

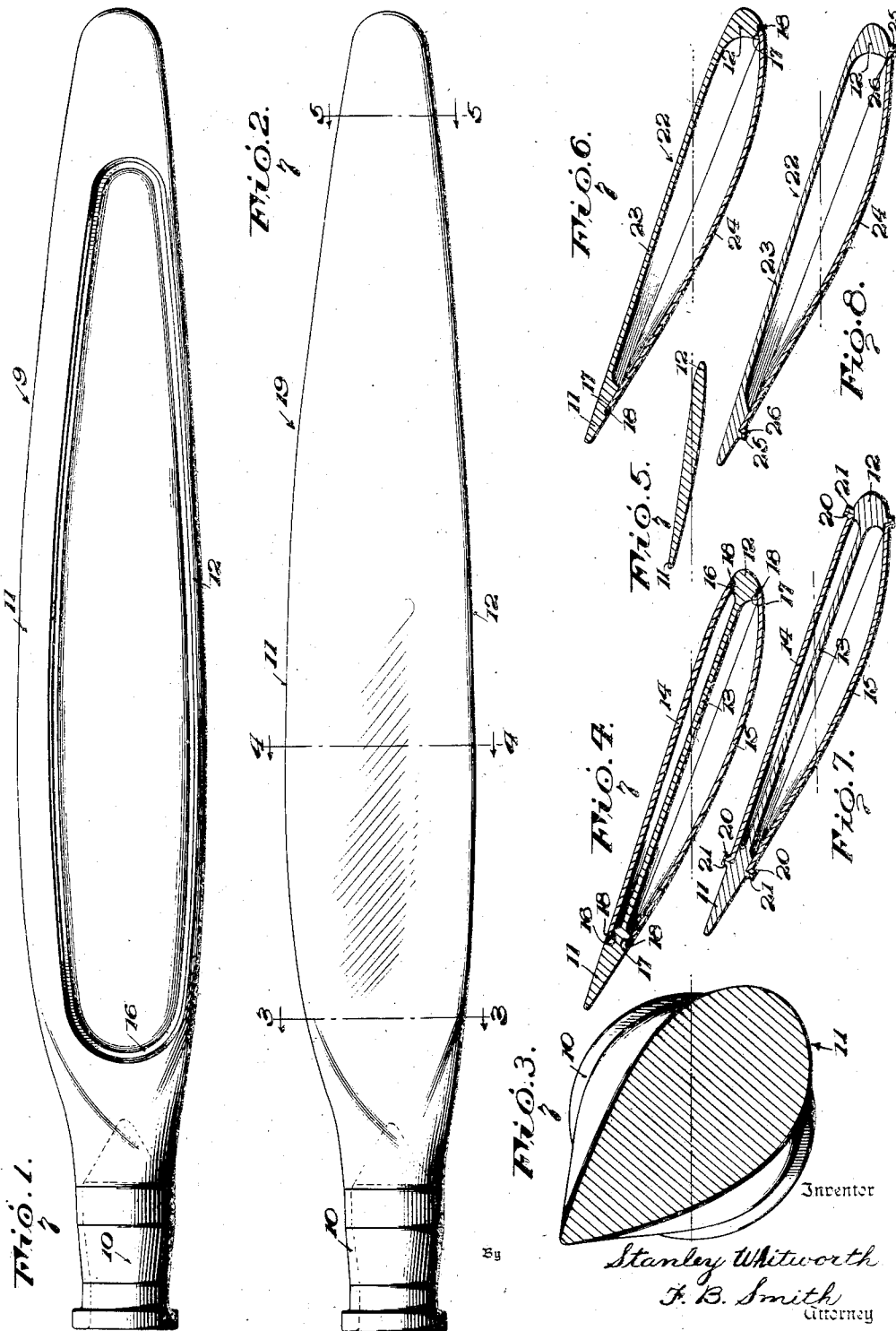
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PROPELLER BLADE AND METHOD OF MAKING THE SAME

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PROPELLER BLADE AND METHOD OF
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This invention relates to propellers, and more particularly to hollow metal propeller blades and the method of constructing the same.

