L. H. Colborn.

Screw Propeller.

No. 51,295. Patented Dec. 5, 1865.

Fig. 1.

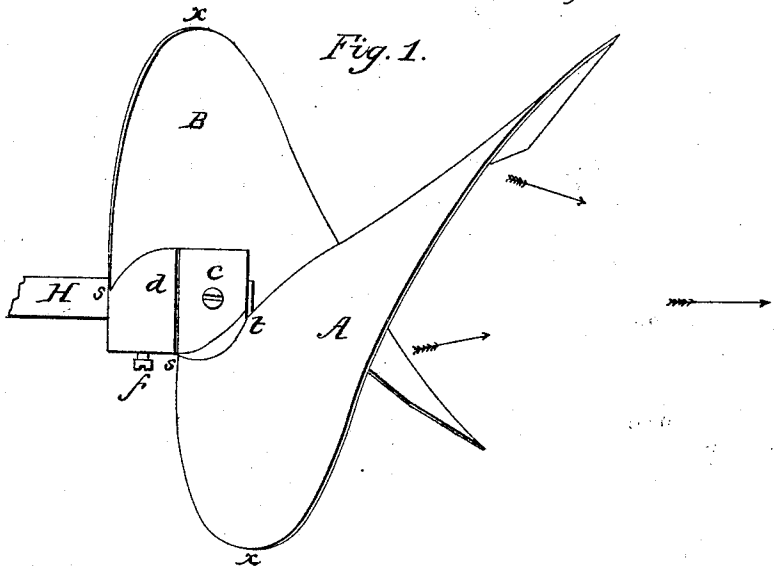
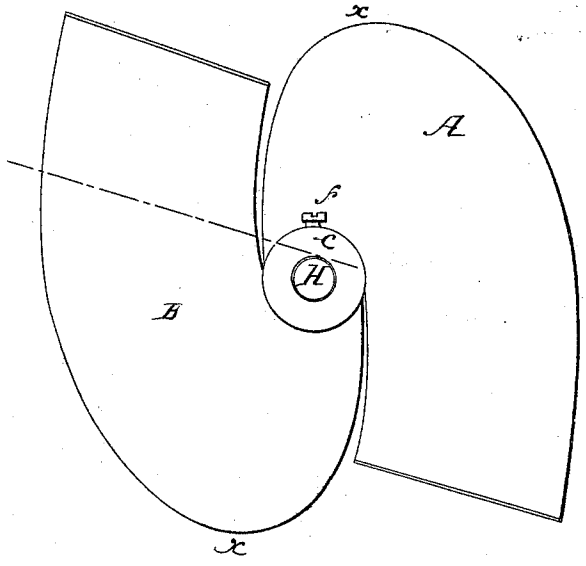


Fig. 2.



Witnesses.
Jay Hyatt.
James C. Brown

Inventor.
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UNITED STATES PATENT OFFICE.

LEVI H. COLBORN, OF CHICAGO, ILLINOIS.

IMPROVED SCREW-PROPELLER.

Specification forming part of Letters Patent No. **51,295**, dated December 5, 1865.

To all whom it may concern:

Be it known that I, LEVI H. COLBORN, of Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Screw-Propellers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation thereof, and Fig. 2 a rear elevation of the same.

Like letters of reference indicate corresponding parts in both figures.

My invention consists in making the screw-blades of propellers with a central open space around their axis of revolution; in making them enter the water sharply at their forward end, then gradually and uniformly increase their lead to the rear end thereof; in so arranging them that in revolving their outer edges shall be in advance of the radial lines extending from their inner edges, and in casting or forming each blade with its own distinct hub complete in itself, so that it may be attached to the propeller-shaft and replaced independently of the other blade or blades, and so that either the forward or rear blade or blades may be adjusted in advance of the other blade or blades, as desired, all substantially as hereinafter set forth.

