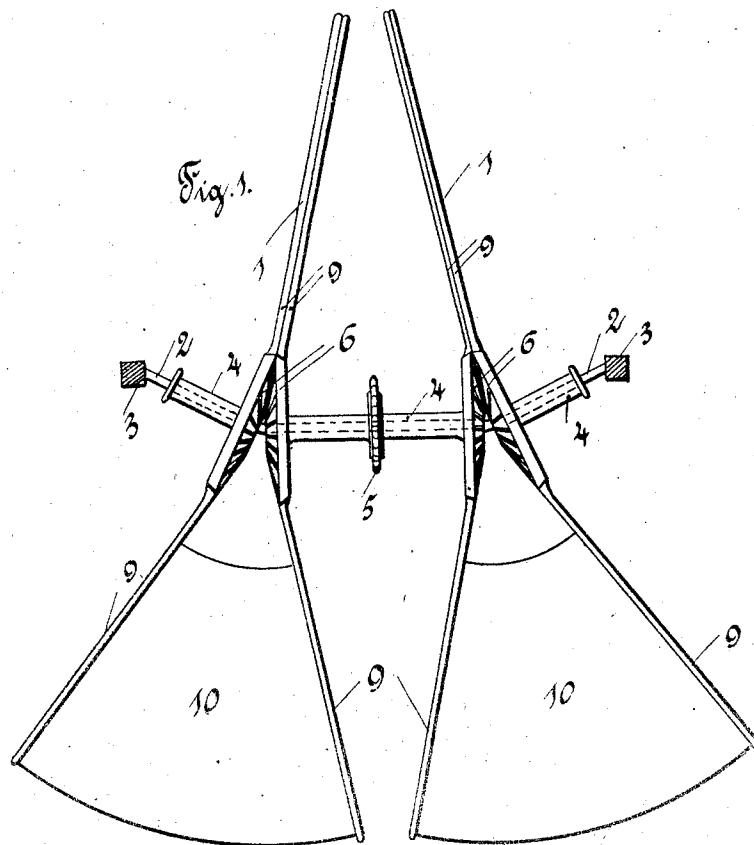


A. HOLMSTRÖM.
PROPELLER.
APPLICATION FILED DEC. 11, 1909.

1,025,399.

Patented May 7, 1912.
7 SHEETS—SHEET 1.



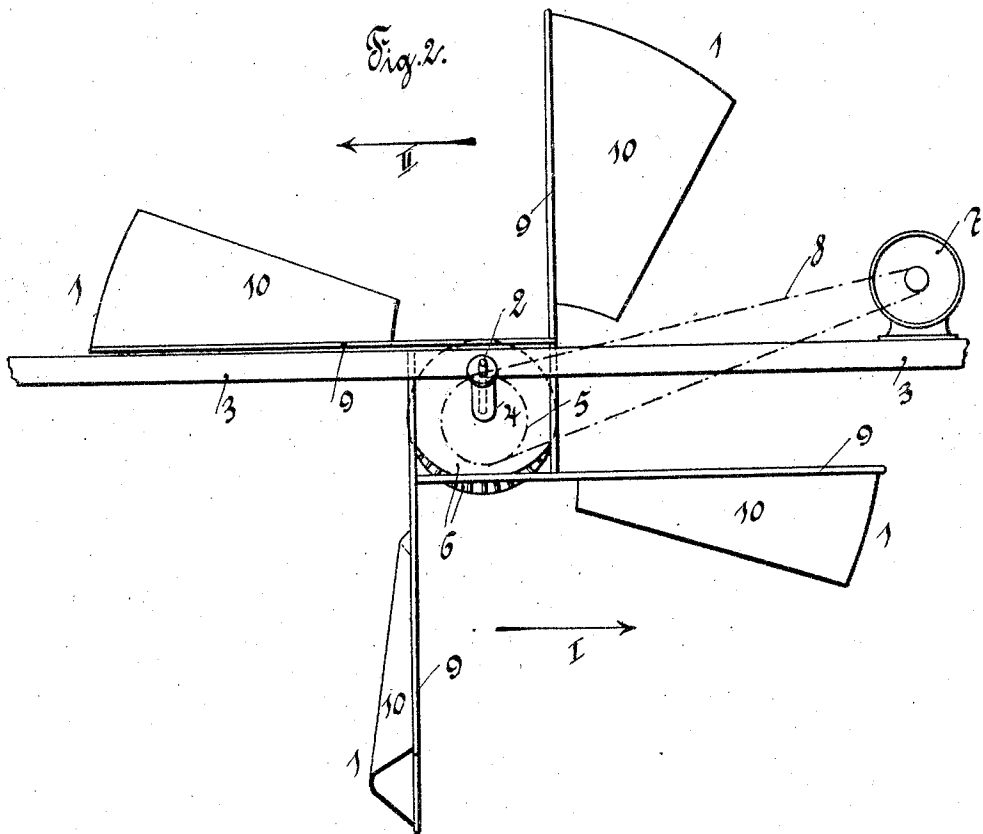
Witnesses:
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Inventor:
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7 SHEETS—SHEET 2.



