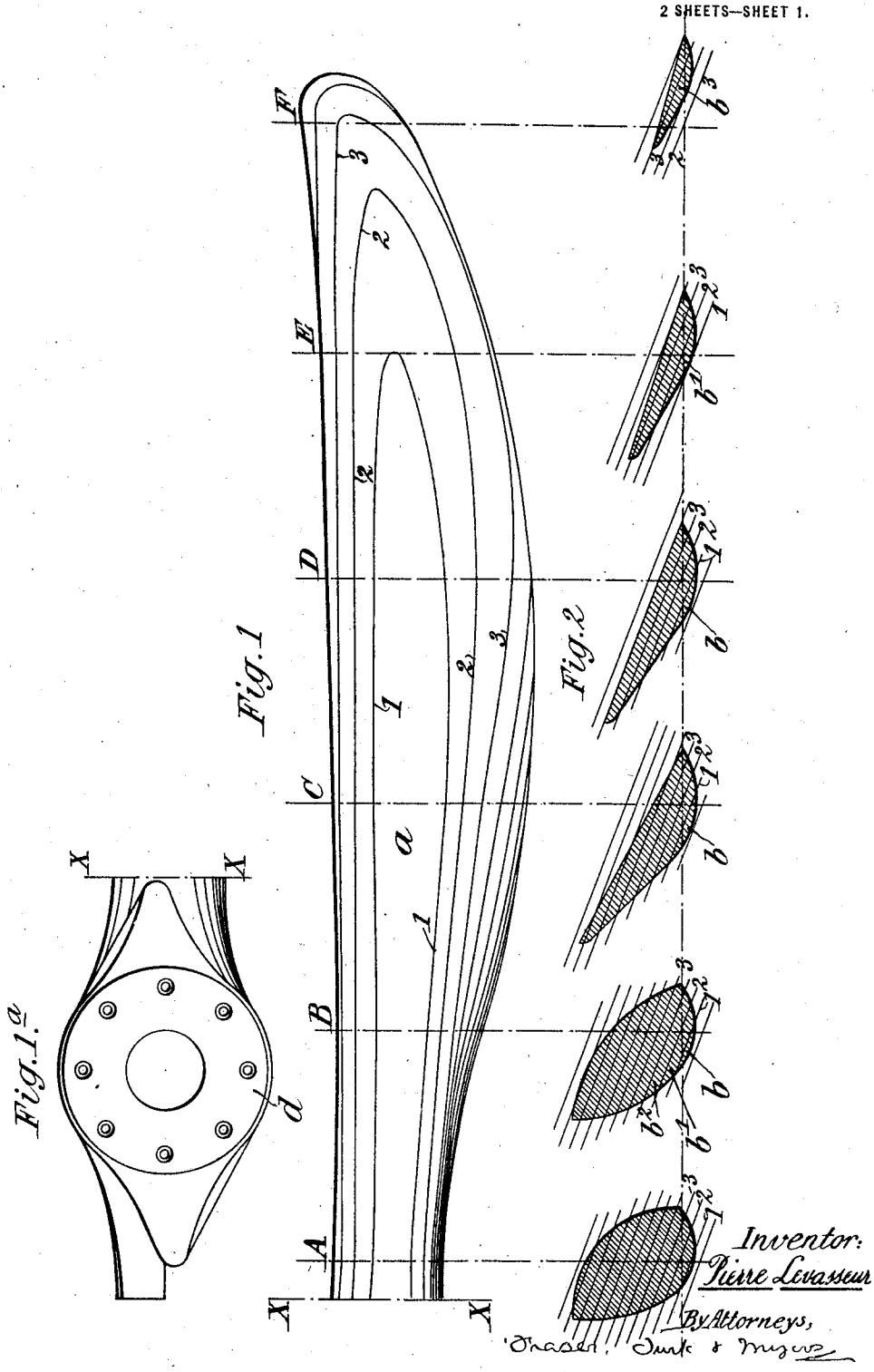


Fig. 1.

Fig. 2.

Fig. 1a.

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2 SHEETS—SHEET 2.

Fig. 5.

