(No Model.)

A. SWERINTZEFF-KUSMINSKY.

PROPELLER.

No. 532,493. Patented Jan. 15, 1895.

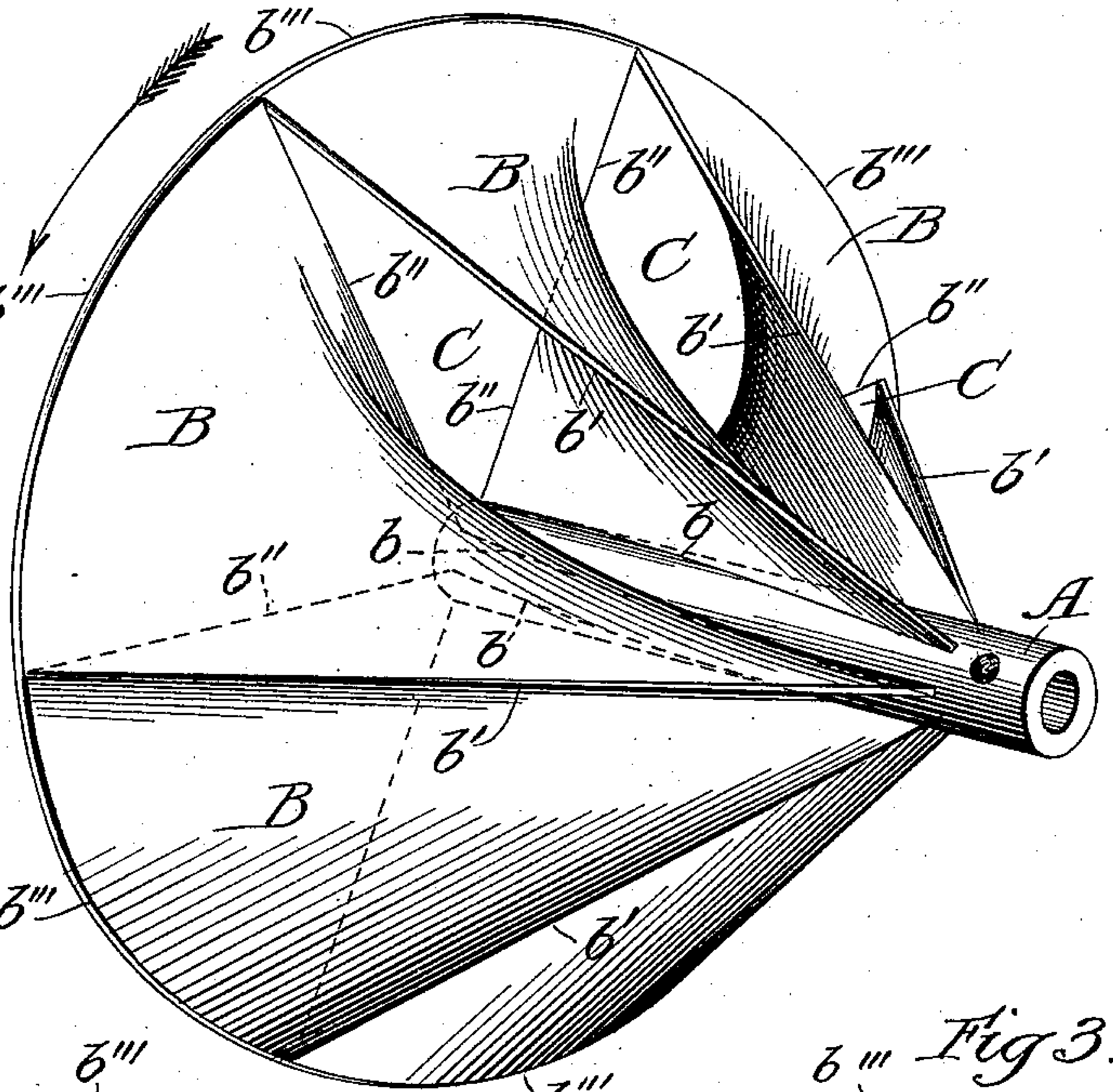

Fig 1.

