J. L. SCOTT.

PROPELLER.

APPLICATION FILED JUNE 2, 1914.

**1,142,916.**

Patented June 15, 1915.

Fig. 1.

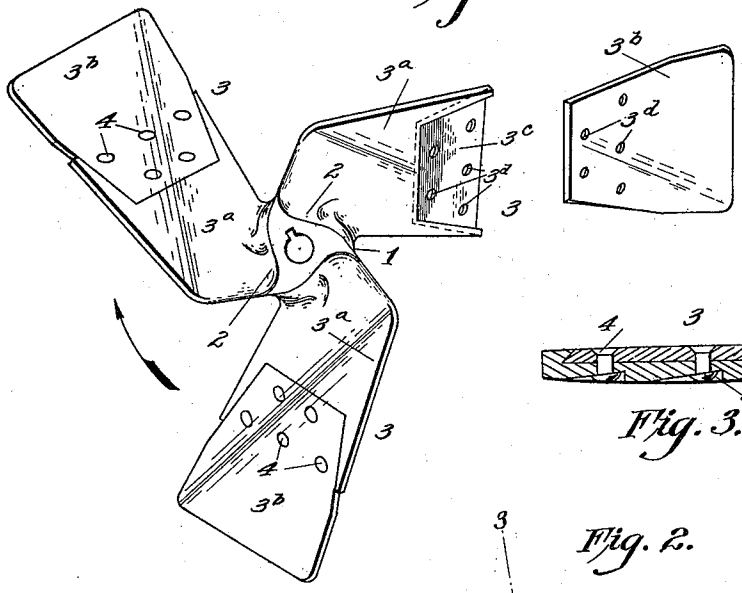
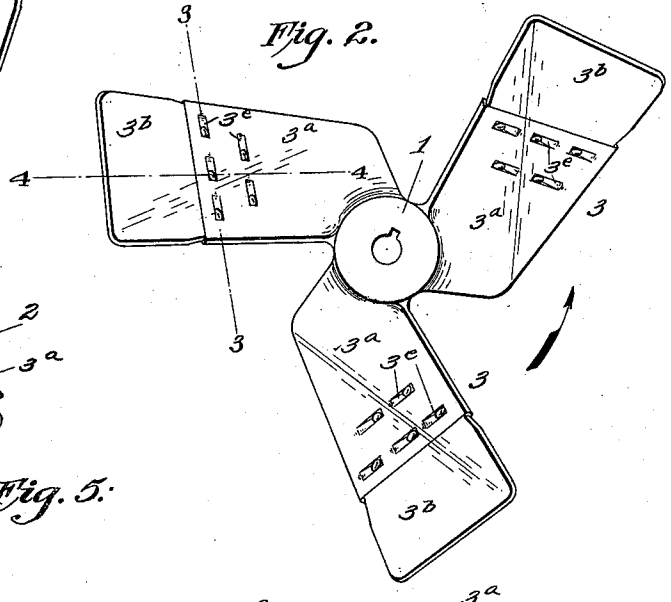






Fig. 3.

Fig. 2.



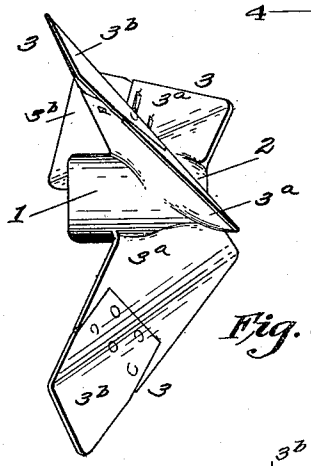




Fig. 5.

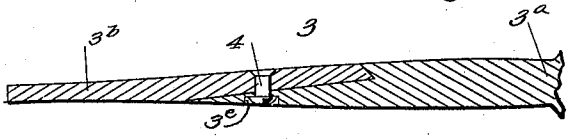



Fig. 4.