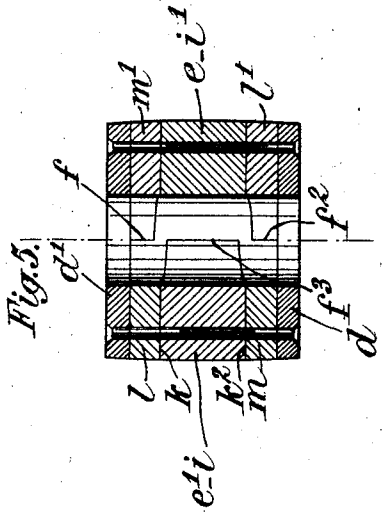


Fig. 6.



Fig. 3.

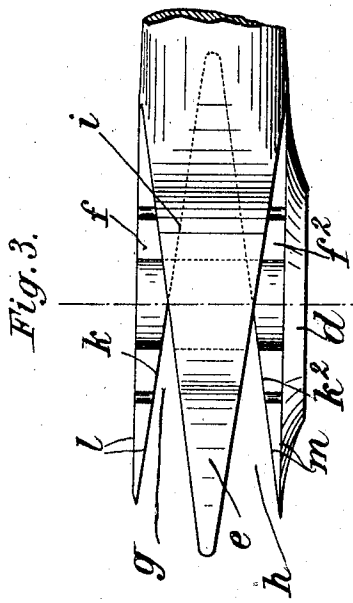
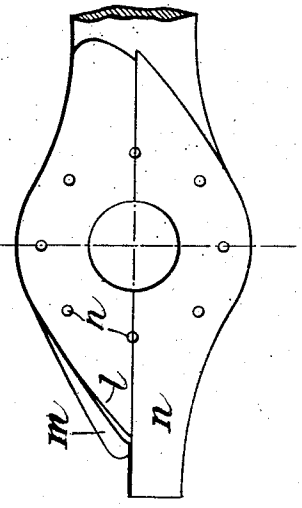


Fig. 4.



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UNITED STATES PATENT OFFICE.

PIERRE LEVASSEUR, OF PARIS, FRANCE.

AERIAL PROPELLER.

1,389,146. Specification of Letters Patent. Patented Aug. 30, 1921.

Application filed July 25, 1918. Serial No. 246,657.

To all whom it may concern:

Be it known that I, PIERRE LEVASSEUR, a citizen of the Republic of France, residing at 140bis Rue de Javel, Paris, Seine, France, have invented certain new and useful Improvements in or Relating to Aerial Propellers, of which the following is a specification.

The present invention has for object, a propeller of improved design. The invention allows of the employment of wood which has been subjected to less rigorous inspection as regards dimensions and quality than is generally employed. The invention further provides a propeller which gives greater solidity and security in a very marked degree. These results are obtained by making the propeller in two distinct parts (for two-bladed propellers). These two parts suitably joined, are each one made of superimposed layers of wood in such a manner that their surfaces of connection are approximately normal to the pressure exerted by the air during the period of rotation. A special means of assembly solidly unites the two parts of the propeller. The structure of this propeller is characterized by the fact that the superimposed layers of wood which form the blades are parallel to two diferent planes which correspond respectively to an orientation approximately perpendicular to the reaction of the air on the blades. This disposition permits of causing the blades to work normally to the flexion strains in a manner similar to wagon springs, and acts to avoid ungluing.

The invention will be readily understood by the aid of the annexed drawing which shows one method of construction of propellers thus described, and shows its particularities and advantages.

Figs. 1 and 1a are together a view seen from below of one of the blades.

Fig. 2 shows a series of sections A, B, C, D, E, F, Fig. 1 and turned around into the plane of the drawing.

Fig. 3 is a side view of the part of the half of the propeller carrying the connecting piece.

Fig. 4 is a plan thereof.

Fig. 5 is a section of the connecting piece when connected perpendicular to the screw, and (parallel) to its axis of rotation.

Fig. 6 shows the extremity of a propeller constructed in the ordinary manner.

It is known that aerial propellers are generally composed of layers of wood of a length equal to their diameter superimposed in planes perpendicular to the axis of rotation. The propeller of which one half is shown on the first five figures mentioned above, is composed of two separate parts, each one forming one of the blades and a portion of the nave. These parts machined separately are joined when completed by a hub device which makes them solidly homogeneous.