Propellers of the hollow metal type have heretofore been proposed, and such propellers have been characterized by structures wherein sheet metal members are rolled or otherwise suitably shaped to form the faces of the blades and are thereafter united along their marginal edges by a suitable welding process, in order to form a unitary, integral structure. In such constructions, however, it has been determined that when the welded seams or joints are formed coincident with the leading and trailing edges of the blade, a weak construction results, in that during operation of a propeller so constructed there will be a tendency for such seams to open due to the location thereof at a position in the blade which should be materially strengthened.

It is accordingly one of the objects of the present invention to provide a novel propeller construction so constituted as to avoid the above difficulties.

Another object of the invention is to provide a hollow metal propeller comprising a plurality of parts which are united in a novel manner.

Still another object is to provide in a hollow metal propeller blade, a novel construction whereby the component parts are secured together in such a manner as to avoid seams or joints at the leading and trailing edges of the blade.

Another object is to provide a metal propeller wherein the seams or joints between the various parts are located between the leading and trailing edges of the blade and are constituted in a novel manner, thereby producing a propeller blade of extreme strength and rigidity.

A further object is to provide in a propeller blade construction of the above character, a novel arrangement of parts including a blade reinforcing member, the outer periphery of which is adapted to form the leading and trailing edges of the blade.

A still further object is to provide a lightweight hollow metal propeller blade constituted by a plurality of parts of novel construction which are united or secured together in a novel manner to produce a blade having exceptionally durable qualities.

Other objects and novel features of the invention will appear more fully hereinafter from the following detailed description when taken in connection with the accompanying drawing. It is to be expressly understood, however, that the draw-

ing is for the purpose of illustration only and is not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawing wherein similar reference characters denote like parts throughout the several views:

Fig. 1 is a plan view of a blade member constituting a portion of a propeller blade constructed in accordance with the present invention;

Fig. 2 is a plan view of a completed propeller blade;

Figs. 3, 4, and 5 are transverse sections of a finished propeller blade taken on lines 3—3, 4—4, and 5—5 respectively of Fig. 2;

Fig. 6 is a transverse section of a propeller blade illustrating a slightly modified form of the invention;

Fig. 7 is a transverse section of a blade similar to the blade shown in Figs. 1—5 but illustrating a modified form of the construction for securing the blade members together; and

Fig. 8 is a transverse section of a blade similar to that shown in Fig. 6 but illustrating a modified form of the construction for securing the blade members together.

Referring more particularly to Figs. 1—5, a hollow built-up metal propeller blade constructed in accordance with the present invention, is illustrated therein as being constituted by a blade reinforcing element or member 9 extending the full length of the blade desired to be produced, and having an integrally formed root 10 adapted to be received in the usual propeller hub. This member may be forged or otherwise suitably formed from a single metal blank, and is preferably so constituted that the outer marginal portions 11 and 12 thereof serve as the trailing and leading edges respectively of the completed blade, it being pointed out that sufficient metal is disposed at these regions to effect a substantially rigid construction. As shown in Figs. 4 and 7, the marginal portions 11 and 12 of the blade reinforcing member 9 are interconnected by an integral web portion or metal plate 13.

In order to complete the exterior surface of the blade element 9, a pair of surface or cover members 14 and 15 are secured thereto, and preferably these members are attached to the element between the edges 11 and 12, or in other words, rearwardly of each edge. As shown, each of the aforementioned edges is provided with under cut ledges 16 and 17 of substantial elliptical outline, Fig. 1, and constituting seating means for receiving the outer peripheral portions of the surface

members 14 and 15 respectively. The surface members may be united to the marginal portions 11 and 12 by a suitable welding process, the line of the weld being indicated at 18, and any excess metal produced by such process may be thereafter ground off and the resultant blade burnished and polished in any suitable manner to form the completed blade 19. If desired, the root 10 of the blade may be recessed internally as illustrated in order to reduce the weight thereof.