Witnesses:
Gösta Olsson
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Inventor:
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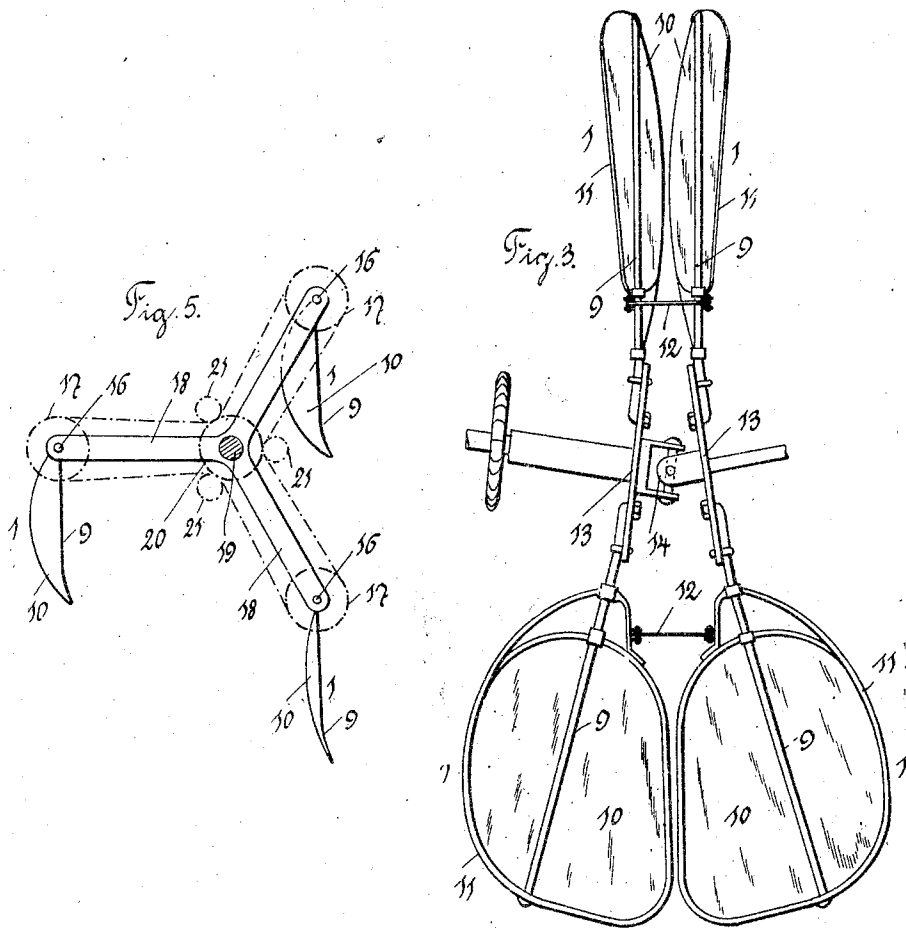
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7 SHEETS—SHEET 3.



