

W. R. BOUTWELL.
 METHOD FOR PRODUCING PROPELLER BLADE PATTERNS.
 APPLICATION FILED MAY 27, 1912.

1,062,762.

Patented May 27, 1913.

3 SHEETS-SHEET 1.

Fig 1

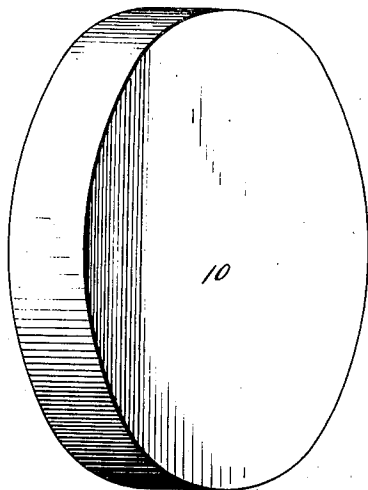


Fig 2

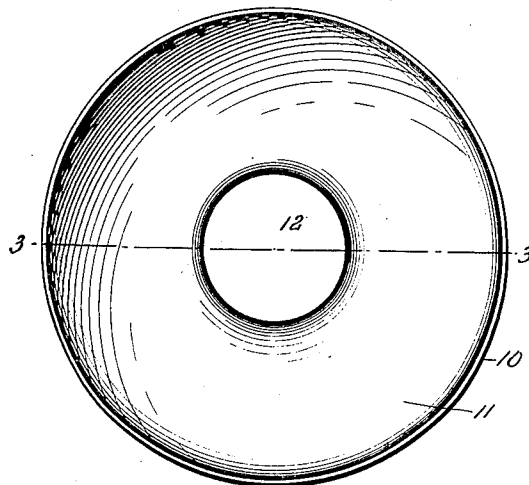


Fig 3

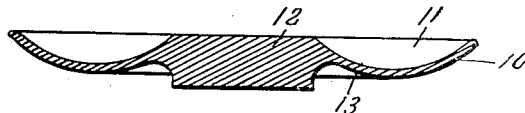


Fig 4

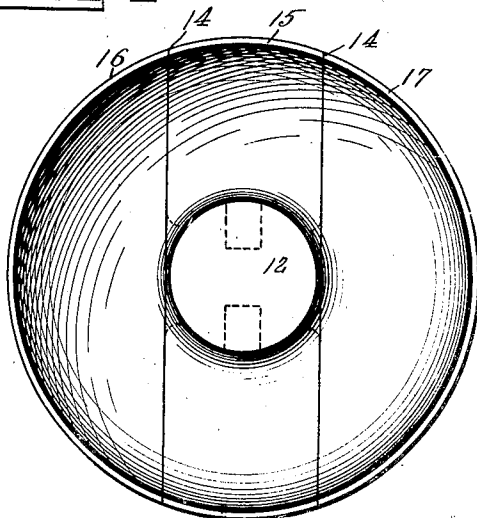
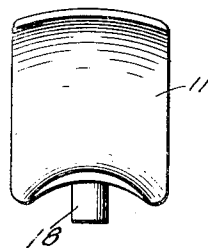