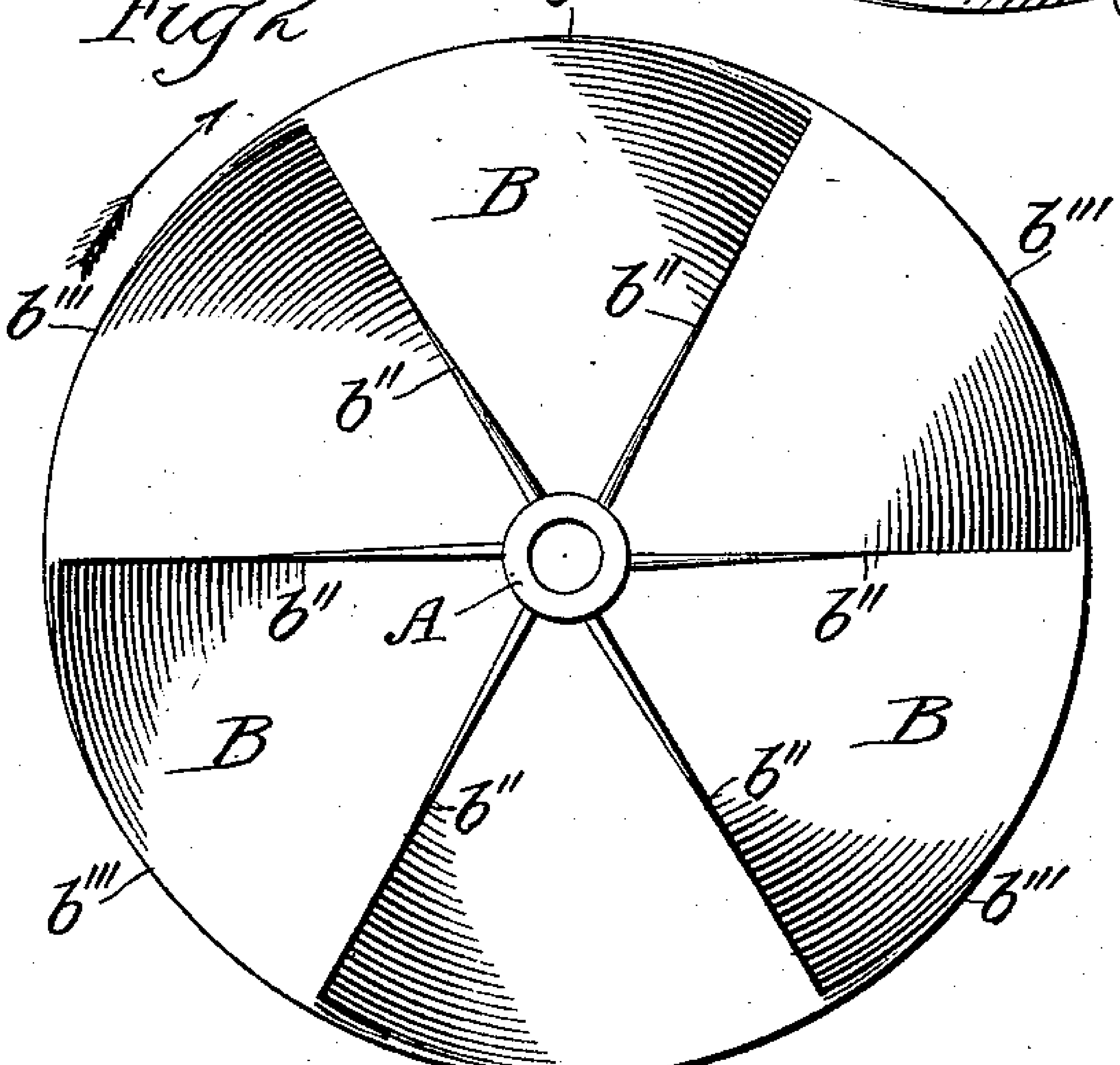

Fig 2