Fig. 7 illustrates a slightly modified form of the method for uniting the surface members 14 and 15 to the marginal portions 11 and 12. As herein illustrated, each of the surface members is provided with upturned peripheral flanges 20 which are adapted to cooperate with flanges 21 formed on the marginal portions 11 and 12, and these flanges are fused together to form a substantially integral and rigid connection between these parts, any excess metal being ground off, and the blade completed as heretofore described.

A slightly modified form of the invention is illustrated in Fig. 6, this form being characterized by the provision of a single additional surface member only. In this form of the invention, the blade reinforcing element 22 is so formed that the web 23, interconnecting the edge portions 11 and 12, constitutes one of the surface members or faces of the finished blade, the other face of the blade including a surface member 24, the outer periphery of which may be welded to the edges 11 and 12 in a manner similar to that described in connection with Fig. 4.

Fig. 8 illustrates a slightly different method of securing these parts together, the same being constituted by the fusing together of upturned peripheral flanges 25 and 26, provided on the edges 11 and 12 and the surface member 24 respectively, and the subsequent removal of excess metal in order to obtain a smooth blade.

There is thus provided by the present invention a novel propeller blade and method of producing the same, the said blade being constituted by a plurality of metal members constructed and arranged in a novel manner whereby to produce a hollow metal blade of exceptional durability and strength. The provision of the blade reinforcing member, the marginal portions of which are formed to constitute the leading and trailing edge portions of the blade, insures great rigidity of the finished blade. The uniting of the surface forming members to the leading and trailing edge portions, rearwardly of the latter, and by fusing these parts together eliminates all joints and seams coincident with the marginal periphery of the blade and greatly amplifies the attachment of these parts.

While there has been shown and described several embodiments of the invention, it will be understood that the same is not limited thereto, but may be embodied in various other forms, as well understood by those skilled in the art. Reference will therefore be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A hollow metal propeller blade comprising an integrally-formed blade reinforcing member the peripheral portions of which form the leading and trailing edges of the blade, said peripheral portions being interconnected by a substantially

flat web portion and being provided with ledges inwardly of the periphery of said member, and cover means disposed on either side of said reinforcing member and spaced from said web portion, the marginal edges of said cover means being received in said ledges, said cover means forming with said peripheral portions a blade of aerofoil section, and means for securing said peripheral portions and said cover means together.

2. A propeller blade comprising a web member having marginal ledges on either side thereof, surface-forming members spaced from said web member, the edges of said surface members being received in said marginal ledges and attached to said web member.

3. A propeller blade comprising a web portion and surface-forming members, edge-receiving means formed on said web portion on either side thereof, the edges of said surface-forming members being received in said edge-receiving means and being attached to said web portion.

4. A propeller blade including a web member, surface-forming members for said blade, the peripheries of said surface-forming members being attached to said web member upon either side thereof inwardly of the margin of said web member.

5. A hollow propeller blade comprising a web portion, a pair of surface-forming members spaced from said web portion, and connected thereto upon either side thereof inwardly of the marginal edge thereof.

6. A hollow metal propeller blade comprising a forged integrally-formed blade reinforcing member, the peripheral portions of which form the leading and trailing edges of the blade, said peripheral portions being interconnected by a substantially flat web portion and being provided with ledges inwardly of the periphery of said member, and cover means disposed on either side of said reinforcing member and spaced from said web portion, the marginal edges of said cover means being welded in said ledges, said cover means forming with said peripheral portions a blade of aerofoil section.

7. A propeller blade comprising a web portion having marginally-disposed ledges upon either side thereof, surface-forming members spaced from said web portion and attached thereto by welding the edges of said members in said ledges.

8. A propeller blade comprising a web member, ledges formed in said member upon either side thereof, surface-forming members for said blade, the edges of said surface-forming members being received in said ledges and welded therein.

9. A method of producing a hollow metal propeller blade comprising forging a blade reinforcing member having leading and trailing edges interconnected by a web portion, forming ledges on said leading and trailing edges inwardly thereof and on either side of said web portion, forming a pair of blade members of an area equal to the areas defined by said ledges respectively, fusing the marginal portions of said blade members to said blade reinforcing member to unite these parts, and finishing the exterior surface of the hollow blade thus formed to smooth the contour thereof.

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