No. 810,032. PATENTED JAN. 16, 1906.

A. T. BROWN.

PROPELLER.

APPLICATION FILED APR. 12, 1902.

3 SHEETS—SHEET 1.

Fig. 1.

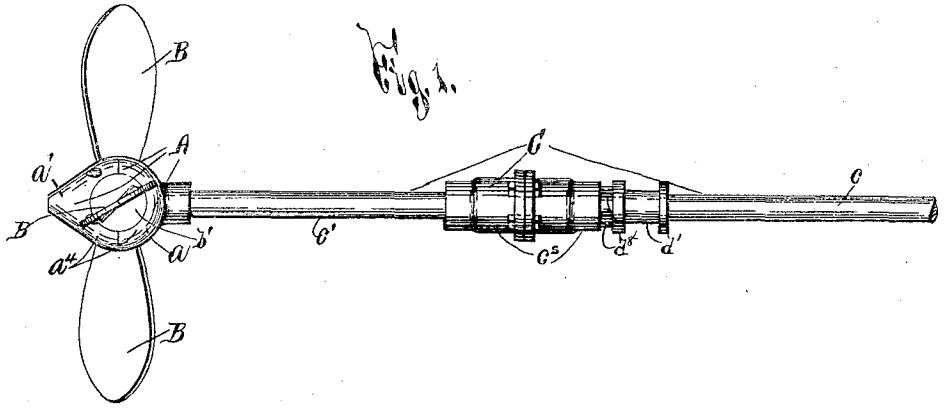



Fig. 2.

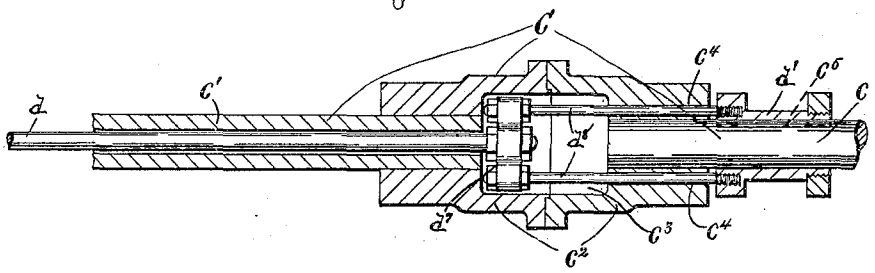
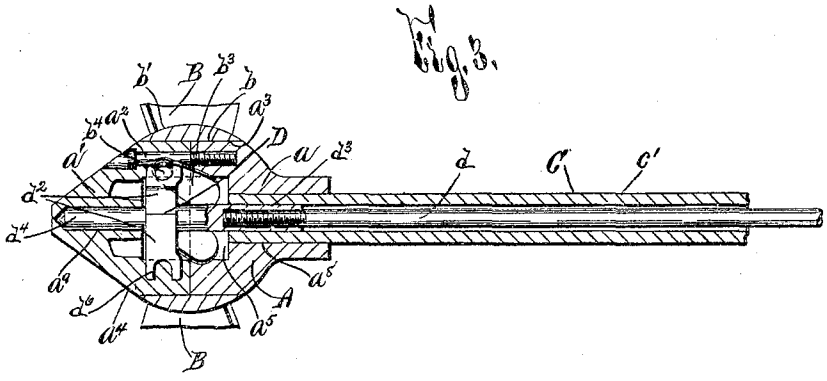



Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 4.

