J. B. WARD.

Screw-Propeller.

No. 216,244. Patented June 3, 1879.

Fig. 1.

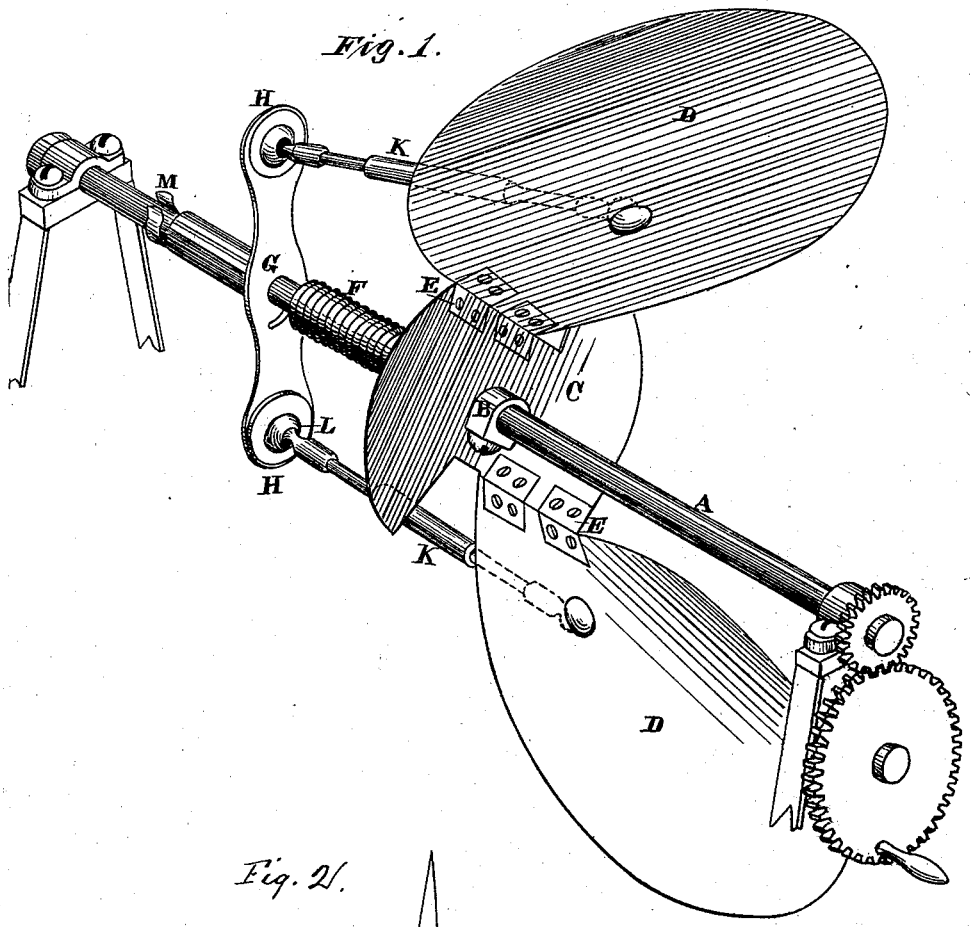
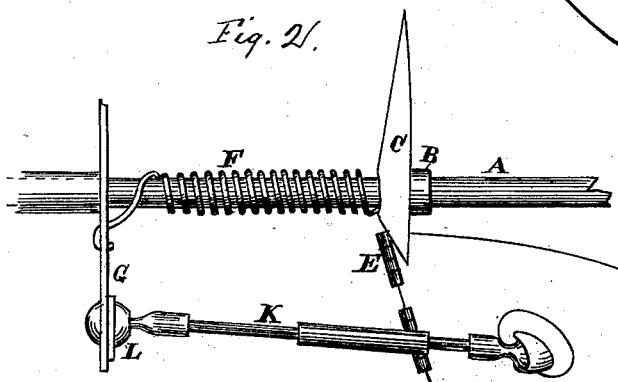


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN B. WARD, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN SCREW-PROPELLERS.

Specification forming part of Letters Patent No. **216,244**, dated June 3, 1879; application filed November 9, 1878.

To all whom it may concern:

Be it known that I, JOHN B. WARD, of the city and county of San Francisco, and State of California, have invented a Self Adjusting and Registering Propeller; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved propeller. Fig. 2 is a view with one blade of the propeller detached.

My invention relates to an improved self adjusting and registering propeller; and my improvements consist, first, in hinging the blades to a central flange or hub disk, so that the propeller is made expansible, the pitch of the blade being automatically adjusted in proportion to the power applied and the resistance of the medium in which the propeller is revolved.

It also consists in attaching a registering device to the sliding collar connecting with the blades, so that the exact pitch of the blades at any point is indicated and registered, and the pressure registered also.

Let A represent the axle or shaft on which the propeller is secured, and which is rotated by any suitable mechanism or power.

When the propeller is to be used for aerial navigation, proper gearing will be applied between the power and the shaft, and if used for marine propulsion direct connection can be made with an engine.

The hub B is keyed to the shaft in the ordinary manner, and on this hub are formed or secured the flanges C, their number corresponding to the number of blades to the propeller. The flanges are placed vertically or set at a slight pitch, as shown.

By means of these flanges I obtain a broad and secure hinge bearing-surface to which to attach the blades B. The torsional strain on the blades is such as to require a broad bearing for one or a series of hinges, E, to sustain this strain as well as the thrust-strain.