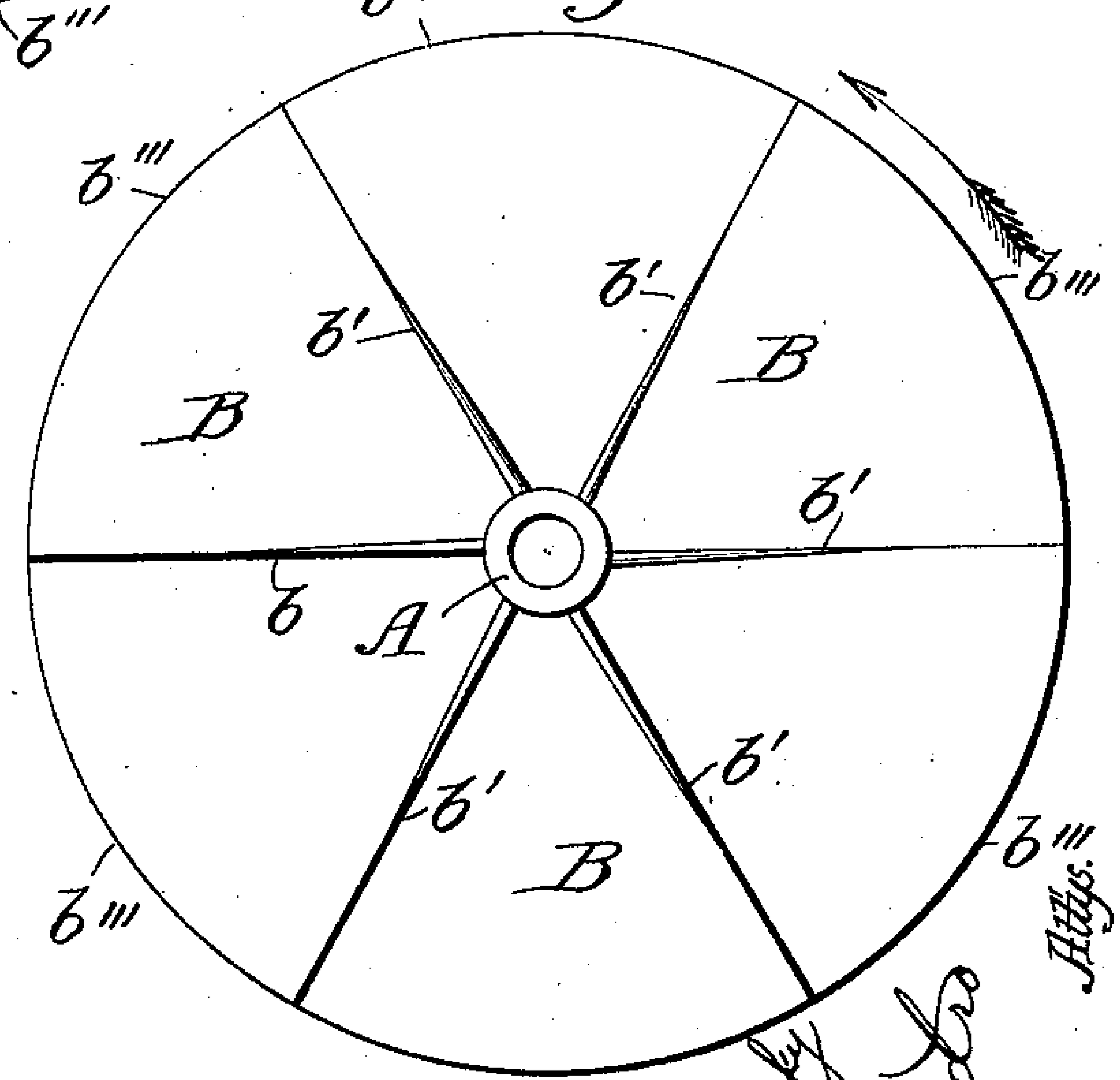

Fig 3.