Witnesses:

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# UNITED STATES PATENT OFFICE.

JOHN L. SCOTT, OF VERMILION, OHIO.

## PROPELLER.

1,142,916. Specification of Letters Patent. Patented June 15, 1915.

Application filed June 2, 1914. Serial No. 842,434.

*To all whom it may concern:*

Be it known that I, JOHN L. SCOTT, a citizen of the United States, residing at Vermilion, in the county of Erie and State of Ohio, have invented a certain new and useful Improvement in Propellers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to improvements in screw propellers, and it has for its primary object to provide a propeller having composite blades, that portion of each of the blades that is most liable to breakage (either by reason of its design or because of the nature of the material from which it is made) being material that is more frangible than the remainder of the propeller. For example the hub and inner portions of the blades of my propeller may be formed of cast steel, while the outer ends of the blades may be of cast iron.

As a further object, my invention provides a simple and effectual method of securing the breakable sections of the blades to the permanent sections that are carried by the hub, which method enables fragments of the breakable section to be quickly and easily removed from the permanent sections without injury to the permanent sections, and allows new breakable sections to be very easily attached thereto.

Therefore, in general terms, it may be stated that my invention has for its principal object the provision of a propeller the broken blades whereof may be quickly repaired at a minimum expense.

To illustrate my invention, I have shown it as embodied in that type of propeller shown in my copending application for United States Letters Patent, filed January 30, 1914, Serial No. 815,446; and my reason for showing it in such connection is that there exists a certain interdependence between the design of propeller shown in said application and the composite blade feature that forms the subject matter of this application.

It is well known to all familiar with the art to which this invention relates, that it is highly desirable to have the blades of a comparatively large propeller, detachable, so that in case one of the blades is broken, a perfect blade may be substituted for it and the remainder of the wheel saved. It might be well to state at this time that, although it has been the practice heretofore to make the entire blade detachable, it is usually only the outer end of the blade that becomes damaged, unless because of the design of the blade the weakest point is in the vicinity of its base, when the blade will, of course, break at this point, notwithstanding the fact that the blow was delivered at the end thereof. In my aforesaid application I have shown a propeller of very high efficiency, and have illustrated two modifications of it, one in which the blades and hub are formed integral, and the other consisting of a hub and detachable blade. In the detachable blade modification illustrated in the drawings of said application, it is impossible to carry out, perfectly, the exact design of the other form of my propeller, and this divergence results in a slight decrease in efficiency.

With my present invention it is possible to construct a detachable blade type of propeller along precisely the same lines as the unitary form shown in my former application.

In the accompanying drawings Figure 1 is a rear elevation of my improved propeller, the breakable section of one of the blades being separated from the permanent section thereof, for the purpose of showing the formation of the adjacent ends of the blade section. Fig. 2 is a front elevation of the propeller; Fig. 3 is a transverse section through one of the blades, said section being taken on the line 3—3 of Fig. 2; Fig. 4 is a longitudinal section through one of the blades as represented by the line 4—4 of Fig. 2; and Fig. 5 is a side elevation, on a reduced scale, of the propeller shown in Figs. 1 and 2.

I will first describe the general design of my propeller and set forth the advantages gained thereby, and then take up a detailed description of the composite blade. The hub 1 of the propeller is substantially cylindrical except at its rear end, where its sides are inclined inwardly and rearwardly between the blades, as shown at 2. The blades 3 are substantially rectangular in outline, and in order to convey a clear idea of their formation, it will be stated that the ends of each of the blades are twisted, as it were,

with respect to each other, the twist being distributed evenly throughout the length of the blades.