To each of these flanges is attached a movable propeller-blade, D, broad hinges E or similar devices connecting the blade and flange, as shown.

Around the shaft A is the coiled spring F, one end of which is secured to the propeller-hub, and the other end to the sliding collar G. This sliding collar has two or more arms, H, corresponding to the number of blades to the propeller, attached to it, and in the ends of these arms H are the hinged braces K.

A circular disk may take the place of the arms, and any form of spring or springs may be used. These braces are hinged or swiveled by ball-and-socket joint L to the arms H, and are attached by similar means to the propeller-blades, as shown. Each blade will then have a brace connecting it with the arm on the sliding collar.

It will be manifest that when the propeller is in a state of rest or revolved slowly the hinged blades will be pushed out so as to have a sharp pitch by means of the coiled spring acting on them through the sliding collar, arms, and hinged braces. As the shaft is revolved more rapidly centrifugal action will cause the periphery of the blades to approach more nearly the line of motion of the hub or central flanges, and decrease the pitch in proportion to the velocity. When it is desired to have the blades maintain a certain fixed pitch, by securing the sliding collar by a set-screw or other suitable device at the proper point on the shaft the braces on the arms of the collar will hold the blades in the proper position, and at the same time admit of the revolution of the propeller.

It will be seen that by connecting a suitable registering attachment with the sliding collar the actual pitch of the screw at different speeds will be recorded, inasmuch as the horizontal movement of the collar on the axle or shaft is directly proportionate to the pitch of the propeller-blades by reason of the connection between the collar and blades, as heretofore described.

The amount of power exerted by the fan in pounds can also be registered by fixing an appropriate scale on the shaft. Then by placing a loose collar on the shaft outside of the sliding collar the loose collar would remain at the farthest point to which it was pushed, and thus register the greatest power exerted.

In some cases the sliding collar, spring, and arms may be used on the shaft on one side of

the propeller, and sometimes on the other, according to the uses to which the propeller is to be put.

The registering attachment which I have shown consists of a spring-clamp, M, which partly encircles the shaft, so that as the sliding collar is extended to its utmost by the centrifugal action herein described the said collar pushes the registering-clamp to its farthest point, and as the collar is drawn back by the action of the springs the clamp will remain at the point where it was pushed, thus registering the maximum pressure exerted on suitable scale-marks on the shaft. As the clamp is gradually moved out the varying pitch of the screw may also be shown by suitable marks on the shaft, the clamp M acting as a pointer. Instead of using this clamp I may cut a slot on the shaft and fit a dovetailed sliding plate therein, part of it projecting above, so as to engage with the sliding collar, and this acts as a marker or register.

A propeller made in the manner herein described may be used for various purposes, more particularly for marine and aerial propulsion.

For use on steamers the central flanges are reduced as much as possible, so as to offer little resistance to the water. This form of propeller is then very useful for such vessels as use both steam and sails, since when the sails alone are used the blades of the propeller will be drawn or forced back, so as to lie in a position offering no resistance to the water, the arms being so constructed as to admit of the blades lying almost parallel with the shaft.

The arms themselves are then formed of suitable shape to offer little resistance to the passage of the vessel through the water. When, however, it is desired to use steam again, as soon as the power is applied to the shaft the blades automatically assume the position necessary to drive the vessel onward. In this way the propeller can be used for marine propulsion on many vessels which now use sail alone, the main objection to propellers in such cases being the fact that they make a heavy drag when the vessel is under sail and the propeller not in motion. This propeller automatically adjusts itself both in closing and opening when power is applied or when it is shut off, and the pitch is also automatically adjusted in accordance with the amount of power exerted.

For aerial navigation this propeller is specially adapted, its blades being then made broad and light. For greater centrifugal effect the edges of the blades may be made somewhat thicker than the inner portion, thus bringing more weight at the outer edges. The blades may also be made concave, if desired. It may also be used for sustaining or elevating vessels in the air or water by the shaft being placed vertically and the propeller revolved in a horizontal plane. When operating horizontally from a vertical shaft, a circular disk may be attached to the flanges inside of the braces. Used in this position the propeller may be used to sustain leaky vessels or for elevating or depressing aerial cars or vessels. It may be utilized as a sand pump or excavator, and in hard material the blade-edges may be beveled down and the central flanges or hub set at an angle, so as to work as a screw into the material. It may be used for propulsion through air or water, for compressing air, pumping water, transferring air or water from one vessel to another, &c.

When used for compressing air the propeller is inclosed in a suitable tube, pipe, or case having proper feed and discharge openings.

I am aware that heretofore an adjustable propeller has been made wherein blades have been hinged to the shaft, and are self-adjusting by means of braces attaching them to a movable collar around the shaft controlled by a coil-spring; but I am not aware that a flange has been interposed between the hinged blades and the shaft or hub.

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

1. The propeller-blades D and the central flange or hub C, in combination with the sliding collar G and the spring F, or equivalent tensional attachment, substantially as and for the purpose herein described.

2. The adjustable propeller-blades D, hinged as shown, and connected with the collar and tensional device, in combination with the registering device M, substantially as and for the purpose herein described.

In witness whereof I have hereunto set my hand this 25th day of October, A. D. 1878.

JOHN B. WARD.

Witnesses:

CHAS. G. YALE,

FRANK A. BROOKS.