Witnesses:

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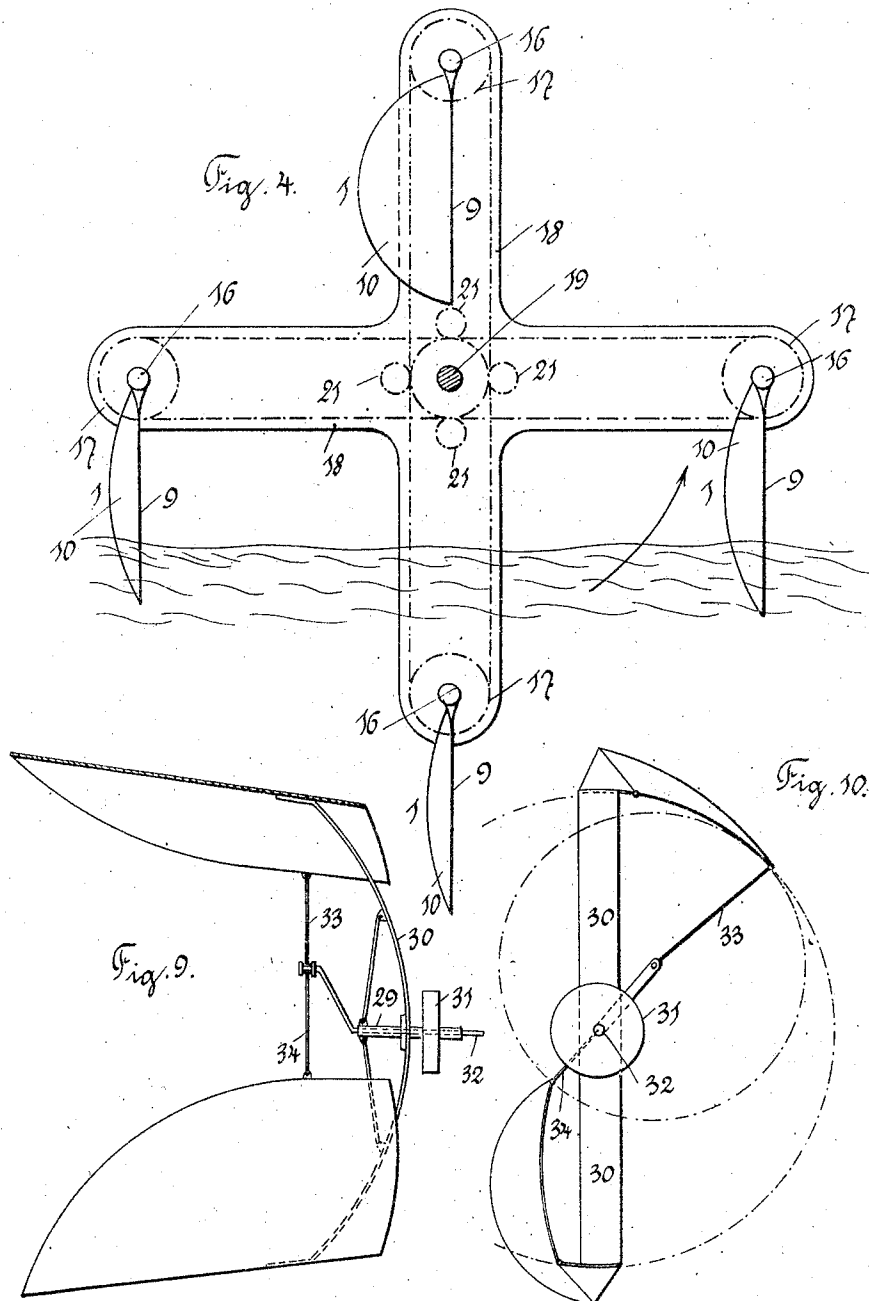
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APPLICATION FILED DEC. 11, 1909.