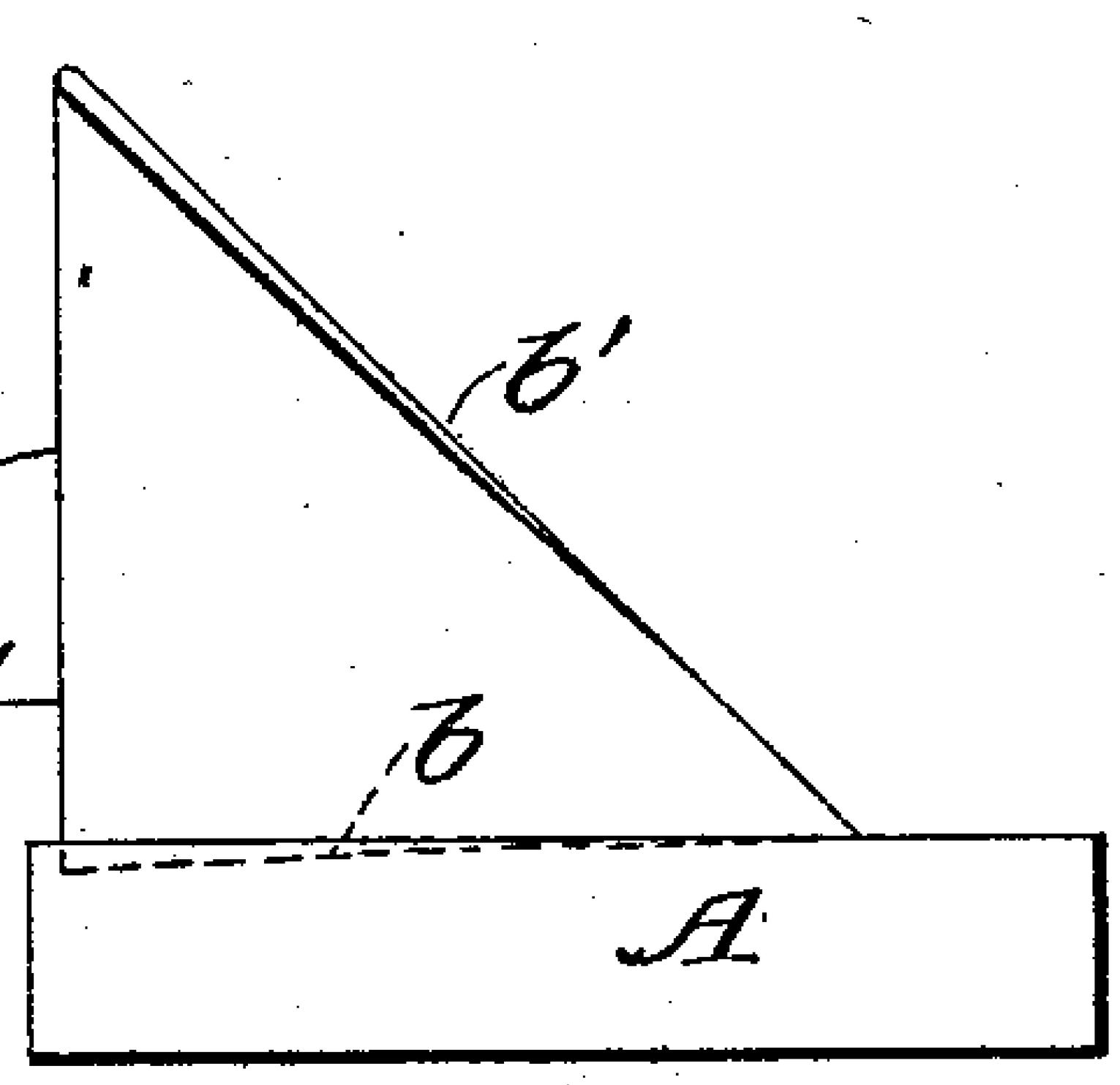

Fig 4.