Fig 5



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Fig 6

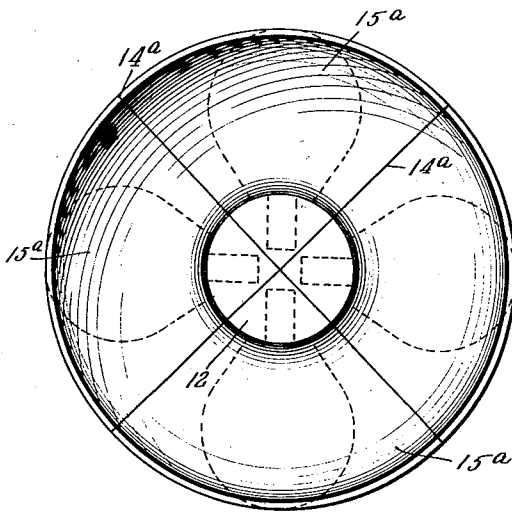


Fig 7

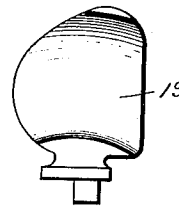


Fig 8

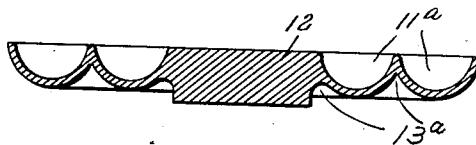
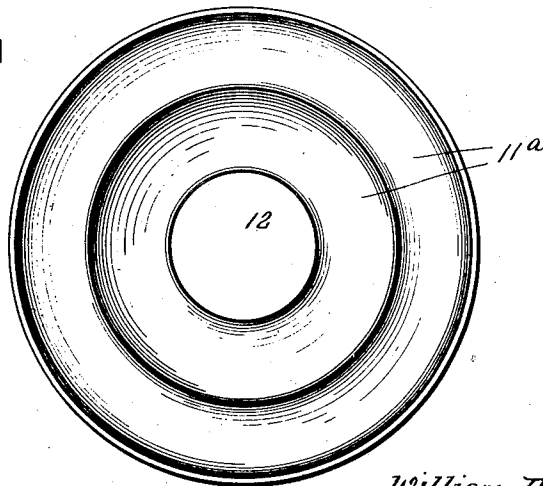


Fig 9



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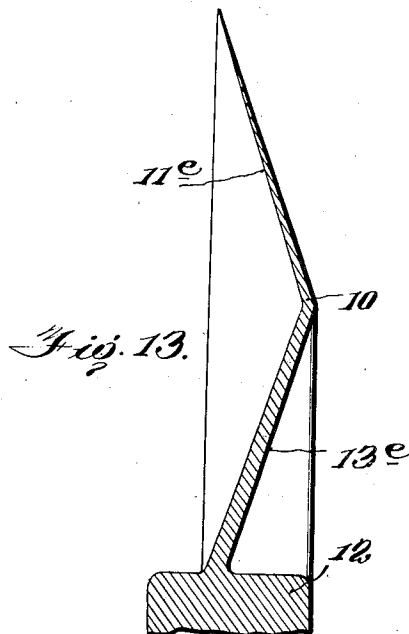
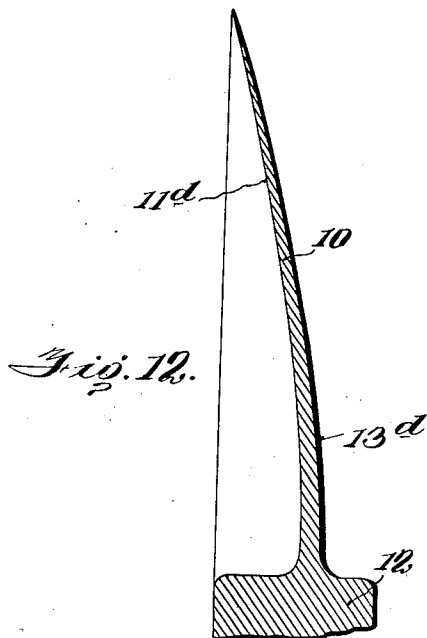
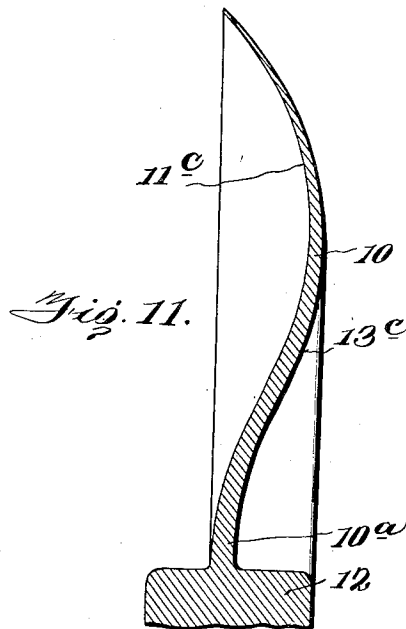
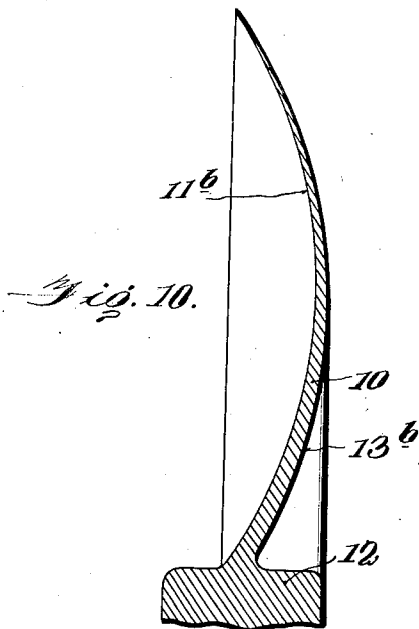
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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METHOD FOR PRODUCING PROPELLER-BLADE PATTERNS.