Patented May 7, 1912

7 SHEETS—SHEET 4.

1,025,399.



Witnesses:

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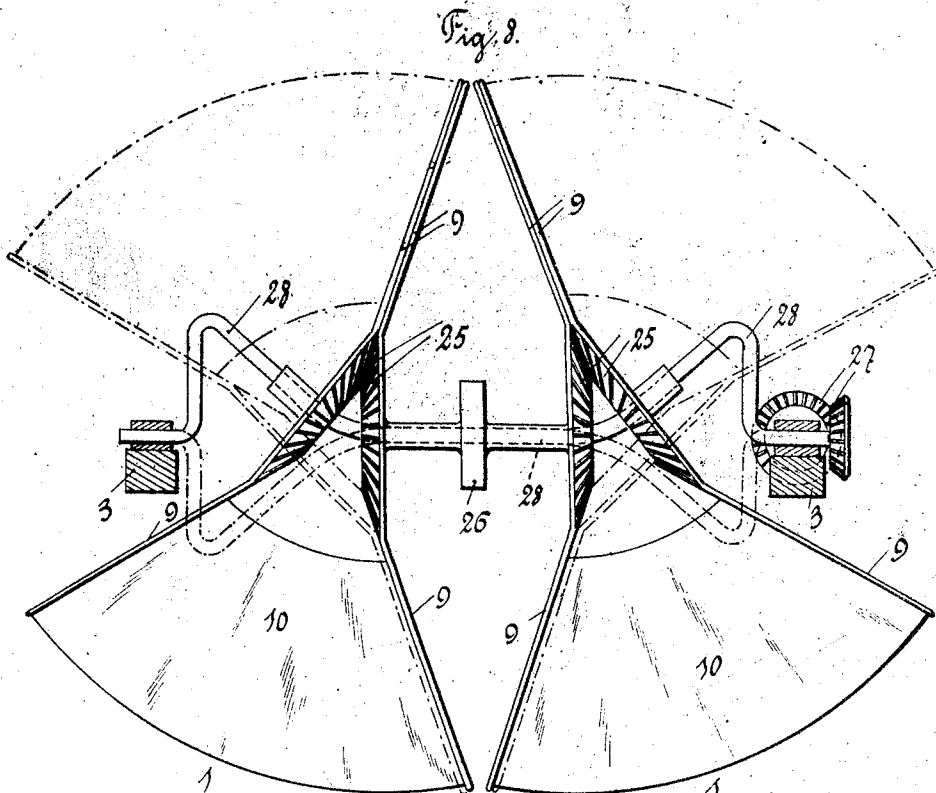
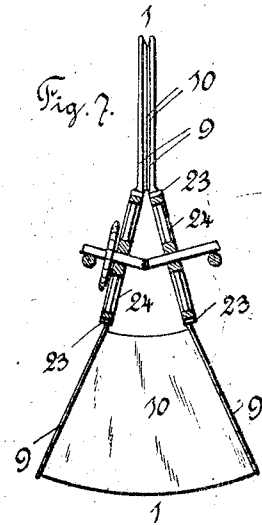
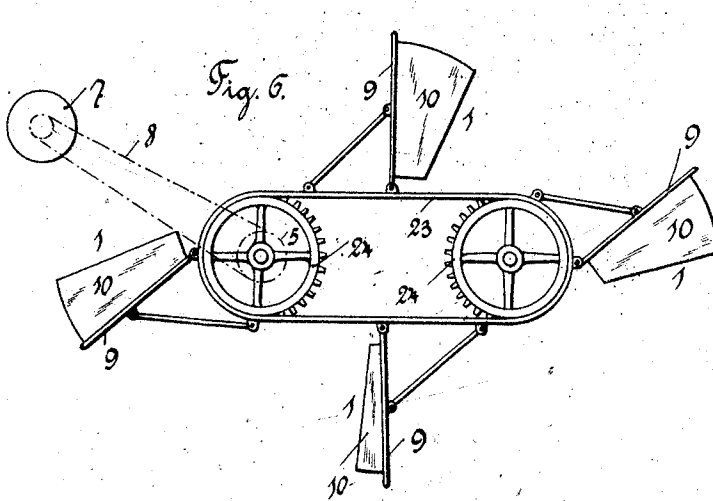
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PROPELLER.
APPLICATION FILED DEC. 11, 1909.