In accordance with the principles of practically all propellers, my propeller is constructed along the lines of a true screw; and to this end each blade is set at an angle with respect to the longitudinal axis of the hub, which corresponds to the pitch of the blade at its inner end. Throughout the length of the blade this angle gradually increases in proportion to the increase in radius, in order that the pitch may be true and constant throughout. Not only are the blades set at an angle with respect to the longitudinal axis of the hub, but they are also arranged at an angle (substantially that of 30°) with respect to the vertical axis of the hub, considering the same in the position shown in Fig. 5. This results in the outer ends of the blades projecting beyond the front of the hub, and the rear corners of the blades extend beyond the rear thereof. It will also be observed that the blades are tangent to the central portion of the hub. Now, taking all of these parts into consideration the transverse angle, the forward inclination, and the tangential arrangement of the blades—it will be seen that, in the operation of the propeller, the forward end of each blade is constantly reaching out into "solid" or undisturbed water; that the remainder of the blade, because of the proportional change in angle and radius, follows the leading end without unduly agitating the water; and that the working surface of the blade is comparatively large because of the long diagonal lines of bearing that are produced by its forward inclination. (By "the lines of bearing" is meant the lines defined by the water as it passes from the leading to the following edges of the blades in a course substantially parallel to the shaft). Also, the friction of the water upon the blade is reduced to a minimum because of the convexity of its working surface, such convexity resulting from the previously mentioned twist of the blade. The convexity of the working surface also prevents pocketing of the water and the directing of it toward the periphery of the propeller, thereby eliminating the centrifugal action produced by propellers of ordinary type wherein the working surfaces of the blades are concave. It is the tangential arrangement of the blades and the overhanging of their rear corners beyond the rear end of the hub that creates a centripetal action in the region of the hub which directs the water inwardly and prevents a void and consequently a suction at the rear thereof.

The hub 1 and the sections $3^a$ of the blades are formed of cast steel or other practically non-frangible material, and the outer end of each of said sections is recessed at $3^c$ on its driving side, as shown very clearly in Fig. 1. The outer ends, or sections $3^b$ of the blade are made of breakable material, such as cast iron, and the inner ends of said sections are formed complementary to the recesses in the sections $3^a$. It will be observed, particularly from Figs. 3 and 4, that the end and side walls of the recesses $3^c$ are inclined, and the end and side edges of the sections $3^b$ are beveled so as to form a dovetailed joint with the end and side walls of the aforesaid recesses. The overlapping ends of the blade sections are provided with alining holes $3^d$, for the reception of rivets 4. The holes in the sections $3^b$ are counterbored in order that the tapered heads of the rivets may be countersunk therein to prevent protuberances on the driving sides of the blades, which, if permitted to exist, would of course reduce the driving efficiency of the propeller. The following, or that side which is opposite the driving side of each blade, is recessed about each of the rivet holes $3^d$, as shown at $3^e$, particularly in Fig. 3. From this figure, it will be seen that the bottom walls of the recesses $3^e$ are gradually inclined from the plane of the following surface to a depth that will allow the ends of the rivets to be upset within said recesses, and prevent the overturned portions from projecting beyond the plane of the following surface of the blade. The inclination of the bottom walls of the recesses $3^e$ enables the overturned ends of the rivets to be cut or knocked off by the use of a chisel without having to cut, drill, or in any way damage the permanent part of the propeller blade in order to make working room for the chisel. In this way the breakable end of the blades may be replaced without the slightest injury to said permanent part of the propeller.

While I have described my present invention specifically in connection with the type of propeller blade shown in my former application, because of its peculiar adaptability to said type, I wish it to be understood that I do not limit myself to such an application of my latest improvement, for it is just as applicable to propellers of ordinary type.

Having thus described my invention, what I claim is:

1. A propeller comprising a hub, and a plurality of composite blades, each blade consisting of two sections one of which is more frangible than the other, the less frangible section being located adjacent the hub.

2. A propeller comprising a hub, and a plurality of composite blades, each blade consisting of two sections that are detachably connected and one of which is more frangible than the other, the less frangible section being located adjacent the hub.

3. A propeller comprising a hub, and a plurality of composite blades, each blade consisting of two sections one of which is more frangible than the other, one of said sections having a recess, and the other having a portion that is arranged to occupy said recess, the less frangible section of each blade being located adjacent the hub.