1,062,762.

Specification of Letters Patent.

Patented May 27, 1913.

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To all whom it may concern:

Be it known that I, WILLIAM R. BOUTWELL, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented new and useful Improvements in Methods for Producing Propeller-Blade Patterns, of which the following is a specification.

This invention relates to an improved method for producing patterns, and has particular reference to a method for making patterns from which may be cast peculiarly formed blades of propellers for water and air craft whereby, under set conditions, the highest possible speed of the craft may be obtained for the least expenditure of power, and from which may be cast propeller blades of various forms adaptable to various uses as may be found desirable.

The invention has for an object, to provide a simple method of forming, not only propeller blades of various shapes and sizes, but also all manner of articles and parts of devices which, generally, have the same characteristics as these peculiarly formed propeller blades.

This invention designs to produce patterns from which may be cast a propeller blade having grooved or dished faces varying in cross-sectional form, as shown in the accompanying drawings and specifically referred to in the following detail description.

The groove in the propeller blade is arc-shaped and formed on a circle of the same diameter throughout its width and concentric to the propeller in its assembled form. The circle of the inner edge of the groove of the propeller blade is concentric with the circle of the outer edge of the groove. It is designed to produce a number of these peculiarly formed propeller blades which have a uniform depth of groove of the character specified, and mount these blades on a common hub. The propeller blades are adapted to be so arranged on the hub that the grooved faces are angled more or less obliquely to the axis of rotation to form driving faces, the tops of the grooves being positioned a distance from the center of the hub equal to the radius of the circle of the top edges of the grooves.

Briefly stated, the improved method is carried out in the following manner: First, a block of suitable material is placed upon a lathe, or the like, and turned down to the

form of a cylindrical disk. Second, the blank disk thus produced is formed with a concentric groove, or grooves, in one side, while its opposite side is provided with a complementary groove, or grooves, so as to give to the blank the desired thickness and curvilinear form. Third, the blank is now cut into segments, each of which is of a size substantially the size of the blade or article which is to be formed. The cuts dissecting the blank extend through the groove transversely or obliquely, whereby the groove extends transversely across the face of the segment. And lastly, the segments are each worked down to the desired shape or contour of the propeller blade or other article desired.

Various other minor objects will appear from the detail description of this improved method in conjunction with the accompanying drawings referred to in such description.