1,025,399.

Patented May 7, 1912.

7 SHEETS—SHEET 5.



Witnesses:

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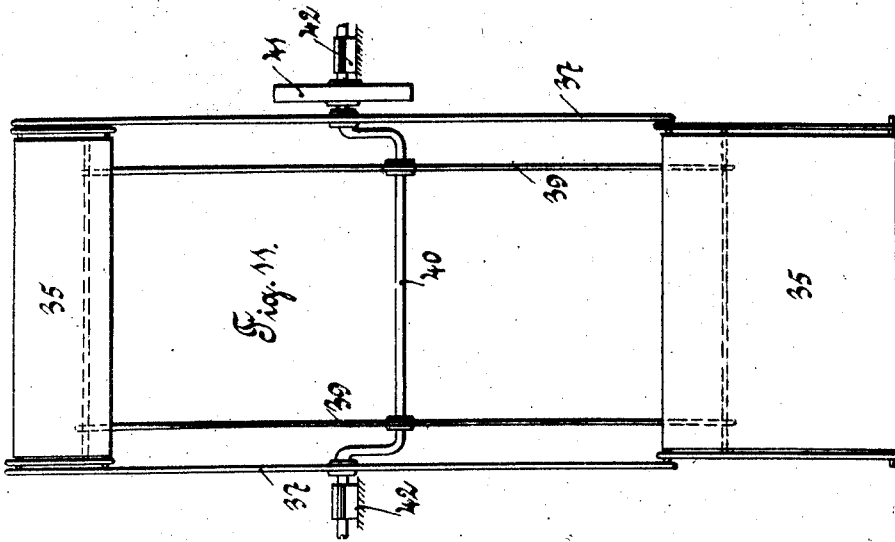
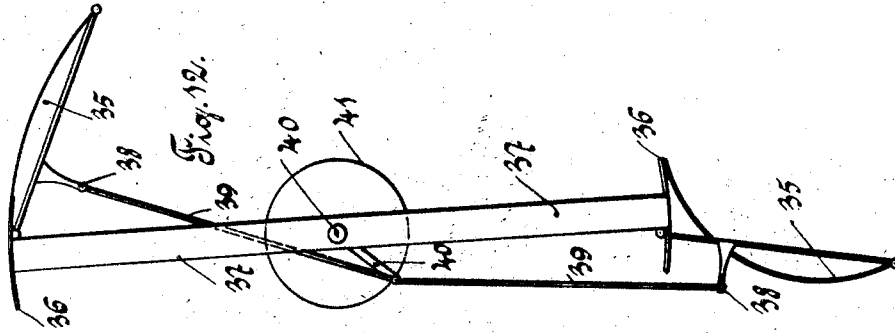
A. HOLMSTRÖM.
PROPELLER.

APPLICATION FILED DEC. 11, 1909.

1,025,399.

Patented May 7, 1912.