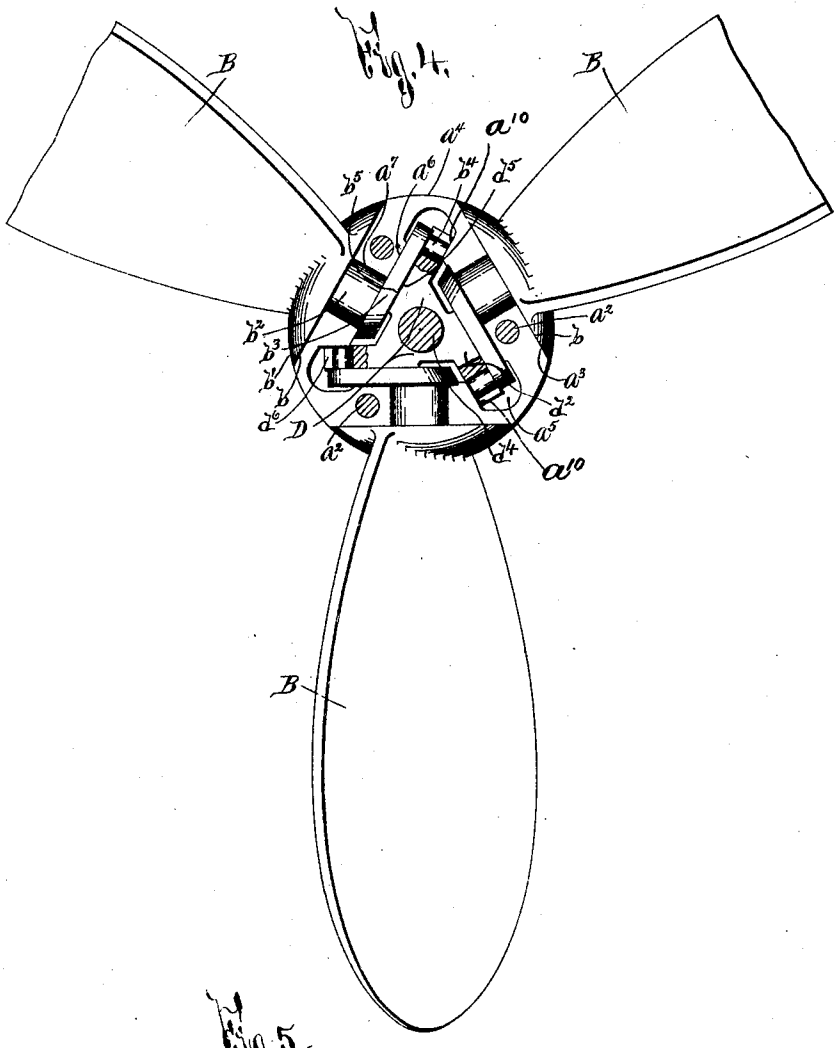
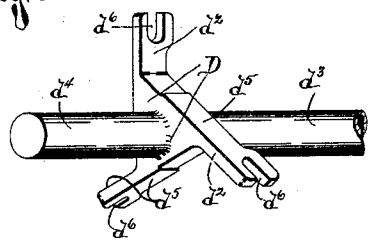



Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 6.

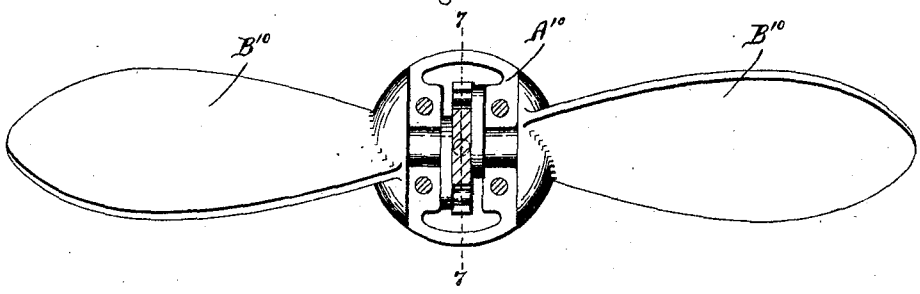
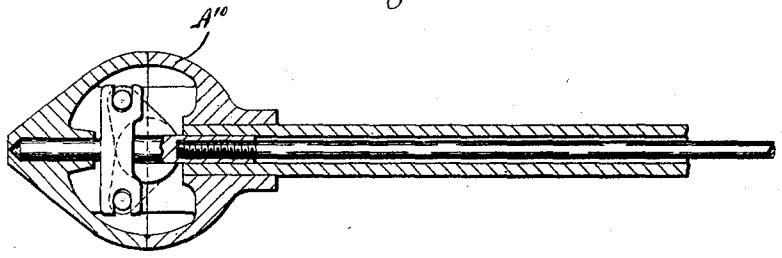



Fig. 7.