If the different sections on the blade A in Fig. 2 are examined, it is seen that the lines 1, 2, 3, etc., in the drawings instead of being parallel to the horizontal plane as in the majority of propellers, or of following a direction which varies according to the sections as has been attempted in certain patterns, are all parallel to a given direction. This direction is determined by the reaction of the air on the blade, which reaction is approximately normal to the blade, since the orientation of this varies appreciably from the center to the extremity of the propeller. In practice, by these means, a higher efficiency is obtained than is obtained in other systems in a cheap and easy manner of construction.

The layers b, b' etc., are glued one on the other and are disposed in planes parallel with the face of the propeller near the mid section of the propeller. By these means, the pressure of the air instead of exerting on the different layers an action which tends to cause them to slide one on the other, and even to separate them, which occurs in certain cases, (see Fig. 6) continually press them as one against the other. The tendency for the parts to become unglued is consequently eliminated.

On the other hand, one sees on examining Fig. 1, that on the non-working face of the blade, that the solid formed by a blade of the propeller is constituted in such a manner (see lines 1, 2 and 3 in the drawings) as to meet flexion strains in the same way as laminated carriage springs. This is not the same as with propellers as hitherto constructed, where the layers are subjected to torsion.

The results are that with propellers made in accordance with this invention solidity is increased whereby it is possible to reduce the thickness of the blades, particularly at the extremity of the periphery of the blades so that there is no longer any limit to the

minimum thickness imposed by reason of construction.

In the propellers in which the layers are perpendicular to the axis of rotation, if the thickness is too much reduced at the extremity, the solidity of the propeller is jeopardized. On examining Fig. 6 it will be seen that not only is the gluing surface very small, but an upsetting or reversing couple about the edge S has been formed by the reaction of the air, which tends to unglue the two layers. If it is borne in mind that this extremity rotates the most rapidly of any part of the propeller, and that its effect cannot be neglected; it will be seen that a serious defect is overcome by the applicant. In order to solidly connect the two blades thus constructed a sound connection must be used which will neither weaken nor fatigue the wood. Such connection is shown in Figs. 3, 4 and 5. It consists as regards each part of the propeller of tenons and mortises symmetrically disposed within a boss to form the hub.

The engagement of the two parts is made by pushing the tenons into the corresponding mortise.

Each one of the parts of the connection comprises a tenon e in the form of a wedge, having its inner face f^3 flush with the middle section of the propeller. The inclined faces of this tenon form with the median plane, hollows g h, situated on either side of the tenon. In particular the hollow h limited by the base of the flange d constitutes a mortise. In the posterior portion the mortise i formed by the median face f^3 of the tenon e and the two inclined faces k k^2, corresponds in shape to this tenon. These form two bodies in the shape of wedges l and m above and below. Finally, the base of this mortise is rounded to prevent the splitting of the wood, and the extremity of the tenon is shaped correspondingly. If one imagines the two parts of the propeller thus constructed to be placed end to end and if the left hand one is rotated and the right one is pushed, the two parts will be joined perfectly.

The mortise i' of the left part connects with the tenon e in the right part, in such a manner that the wedges l', m' coact. One wedge fits in the hollow g; the other in the hollow h.

In the posterior part, the tenon e' of the left part which is passed behind the median plane, enters into the mortise i of the right part, while the parts l m engage themselves in the corresponding hollows.

In this manner the contact and coaction of the pieces is assured in all direction except that of disconnection. In this direction, the separating of the two parts is completely prevented by the shaft which passes through the central part. Finally, bolts passing through the holes n of the boss complete the connection.

In Fig. 5 the position of the different parts is clearly seen; and the median plane is flush with the faces f, f^2, f^3. On examining this figure, it is seen that the torsional strains are transmitted by the faces f, f^2, f^3, and that the two halves of the propeller behave as if the propeller consists of one single block.

It is evident that this connection can be suitably modified within the limits of the invention, while the number of blades can be more than two.

What I claim and desire to secure by Letters Patent is:—

1. In a propeller a plurality of blades, each composed of plane layers of wood disposed in planes parallel to a plane which is approximately perpendicular to the reaction of the air on the blades.

2. A propeller comprising a plurality of blades one end of each of which is provided with a tenon and mortise adapted to coact, flanges on each side adapted to clamp said ends together each of said blades being composed of plane layers of wood disposed in planes parallel to a plane which is approximately perpendicular to the reaction of the air on the blades.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

PIERRE LAVASSEUR.

Witnesses:
JOHN F. SIMONS,
HENRI CARTIER.