7 SHEETS-SHEET 6.



Witnesses:

Arvid Klader
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Inventor:

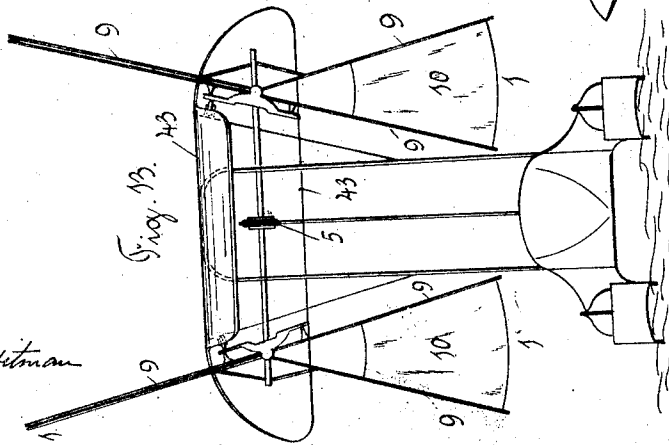
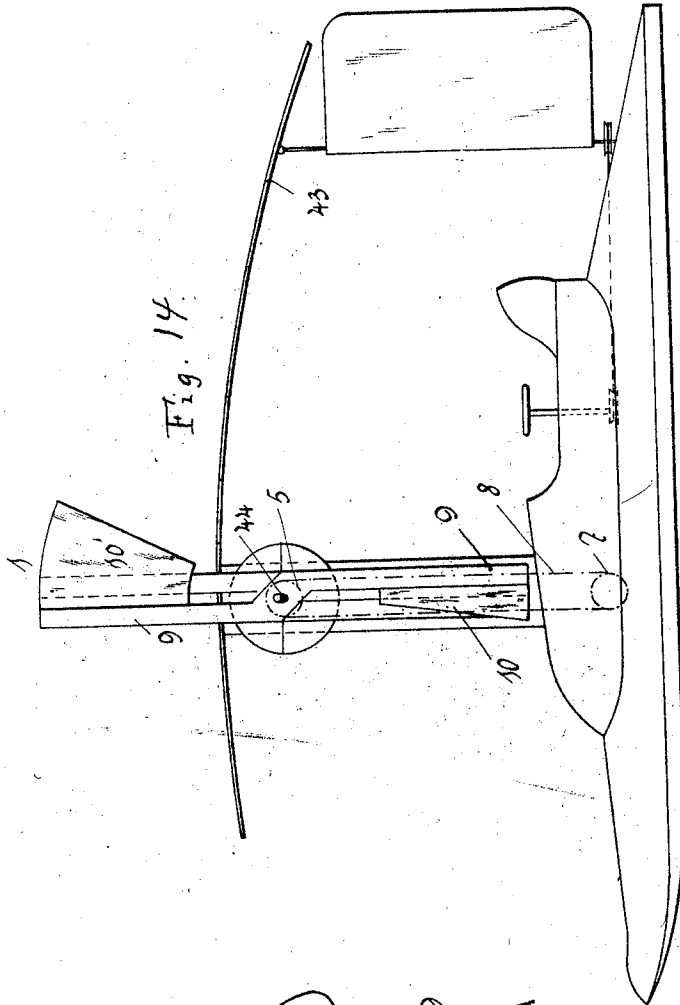
A. Holmström

A. HOLMSTRÖM.
PROPELLER.
APPLICATION FILED DEC. 11, 1909.

Patented May 7, 1912.

7 SHEETS—SHEET 7.

1,025,399.



Witnesses:
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UNITED STATES PATENT OFFICE.

AXEL HOLMSTRÖM, OF PARIS, FR.

PROPELLER.

1,025,399.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed December 11, 1909. Serial No. 532,581.

To all whom it may concern:

Be it known that I, AXEL HOLMSTRÖM, citizen of the Kingdom of Sweden, residing at Paris, France, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

This invention relates to a propeller (termed poly- or bi- centrifugal wheel) which is intended as a substitute for the well known screws and wheels driven by water, air or gas and to effect considerable economy in comparison therewith, particularly in regard to power.