In the drawings, Figure 1 is a perspective view of a disk blank from which a number of patterns are formed; Fig. 2 is a front elevation of the blank having the concentric groove formed therein; Fig. 3 is a central sectional view taken on the line 3—3 of Fig. 2 disclosing the complementary formation of the rear side of the blank; Fig. 4 is a front elevation of the blank cut into segments, and showing in dotted lines the contour of propeller blades adapted to be worked out of the segments; Fig. 5 is a face view of a finished propeller blade; Fig. 6 is a front elevation of the grooved blank cut into segments differing from Fig. 4, showing in dotted lines the contours of another form of propeller blade which may be worked out of the segments; Fig. 7 is a face view of a propeller blade of a further configuration; Fig. 8 is a central cross section view of the blank having two concentric grooves formed in the front face thereof, and showing complementary grooves in the rear face thereof; Fig. 9 is a front elevation of the complete blank of the form disclosed in Fig. 8; Figs. 10 to 13 inclusive illustrate in section some of the various grooves which may be formed in the blank disk from which correspondingly shaped patterns are to be cut.

In carrying out this invention a disk blank 10, such as disclosed in Fig. 1 of the drawings, is placed upon a lathe, or other

suitable turning machine, and is formed with a groove 11 concentric to the center of curvature of the disk and having its inner marginal edge spaced considerably from the central portion of the disk. The blank disk 10 may be suitably turned down from any shape in which the material is found prior to working the same in accordance with the steps of this improved method. The groove 11 is arc-shaped, as may be seen to advantage in Fig. 3, and the central portion 12 of the disk is left uncut so that it has the thickness of the original blank. The disk thus treated is further turned and a complementary groove 13 is cut into the opposite or rear face of the blank to form a convex rear face, and to give the blank the desired thickness at the grooved portion. Thus formed, the disk or blank assumes the contour disclosed in section in Fig. 3. The next step in the method is in cutting the blank into a number of segments or parts of sufficient size to contain the desired pattern.

In Fig. 4 of the drawings the cuts 14 are disclosed as being in parallelism and in the direction of cords of the circular contour of the disk, and dividing the disk into three parts, 15, 16 and 17. The main or intermediate part 15 of the disk has portions extending from diametrically opposite points about the central portion 12. The parts 16 and 17 are removed from the central part 15, and the part 15 is worked in any suitable manner to cut away the excess material about the proposed propeller blade whereby a blade of the configuration disclosed in Fig. 5 is produced. The central portion 12 is left thicker than the grooved portion of the disk so that a stem 18 may be formed upon the inner end of the blade and extend centrally therefrom for the purpose of supporting the blade in true circular relation to similar blades mounted upon a common hub.

In Fig. 6 of the drawings is disclosed another manner of dividing the disk blank. In Fig. 6 the cuts 14^a extend at right angles to each other and divide the disk into four equal parts or segments 15^a. This cutting of the disk is resorted to when it is desired to form a propeller blade of substantial width at its intermediate portion, and where the inner marginal edge of the groove is of reduced length. As will be observed from Fig. 6, the cutting of the disk through its central portion 12 provides ample space for propeller blades of considerable size, and stems upon the blades for supporting the blades upon the hub. Further, it will be noted that in cutting the disk as disclosed in Fig. 6 four blades may be produced from one disk, whereas in the cutting of the blade as disclosed in Fig. 4, but two blades can be produced.

Fig. 7 of the drawings discloses a further or modified form of blade which may be con-

veniently made from the disk when cut as in Fig. 6. This propeller blade 19, disclosed in Fig. 7, is of substantial pear-shape and may be readily formed from a blank or pattern produced from the disk as cut in Fig. 6. It will, of course, be understood that the blanks may be cut in any desired manner to produce a number of segments or parts, each one of which contains a propeller blade, or other device which is to be produced from the blank. It will also be understood that in the disk 10 may be formed not only one concentric groove, but two or more of the same, so as to provide a number of arc-shaped faces constituting working faces for the propeller formed from these blades.

Figs. 8 and 9 illustrate the disk having two concentric grooves 11^a in the working face, and the complementary grooves 13^a in its opposite or rear face, giving to the pattern the true shape and thickness of the propeller blade to be cast.