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# UNITED STATES PATENT OFFICE.

ALEXANDER T. BROWN, OF SYRACUSE, NEW YORK.

## PROPELLER.

No. 810,032. Specification of Letters Patent. Patented Jan. 16, 1906.

Application filed April 12, 1902. Serial No. 102,588.

*To all whom it may concern:*

Be it known that I, ALEXANDER T. BROWN, of Syracuse, in the county of Onondaga and State of New York, have invented a certain new and useful Propeller, of which the following is a specification.

My invention has for its object the production of an adjustable or reversible propeller which is particularly simple in construction and highly efficient and practical in use; and to this end it consists in the novel combinations and constructions hereinafter described and claimed.

Figure 1 is a plan view of a preferred embodiment of my invention. Figs. 2 and 3 are longitudinal sectional views, partly in elevation, of the parts shown in Fig. 1. Fig. 4 is an end elevation of the embodiment of my invention illustrated in Fig. 1, the rear division of the hub being removed, portions of two of the blades being broken away, and part of the adjusting member and its rod being shown in section. Fig. 5 is an isometric view, partly broken away, of said adjusting member. Fig. 6 is an end elevation, partly in section, of a portion of a modified construction of my propeller. Fig. 7 is a sectional view, partly in elevation, taken on line 7 7, Fig. 6.

The preferred embodiment of my invention comprises a hub A, blades B, and means for moving the blades on their axes.

The hub A is formed hollow and consists of separable front and rear parts or divisions $a$ $a'$, secured together with their opposing faces in contact by any desirable fastening means, as screws $a^2$, extending from front to rear of the hub. Said hub A is generally formed with an outer or peripheral surface, having substantially flat engaging or bearing faces $a^3$ and contiguous curved and inclined faces $a^4$, an internal cavity $a^5$, formed with substantially flat engaging or bearing faces $a^6$, each opposed to one of the faces $a^3$ and arranged substantially parallel therewith, openings $a^7$, leading from the cavity $a^5$ at the point of union of the divisions $a$ $a'$ and in the contiguous faces of said divisions through the bearing or engaging faces $a^3$ $a^6$, the wall of the hub being thickened between said faces $a^3$ $a^6$, and an opening $a^8$ and a guide $a^9$, leading, respectively, from the front and rear sides of the cavity $a^5$ in the parts or divisions of the hub A, the opening $a^8$ being extended through the front face of said hub and the guide $a^9$ being provided with a closed rear end.

In the preferable embodiment of my invention (shown in Figs. 1 to 5, inclusive) the faces $a^3$ $a^6$ and also the openings $a^7$ are triangularly arranged, the screws $a^2$ are each arranged between one of the internal faces $a^6$ and the opposing face $a^3$, and the internal cavity $a^5$ consists of a main part triangular in cross-section and openings or branches extending from each angle of the main part and formed relatively narrow, the main part of the cavity $a^5$ having its triangularly-arranged sides provided with the faces $a^6$ and the triangularly-arranged openings of said cavity having corresponding sides forming substantially continuations of the series of faces $a^6$ and their opposing sides $a^{10}$ arranged in planes substantially parallel with said faces $a^6$ and forming a second series of triangularly-arranged engaging or bearing faces within the cavity $a^5$.

The propeller-hub A is mounted on a revoluble driving-shaft C, which preferably consists of a main section $c$, a rear hollow section $c'$, having its rear end fixed in the opening $a^8$ of the hub A, and a sectional coupling $c^2$, connecting the sections $c$ $c'$ and formed with a chamber $c^3$ between the opposing ends of said sections.