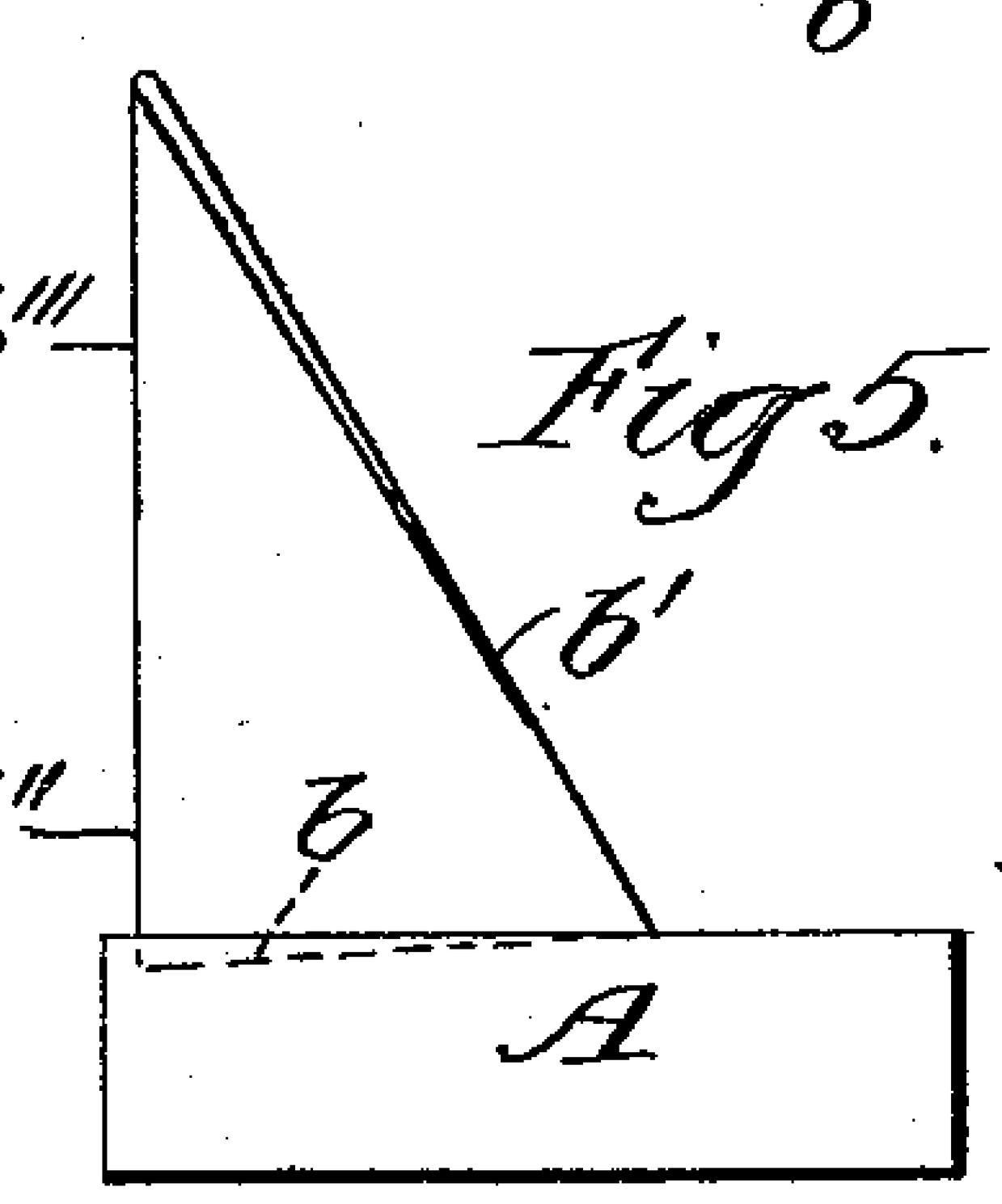

Fig 5.

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UNITED STATES PATENT OFFICE.

ALEXANDER SWERINTZEFF-KUSMINSKY, OF CHICAGO, ILLINOIS.

PROPELLER.