The essential feature of this propeller consists in the special construction of the propeller vanes or blades, which are composed of rigid parts and a flexible part, the flexible part being arranged in such a manner and so varied in its form by the rigid parts, that the flexible part alone serves for overcoming the resistance of the air or water and that only when it is in the working position, while when in the neutral position its form is altered by the rigid parts in such a manner that on the one hand, it performs no work, and, on the other hand offers only the slightest resistance to air or water.

Propeller blades of this kind can be employed according to the purpose in view either singly or in groups so as to form wheel like devices and the efficiency of the whole propeller thus brought to the highest pitch, which is unattainable with the existing propeller screws or wheels. The action of the propeller blade or vane approximates to the flying and soaring of birds, the effect being that of simultaneous forward and upward movement. However in consequence of the above mentioned automatic alteration in the form of the blades the great frictional resistances, which are produced in connection with the known screws and wheels driven by air and water, especially when the speed is great are avoided. When the propeller is employed for air ships and the like, it is possible, in consequence of the simultaneous forward, and upward effect of the same, to dispense with the hitherto necessary special sliding and supporting surfaces, subject to suitable dimensions and sufficient motive power, so that the particular machine can effect a flying movement in the fullest sense of the term.

The propeller can be constructed in a

very large number of different forms, so that the accompanying drawings, which diagrammatically illustrate a few examples, give only an approximate idea of the many forms in which the propeller can be constructed.

Figure 1 is a front elevation showing the arrangement of four blades or vanes, which are driven by the same shaft. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is a front elevation of the arrangement of vanes, which are coupled with one another and arranged on the same shaft by means of a double link. Figs. 4 and 5 illustrate in side elevation a number of vanes connected with one another by a chain gear and simultaneously actuated. Fig. 6 represents a similar arrangement of which Fig. 7 is a front elevation. Fig. 8 shows the arrangement of the vanes, which insures a forward and a backward impulsion as well as an ascending and descending motion. Figs. 9 to 12 are respectively front and side elevations of another form of the devices for supporting as well as for opening and closing the vanes. Figs. 13 and 14 are respectively front and side elevations of the vanes as an air propeller in combination with a high speed boat.

In this invention one or a plurality of propeller blades is mounted upon an actuating mechanism, and each blade or vane consists of a collapsible or movable frame upon which is mounted a flexible web which is adapted to be folded as the frame is automatically collapsed or moved by the actuating mechanism. The flexible web may be formed of any suitable material, such as cloth, canvas, leather, sheet metal or similar webbings. The automatic action of the vanes is so timed that they are effectively unfolded only when in position to oppose the resistance of the medium in which the vehicle is propelled, and are folded or collapsed when they are in return motion or during the periods when they are ineffective, so that their opposing resistance may be rendered at a minimum.

In the form of the invention shown in Fig. 3 the construction of the vanes and the vane arms shows one embodiment of my invention. The material 10 composing the vanes is furnished with framing or stiffening 11 of any preferred kind, in which the arms 9 are pivotally mounted. Moreover each two adjacently situated vanes are con-

connected together by means of intermediate pieces 12, which are flexibly seated on the pieces 11. All the vanes are connected by intermediate pieces 13 of a suitable form with a shaft link coupling 14, which enables the adjacently situated vanes to be turned to a slight extent and the direction of working to be reversed. The driving of the vanes is effected by an intermediate gear wheel 15.

In rotating the vanes are suitably unfolded and folded by means of the loosely guided supports 9, in consequence of their being inclined and by means of the connections 12 between the oppositely situated vanes which likewise always remain equal. The upper part of Fig. 3 shows the vanes closed, the lower part of the same shows them opened. In other respects the action in this form of the invention is precisely the same as in the form shown in Figs. 1 and 2.