The blades B are of any suitable form, size, and construction, and their inner ends are provided with bosses having annular faces $b$, engaging the faces $a^3$, and curved outer faces $b'$, forming continuations of the curved and inclined faces $a^4$ of the hub A, and with stems or spindles $b^2$, preferably formed integral with the blades and closely fitting the openings $a^7$ and journaled therein and provided with cranks $b^3$, which are movable in the cavity $a^5$ and have their projecting ends extended into the relatively narrow openings of the cavity. Said cranks $b^3$ are generally formed integral with the spindles $b^2$ and provided with integral pivotal pins $b^4$ at the free extremities thereof, projecting laterally from their inner faces, and are usually formed with bearing-faces on their outer sides engaged with the faces $a^6$ and with bearing-faces $b^5$ on their inner or opposing sides arranged substantially parallel with the faces $a^6$. Propeller-blades constructed and journaled as described are firmly supported, are prevented from endwise movement, and relieve the

screws $a^2$ from torsional strain. I preferably use three of the blades B, as best seen in Figs. 1 and 4; but only two may be used, as illustrated in Figs. 6 and 7, in which I have shown a hub $A^{10}$ and two blades $B^{10}$.

The means for moving the blades B on their axes is here illustrated as connected to the cranks $b^3$ within the cavity $a^5$ and as consisting of an adjusting member D, a reciprocating rod or slide $d$, and a collar $d'$. Said adjusting member D is reciprocally movable in the cavity $a^5$ relatively to the shaft C and consists of a main part of triangular cross-section, triangularly-arranged projecting arms or flanges $d^2$, and front and rear portions or extensions $d^3$ $d^4$, supported, respectively, by the opening in the rear end of the hollow section $c'$ of the shaft C and by the guide $a^9$. As seen in Fig. 4, the projecting ends of the arms or flanges $d^2$ of the member D extend in planes tangential to the shaft C into the angularly-arranged openings or branches of the cavity $a^5$ and are each provided with opposite bearing-faces $d^5$ for respectively engaging the faces $b^5$ on the inner or opposing sides of the cranks $b^3$ and the faces $a^{10}$ within said cavity, and thereby preventing said member D from turning movement relatively to the propeller-hub. The arms $d^2$ are generally provided with open-ended slots or notches $d^6$, which extend inwardly from the end surfaces of said arms and receive the pivotal pins $b^4$ of the cranks $b^3$. As clearly seen in the drawings, each crank $b^3$ rotates in a plane parallel with and closely adjacent the arm or flange $d^2$ connected thereto, said plane cutting the proximate flange transversely near its base and being closely adjacent the shaft C and within a circle passing through the slots or notches $d^6$, which notches are preferably distant from the shaft C by less than the length of a crank. Said pivotal pins $b^4$ and the arms $d^2$, having the open-ended slots $d^6$, form a particularly simple and practical detachable pin-and-slot connection between the blades B and the adjusting member D, which provides a maximum leverage for turning the blades B and facilitates the ready removal and replacement of said blades upon the detachment of the rear part or division of the hub A. Moreover, the described construction and arrangement of the cranks $b^3$ and the arms $d^2$ and the detachable connection between the same permit a minimum width of opening in the propeller-hub for receiving said parts $b^3$ $d^2$ and greatly enhance the durability and efficiency of the propeller.

The reciprocating rod or slide $d$, which may be integral with the adjusting member D, is preferably detachably secured thereto, extends through the hollow section $c'$ of the shaft C into the chamber $c^3$ of the coupling $c^2$, and is fixed to a cross-head $d^7$, movable in the chamber $c^3$. The collar $d'$ is movable lengthwise on the main section $c$ of the shaft C toward and away from the front end of the coupling $c^2$ by any suitable means, (not illustrated,) as a hand-lever, for also holding the collar in its adjusted position, and said collar is generally connected to the cross-head $d^7$ by rods $d^8$, which are arranged at opposite sides of the section $c$ of the shaft C, are movable lengthwise of said section in guides $c^4$ in the front of the coupling $c^2$, and are fixed at their front and rear ends, respectively, to the collar $d'$ and the cross-head $d^7$. Said collar is usually prevented from turning on the shaft C by a suitable key $c^5$, and consequently the rods $d^8$ are relieved from torsional strain.