SPECIFICATION forming part of Letters Patent No. 532,493, dated January 15, 1895.

Application filed October 27, 1893. Serial No. 489,265. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER SWERINTZEFF-KUSMINSKY, a subject of the Czar of Russia, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Propellers, of which the following is a full, clear and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to propellers for imparting motion to boats or vessels such as either float upon or are submerged in water, and also to propellers for imparting motion to aerial vessels or vehicles, and to devices for effective use in creating or in utilizing currents either of water or air for various purposes.

Among the primary objects of my invention is included that of producing a propeller which shall possess great strength, rigidity and durability of construction, and also the maximum degree of operative efficiency, so as to develop the utmost effective power from the motive force imparted to it, and which, furthermore, shall be liable only to the minimum amount of slip and drag.

To the above purposes, as well as to such others as may appear from the ensuing description, my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described and claimed.

The more precise nature of my invention will be better understood when described with reference to the accompanying drawings, in which—

Figure 1 is a perspective view of a propeller embodying my invention; the direction of view being toward the front face of the propeller. Fig. 2 is a rear end elevation of the propeller. Fig. 3 is a front end elevation of the same. Fig. 4 is a side elevation of a propeller-hub having all but one of its blades removed, and such remaining blade being of slightly modified form within the spirit of my invention. Fig. 5 is a side elevation of a propeller-hub having all but one of its blades removed, and such remaining blade being of still further slightly modified form within the spirit of my invention.

Before entering into a detailed description of the structures shown in the drawings, as embodying my invention, I will state, for the sake of clearness, and briefly, the general structural features which characterize a propeller embodying my invention. Such a propeller may be provided with any number of blades, according to the requirements of the work in any given instance, but in any event, each blade is of substantially or approximately triangular form in side view, so that when the propeller is viewed sidewise, as a whole, it shall present a substantially or approximately conical form; the base of the cone being preferably at the rear end of the propeller, and the blades being laterally involuted or convoluted. Moreover, the lines of contact between the propeller-blades and the hub are substantially or approximately parallel with each other, such lines being usually (although not necessarily) spiral with relation to the longitudinal axis of the propeller-hub. Furthermore, the outer end of the entering or front edge of each blade comes into actual contact with the discharge or rear edge of the next adjacent blade, and said edge-ends are either integrally united or are strongly secured together, so that the blades mutually support and brace each other and a very strong and rigid propeller is produced. The entering edge of each blade usually (although not necessarily) coincides with the discharge edge of the next adjacent blade, but in any event the entering edge of each blade is more or less oblique to the longitudinal axis of the hub, while the discharge edge of the blade is at right angles to said axis, and furthermore, the outer edges of the blades are segmental and all lie in the same plane transversely to the longitudinal axis of the hub, so that the said outer edges of the blades collectively describe a true circle of which the longitudinal axis of the hub is the center.

In speaking of the "entering" and "discharge" edges of the blades, it is to be understood that I have reference to the front and rear edges of the blades, respectively, when the propeller is being revolved in such direction (indicated, for example, by the arrows in Figs. 1, 2 and 3 of the drawings) as will move a boat or vessel forward.

Referring now first to Figs. 1, 2 and 3 of the drawings, A designates the hub of a pro-

peller embodying my invention, this hub being shown as of elongated cylindrical form and as axially bored to fit upon a driving-shaft of any suitable character. The form and dimensions of the hub are, of course, immaterial and may be varied as much as desired, according to the requirements of the work which is to be required of the propeller in any given instance. The propeller shown in these figures (1, 2 and 3) has six blades B, but a propeller embodying my invention may possess either a greater or less number of blades, according to the requirements of the work in any given instance. In any event, however, the blades are so united or secured to the hub (according as the hub and blades are integral or otherwise) that the line *b* of union or contact between each blade with the hub shall be substantially or approximately parallel with the line *b* of union or contact of the next adjacent blade. Moreover, each blade is of laterally convoluted or involuted form, and such lateral curvature of each blade is substantially similar to the curvature of the next adjacent blade, so that the convex and concave surfaces of the blades extend substantially or approximately parallel with each other; this arrangement producing between each two adjacent blades a laterally convoluted space C, which extends from and opens at the front and rear edges of the blades and also from the hub to the periphery of the blades, and such spaces being each of approximately triangular form in cross-section. Furthermore, the front or entering edge *b'* of each blade is preferably (although not necessarily) substantially coincident in its radial position with the rear or discharge edge *b''* of the next adjacent blade; such coincident edges thus concealing each other when the propeller as a whole is viewed directly either from its front or rear.