4. A propeller comprising a hub, and a plurality of composite blades, each blade consisting of two sections one of which is more frangible than the other, one of said sections having a recess and the other having a portion that is arranged to occupy said recess, the less frangible section of each blade being located adjacent the hub, and means for detachably securing the sections together.

5. A propeller comprising a hub having a plurality of blade sections formed integral therewith, and a section that is detachably secured to each of the aforesaid sections and is more frangible than said sections.

6. A propeller comprising a hub having a plurality of blade sections formed integral therewith, the outer end of each of the blade sections having a recess, and a blade section for each of said former sections and having a portion that is arranged to occupy the recess thereof and that is more frangible than the aforesaid sections.

7. A propeller comprising a hub having a plurality of blade sections formed integral therewith, the outer end of each of the blade sections having a recess, a blade section that is more frangible than the former sections for each of said sections and having a portion that is arranged to occupy the recess thereof, and means for detachably securing the blade sections together.

8. A propeller comprising a hub having a plurality of blade sections, the outer end of each of the sections having a recess in one of its sides, the walls of the recess being undercut with respect to the surface of the blade section, a blade section for attachment to each of the aforesaid sections and having a portion that is adapted to be received by the aforesaid recess, the edges whereof are formed to interlock with the sides of the aforesaid recess, and means for securing the blade sections together.

9. A propeller comprising a hub having a plurality of blade sections, the outer end of each of the sections having a recess in one of its sides, the walls of said recess being undercut with respect to the surface of the blade section, a blade section for attachment to each of the aforesaid sections and having a portion that is adapted to be received by the aforesaid recess, the edges whereof are formed to interlock with the sides of the aforesaid recess, and means for securing said portion within the recess.

10. A propeller comprising a hub, a plurality of blade sections carried thereby, a blade section that is more frangible than the former sections for attachment to each of the aforesaid sections, the adjacent ends of the sections of the blades being formed so as to interlock.

11. A propeller comprising a hub, a plurality of blade sections carried thereby, a blade section that is more frangible than the former sections for attachment to each of the aforesaid sections, the adjacent ends of the sections of the blades being formed so as to interlock, and means for detachably securing the parts together.

12. A propeller comprising a hub, and a plurality of blade sections carried thereby, a blade section that is more frangible than the former sections for application to each of the aforesaid blade sections, the respective sections of each blade having a part which overlies a part of the other section and are provided each with holes that aline with the holes of the other section, the driving surface and the following surface of the blades being recessed about each hole, and connecting members that pass through the alining holes of the blade sections and having enlarged portions that occupy the aforesaid recesses.

13. A propeller comprising a hub, and a plurality of blade sections carried thereby, a section for application to each of the aforesaid blade sections, the respective sections of each blade having a portion which overlies a portion of the other section, said sections being provided each with holes that aline with the holes of the other section, the driving surface of the blades being counterbored about each hole and the following surface of the blades being recessed about each hole, the bottom wall of said recess being inclined downwardly from the plane of said following surface, and rivets for connecting the blade sections each having a tapered head that is received by the counterbored portion of its respective hole and an upset end that occupies the recess that is formed in the following surface of the blade.

14. A propeller comprising a hub and a plurality of composite blades, each blade being composed of two sections that are dovetailed together and one of which is more frangible than the other, the less frangible section being located adjacent the hub.

15. A propeller comprising a hub and a plurality of composite blades, each blade being composed of two sections that are dovetailed together and that are detachably connected, one of said sections being more frangible than the other, the less frangible section being located adjacent the hub.

16. As a new article of manufacture, a

propeller blade that is composed of two sections which are detachably connected and one of which is more frangible than the other, the less frangible section being adapted to be located adjacent the hub of a propeller.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JOHN L. SCOTT.

Witnesses:
BRENNAN B. WEST,
ROBERT L. BRUCK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."