The construction and operation of my propeller will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be particularly noted that more or less change may be made in the construction and arrangement of the component parts thereof without departing from the spirit of my invention.

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

1. The combination with the shaft of a reversible propeller, of the divided hub, the reversible blades pivoted between the front and rear sections of the hub and provided with the cranks, the sliding head movable lengthwise of the shaft and having flanges contiguous to the cranks, pin-and-slot connections between the cranks and the flanges, said flanges being situated in planes tangential to the shaft, and each crank rotating in a plane parallel with and closely adjacent a flange, said plane cutting the proximate flange transversely near its base, substantially as and for the purpose described.

2. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having two series of substantially flat engaging faces within its internal cavity, each face of either series being opposed to a face of the other series and arranged substantially parallel with said opposing face, said hub having openings leading from the cavity through the outer surface of the hub, blades having their inner ends provided with spindles journaled in the openings, cranks within the cavity projecting from the spindles and engaging one series of said faces, and an adjusting member connected to the cranks within the cavity for moving the blades on their axes, said adjusting member being provided with a plurality of faces engaging the other series of said faces of the hub, substantially as described.

3. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having two series of triangularly-arranged engaging faces within its internal cavity, each face of either series being opposed to a face of the other series and arranged substantially parallel with said opposing face, said hub having openings leading from the cavity through the outer

surface of the hub, blades having their inner ends provided with spindles journaled in the openings, cranks within the cavity projecting from the spindles and engaging one series of said triangularly-arranged faces, and an adjusting member connected to the cranks within the cavity for moving the blades on their axes, said adjusting member being provided with triangularly-arranged faces engaging the other series of said faces of the hub, substantially as described.

4. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having its internal cavity formed with a main part and openings leading from said main part, blades having their inner ends provided with spindles journaled in the hub, and an adjusting member movable in the main part of the cavity and connected to the spindles for moving the blades on their axes, the adjusting member being provided with projecting arms extended into said openings and having faces abutting against the contiguous walls of said openings, substantially as described.

5. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having its internal cavity formed with a main part and triangularly-arranged openings leading from said main part, triangularly-arranged blades having their inner ends provided with spindles journaled in the hub and an adjusting member movable in the main part of the cavity and connected to the spindles for moving the blades on their axes, said adjusting member being provided with triangularly-arranged arms projecting into the openings and having faces abutting against the contiguous walls of said openings, substantially as described.

6. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having its internal cavity formed with a main part of angular cross-section and openings extending from each angle of said main part, one of the walls of each of said openings forming substantially a continuation of one of the angularly-arranged sides of the main part of the cavity, angularly-arranged blades having their inner ends provided with spindles journaled in the hub, and an adjusting member arranged in the main part of the cavity and provided with angularly-arranged arms connected to the spindles for moving the blades on their axes and projecting into the openings and having faces abutting against the contiguous walls of said openings, substantially as described.

7. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having two series of engaging faces within its internal cavity, each face of either series being opposed to a face of the other series and arranged substantially parallel with said opposing face, said hub having openings leading from the cavity through the outer surface of the hub, blades having their inner ends provided with spindles journaled in the openings, cranks within the cavity provided on the spindles, said cranks having outer faces engaging one series of the faces of the hub, and inner faces substantially parallel with said outer faces, and an adjusting member having projecting arms connected to the cranks for moving the blades on their axes, each of said projecting arms being provided with substantially parallel faces respectively engaging the opposing inner face of the crank connected thereto and the contiguous face of the other series of said faces of the hub, substantially as described.