Another essentially distinguishing feature of the propeller is that the outer margin *b'''* of each blade is a segment of a circle of which the longitudinal axis of the hub is the center, and all of said edges lie in the same plane transversely to the hub, so that if the propeller as a whole be viewed directly either from front or rear, the outer margins of the blades will form a complete circle concentric to the longitudinal axis of the hub.

The outer terminus or end of the entering edge *b'* of each blade B comes into actual contact with the outer terminus or end of the discharge edge *b''* of the next adjacent blade, and said contacting ends or termini are either integrally united together or are bolted, riveted, or otherwise strongly secured together, according as the propeller is an integral or a sectional propeller. By virtue of this arrangement, the blades are caused to mutually brace or strengthen each other, and the propeller as a whole is consequently rendered exceedingly strong, durable and rigid.

It is to be still further observed that the entering edge *b'* of each blade extends at an oblique angle to the longitudinal axis of the hub, while the discharge edge *b''* of each blade extends at right angles to such axis, and by reference to Figs. 4 and 5 of the drawings it will be seen that the obliquity or acuteness of angularity of the entering edges may be varied without departing from the essential spirit of my invention; the entering edge in Fig. 4 being at about an angle of forty-five degrees to the axis of the hub, and the entering edge of the blade in Fig. 5 being at about an angle of sixty degrees to said axis. These differences of angularity or obliquity of the entering edges are, however, obviously matters of minor detail and involve merely a deepening or shallowing of the concave and convex surfaces of the blades, and furthermore adapt the blades more perfectly to varying working conditions.

As previously stated, there may be any desired number of blades provided for the propeller in any given instance, and it is also to be further observed that, if desired, each alternate blade shown may be dispensed with; the outer edges of the more remote adjacent blades being, in such event connected together by a segmental bridge-piece, or in any other desirable manner, or left disconnected if preferred.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A propeller having a plurality of convoluted blades, the entering edge of each of which extends obliquely and the discharge edge of each at right angles to the axis of the propeller, the outer end of the entering edge of each blade being in actual contact with and connected to the outer ends of the discharge edge of the next adjacent blade, substantially as set forth.

2. A propeller having a plurality of convoluted blades, their entering edges extending obliquely and their outer edges at right angles to the axis of the propeller, the outer end of the entering edge of each of which is in actual contact with and connected to the outer ends of the discharge edge of the next adjacent blade, and the entering edge of each blade being coincident with the discharge edge of the next adjacent blade, substantially as set forth.

3. A propeller comprising a plurality of blades the outer edges of which are segmental and all disposed in a common plane transverse to the axis of the hub, so that collectively the outer margins shall describe a circle of which the axis of the hub is the center; the outer end of the entering edge of each blade being connected to and in contact with the outer end of the discharge edge of the next adjacent blade, substantially as set forth.

4. A propeller comprising a hub, a plurality of blades the line of contact of each of which with the hub is spiral relative to the longitudinal axis of the hub, and also approximately parallel with the line of contact of the

next adjacent blade with the hub, the outer margins of the blades being segmental and disposed in a common plane transversely to the axis of the hub, so as to collectively describe a circle of which said axis is the center; the entering edge of each blade being coincident with the discharge edge of the next adjacent blade, and each two adjacent blades being separated by a laterally convoluted space triangular in cross-section and opening at the front and rear of the propeller, and the outer termini of the adjacent entering and discharge edges of each pair of blades being in actual contact with each other, substantially as set forth.

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