Figs. 4 to 7 illustrate forms of the invention, in which a number of vanes arranged on a chain or on one or more chain wheels are uniformly actuated and suitably opened and closed. In the form shown in Figs. 4 and 5 the vanes are suspended so that for example, when employed as water propellers they dip into and come out of the water without splashing. For this purpose the vanes 1 are pivotally suspended on the axles 16 of chain wheels 17 a suitable number of which are seated in one and the same rotary frame 18. This frame is suitably rotated by the shaft 19 that is driven by any suitable source of power. On this shaft moreover are seated one or more chain wheels 20 firmly connected with the bearing bushes and so connected by chain wheel gear with the wheels 17 that all the paddles are rotated simultaneously always parallel to one another, and opened and closed in the prescribed manner. The wheels 20, moreover, cooperate with wheels 21, so as to keep the chains securely in engagement with the axial bearing chain wheels 20.

Figs. 6 and 7 illustrate another form of the chain gear in which the vanes are fixed directly on the chains 23, which are carried over two or more chain wheels 24. The opening and closing of the vanes is effected as will be seen from Fig. 7 by suitably inclined arrangement of the chain wheels and in the same manner as in the form previously described.

The arrangement shown in Fig. 8 enables the vanes to be reversely arranged as desired, for the purpose of effecting a forward, backward, ascending or descending motion. In this case again bevel wheels 25 or the like are employed which are inclined in relation to one another and can be actuated together by a suitable gear 26. By means of reversing gear 27, the shaft 28 which is in connection with the whole of

the bevel wheels, can be rotated as desired, so that the vanes are suitably opened and closed in opposite positions as indicated by dotted lines in the drawing. Accordingly as the shaft or similar devices are rotated they can be used for producing a forward or backward movement, as well as an ascending or descending movement.

Figs. 9 and 10 illustrate a form of the invention in which the vanes can be suitably opened or closed by the driving shaft through the medium of a lever or rod connection gear. The wing like vanes are fixed to frames 30 or the like seated on two axial sleeves 29 and are actuated from a suitable source of power through the medium of a suitable gear 31 while the shaft 32 remains stationary. The vanes are connected with the shaft 32 by levers 33, 34, so that when the vanes are rotated, the effective point of the connection with shaft 32 on the vanes is correspondingly displaced, whereby the vanes are correspondingly opened and closed. The lever arrangement can also be replaced by suitable crank or other arrangement.

Figs. 11 and 12 illustrate a similar form to Figs. 9 and 10 which only differs as regards the vanes. The vanes 35 are flexibly arranged at 36 on the frame parts 37 and are connected with a cranked shaft 40 by rods 39 flexibly connected with them at 38. This shaft runs through the frames 37 and is seated in bushings 42 and driven by the pulley 41. When the shaft is rotated, the movable vane parts 35 are correspondingly moved outward and inward. These parts may be flexible or rigid. The cranking of the shaft may likewise be replaced by a suitable eccentric or crank arrangement.

Finally Figs. 13 and 14 illustrate the employment of vanes as air propellers in connection with a high speed boat. By means of the vanes 1 in addition to the resistance of the air being overcome, air is simultaneously swept under one or more awnings 43 whereby a lifting effect is produced. Thereby it is made possible, with suitable motive power in the boat to attain a high speed not hitherto possible, with the slightest frictional resistance to air and water. The arms 9 are obliquely fixed on the driving shaft 44, whereby the unfolding and folding of the vanes during their rotation is suitably effected.

What I claim and desire to secure by Letters Patent is:

1. A propeller, comprising in combination, a plurality of continuous flexible supporting means actuated in planes disposed at an angle, arms carried by said flexible supporting means to spread or lie together as the latter are moved in their respective planes, and webbing foldable between said arms.

2. A propeller, comprising in combination, a plurality of continuous flexible supporting means actuated in planes disposed at an angle, arms carried by said flexible supporting means to spread or lie together as the latter are moved in their respective planes, webbing foldably stretched between said arms and flexible driving means oper-

atively connected to both of said supporting means.

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

AXEL HOLMSTRÖM.

Witnesses:

ERNEST ENTENMANN,
FRIDA KLAIBER.