8. In combination, a shaft, a hollow propeller-hub mounted on the shaft and having two series of triangularly-arranged engaging faces within its internal cavity, each face of either series being opposed to a face of the other series and arranged substantially parallel with said opposing face, said hub having triangularly-arranged openings leading from the cavity through the outer surface of the hub, blades having their inner ends provided with spindles journaled in the openings, cranks within the cavity provided on the spindles, said cranks having outer faces engaging one series of the triangularly-arranged faces of the hub and inner faces substantially parallel with said outer faces, pivotal pins projecting from the inner faces of the cranks, and an adjusting member having triangularly-arranged projecting arms formed with open-ended slots extending inwardly from their end surfaces for receiving the pivotal pins and permitting their ready detachment from the adjusting member, each of said projecting arms being provided with substantially parallel faces respectively engaging the inner face of the opposing crank connected thereto and the contiguous face of the other series of said triangularly-arranged faces of the hub, substantially as described.

9. In a triple-blade propeller, the combination with a drive-shaft, of a hub mounted thereon having a cavity therein triangular in cross-section and openings leading from each angle thereof into the body of the hub, blades having spindles journaled in said hub, a triangular head arranged in said cavity having extensions from the angles thereof projecting into said openings with one of their faces abutting against the adjacent walls of the latter, arms fixed to said spindles arranged between the sides of the head and the adjacent walls of the cavity within the hub, pivotal connections between said arms and said extensions, and means for reciprocating the head, substantially as described.

10. The combination with the shaft of a reversible propeller, of the divided hub, the reversible blades pivoted between the front and rear sections of the hub and provided with the cranks, the sliding head movable lengthwise of the shaft and having notched flanges adapted to engage with the cranks, said flanges be-

ing situated in planes tangential to the shaft, and each crank rotating in a plane parallel with and closely adjacent the flange it engages, said plane cutting the proximate flange transversely near the bottom of its notch.

11. The combination with the shaft of a reversible propeller, of the divided hub, the reversible blades pivoted between the front and rear sections of the hub and provided with cranks, the sliding head movable lengthwise of the shaft and having notched flanges adapted to engage the cranks, said cranks each rotating in a plane parallel with and closely adjacent a flange and closely adjacent the shaft and within a circle passing through the notches, said notches being distant from the shaft by less than the length of a crank.

12. The combination with the shaft of a reversible propeller, of the divided hub, the reversible blades pivoted between the front and rear sections of the hub, and provided with cranks and provided with stems and with bosses having their outer surfaces curved to correspond with the hub, the sliding head having the flanges, the pin-and-slot connections between the crank-arms and the flanges, and the slide attached to the head, said hub being cut away on the exterior to form seats for bosses and having its wall thickened on the side adjacent the crank-stems, all substantially as set forth, whereby the contour of the bosses and hub are made continuously similar and the crank operatively supported in close proximity to the shaft.

13. The combination with the shaft of a reversible propeller, of the divided hub, the reversible blades pivoted between the front and rear sections of the hub and provided with cranks and provided with stems and bosses, the sliding head having the flanges, the pin-and-slot connections having the crank-arms and the flanges, and the slide attached to the head, said hub being cut away on the exterior to form seats for bosses, and having its wall thickened on the side adjacent the crank-stems, all substantially as set forth, whereby the crank is operatively supported in close proximity to the shaft.

14. In a propeller, the combination of a shaft, a sliding head supported by the shaft and having a plane surface with a slotted flange projecting from one side thereof, a propeller-blade, a crank on said blade lying on the said plane surface of the slide, a crank-pin playing in the slot of the flange, the crank being constructed and arranged to bear against the flange of the slide as the position of the blade is changed, and a hub in which the blade is mounted to turn.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 17th day of March, 1902.

ALEXANDER T. BROWN.

Witnesses:

D. LAVINE,

S. DAVIS.