In Fig. 10 of the drawings the disk blank 10 is disclosed as having a single concentric groove 11^b in its working face extending in width from the edge of the central thick portion to the outer edge of the blank, and the complementary groove 13^b in the rear face of the blank 10 is formed eccentric to the groove 11^b forming a body for the pattern which gradually tapers in thickness from the central portion 12 to the outer edge of the blank.

Fig. 11 shows the complementary grooves 11^c and 13^c formed in the blank 10 so as to provide a flat portion 10^c immediately adjacent the thick central portion 12, and in a plane at right angles to the axis of the blank 10. This formation of the grooves provides a concentric tapering body about the flat portion 10^c.

A tapering body which inclines forwardly and uniformly from the central thick portion 12 is shown in section in Fig. 12, wherein the groove 11^d in the working face is formed with its deepest portion immediately at the central portion 12 of the blank 10, and wherein the complementary groove 13^d in the rear face of the blank is formed not only eccentric to the working face but also has its deepest portion at the outer edge of the blank.

Another formation of groove is shown in Fig. 13 wherein the grooves 11^e and 13^e are not formed in the arc of a circle, but are formed to provide oppositely inclined flat faces. In the working face of the blank the opposite inclined faces converge to a point intermediate of the thick central portion 12, and the outer edge of the blank, which intermediate point is the deepest portion of the groove so that the patterns will present a concave working face and a convex rear face as in the other forms above described. In this form, shown in Fig. 13, the body 10 is

also tapered by forming the complementary grooves 11° and 13° eccentric to one another. It is, of course, understood that any other adaptable form may be given the pattern by
 5 peculiarly forming the grooves 11 and 13 in the opposite sides of the blank 10, and in forming any desired number of grooves in the blank.

What I claim is:

10 1. That method of forming propeller blade patterns which consists in forming a circular groove in a disk of material, the groove being formed concentric to the disk leaving the central portion of the disk
 15 thicker than the grooved portion, cutting the disk to provide a number of independent parts, and working down the parts to produce a pattern of the desired width, the thickened central part being worked down
 20 to provide a stem for the propeller blade pattern.

2. The method of forming a propeller blade pattern which consists in concentrically grooving the side of a disk blank and
 25 leaving the central portion thereof thicker than the grooved portion of the blank, then cutting said blank to provide a part having a width substantially equal to the width of the desired pattern, and finally turning
 30 down the section to produce the propeller blade, the central thickened portion of the blank being turned down to provide a stem integral with the pattern.

3. The method of forming patterns for
 35 propeller blades which consists in first: forming a concentric groove in a cylindrical blank leaving the central portion of the blank thicker than the grooved portion, second: cutting the blank through the groove
 40 to form a number of segments having transverse grooves therein, and third: working down the segments to provide patterns for the propeller blades from the grooved por-

tions and stems for the blades from the thickened central portions. 45

4. That method of forming propeller blade patterns which consists in cutting a concentric groove, or grooves, arcuate in cross-section in the face of a blank leaving
 50 a central thickened portion cutting the blank through the arcuate groove or grooves and the thickened portion to provide a number of parts each having a thickened inner end, and working down each part to produce the blade patterns desired, the thick-
 55 ened inner ends being worked down to produce stems for the parts.

5. The method of forming patterns for water and air craft propeller blades which consists in forming complementary grooves
 60 in the opposite sides of a disk blank and leaving a central thickened portion, cutting the disk blank through the grooves into a number of parts, and working down the desired patterns of the blade from the said
 65 parts and working the stems for the blade patterns from the central thickened portion.

6. The method of forming patterns for water and air craft propeller blades and other articles having like characteristics
 70 which consists in forming complementary and concentric grooves in the opposite faces of a disk blank leaving a thickened central portion, cutting the blank through the grooves and the central thickened portion
 75 into a number of parts, and working down the patterns desired from the grooved parts and stems for the patterns from the thickened parts.

In testimony whereof I have hereunto set
 80 my hand in presence of two subscribing witnesses.

WILLIAM R. BOUTWELL.

Witnesses:

R. C. HENLEY,
 ELMER WING.