In the drawings, A represents the rear blade with its hub *c*, and B the forward blade with its hub *d*, each secured to the propeller-shaft H by a screw, *f*, or any equivalent means, the two composing a two-bladed screw-propeller. Each blade is complete and distinct in itself, so that it can be attached to the propeller-shaft and detached in case of breaking, and replaced independently of the blade, so that there is no loss in case of breakage beyond that of the blade broken. When two blades are used they are generally situated opposite to each other on the shaft. Three or more blades may be employed instead of two, the arrangement generally being at equal distance, around the circle. Since one blade, by this construction, is placed the thickness of the hub forward of the other, advantage may also be taken to place the forward blade so as to cut the water in advance of the rear blade, or vice versa, according to circumstances.

The blades are constructed alike, and a description of one will apply to the other or others, and I will proceed to describe the formation of one of them.

The blade forms part of a screw-thread, the axis of formation being either coincident with its axis of revolution or, as represented in the drawings, at one side thereof, so that each blade of a propeller has a separate axis of formation. In either case the most essential feature is to have a central open space around the common axis of revolution, which is a continuation of the central line of the shaft H. The diameter of this central space, as left unswept by the revolution of the blade or blades, may be varied, but generally as great as or greater than the diameter of the blade-hubs. This construction leaves room for a body of water centrally behind the propeller, and enables the action of the blades so formed to throw the water toward or along the central line of motion, so that the propelling force due to the reaction of the water is all expended in a forward direction, as desired. This could not be the case if the shaft were continued the whole length of the blades, or there were no central open space, since it is readily seen that if there were no open central space the water between the blades must revolve therewith till discharged at the rear end or forced out sidewise by the centrifugal action. This action of my blades on the water is illustrated by the arrows in Figs. 1.

Another feature in the construction of the blade is that its forward end enters the water very sharply or at a very small angle, as from the initial point *s* to the point *x*, where the full width of the blade is attained, and thence its lead constantly increases to the rear end of the blade, so that the successive rearward portions of its face continually follow up the retreating water due both to the forward motion of the boat and its own backward impulse, and thus the action of the blade continues effective throughout its whole length and leaves the water with an impingement almost directly backward.

A third feature in the construction of the blade is the overhanging or advanced position of the outer edge, as compared with the opposite or corresponding points on the inner edge thereof, in respect to the radial lines, perpendicular to the axis of revolution, extending outward from

the said inner edge. The effect of this formation with a blade having an open central space around its axis of revolution is to further counteract the centrifugal tendency of the impelled water and to move it or leave it in a compact central body directly behind the propeller.

The advantages of my improvement thus constructed are as follows:

First, in starting the wheel the scroll or curved form of the blade enables it to enter the water easily and smoothly without that sudden percussion and consequent jar or shock to the vessel and strain upon the machinery which is produced by the tangent arm and blade of an ordinary propeller-wheel.

Second, the increasing lead of the blades as they enter the water enables the "gain" part, which is constantly increasing, to take hold of the water, and as the wheel revolves continue to act against the water the whole length of the blade, thus unceasingly urging the boat forward in a manner of a fish's tail, or an oar in the act of sculling a boat.

Third, the centrifugal action common to ordinary propeller-blades is here counteracted, and the action upon the water is directly rearward, thereby utilizing the whole power for the propulsion of the boat.

Fourth, it is obvious that this direct backward current enables the rudder placed in it to be operated more effectually as the receding current offers a greater resistance to the sides of the same.

The separate and complete construction of each blade renders the repairs cheaper, in case of breakage, and prevents the boat from becoming disabled in such cases, since an extra blade kept on hand remedies the matter, and where there are three or more blades composing the propeller, if one is broken the remaining blades are readily adjusted so as to dispense with the additional one for the time being.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A screw-blade having a central open space around its axis of revolution, substantially as and for the purpose herein specified.

2. Arranging the face of a screw-blade, having a central space around its axis of revolution, so that its outer edge in revolving shall be in advance of the radial lines extending from its inner edge, substantially as herein described, and for the purpose set forth.

3. Casting or forming each blade with its own hub complete in itself, so that it may be attached to the propeller-shaft and replaced independently of the other blade or blades, substantially as herein described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LEVI H. COLBORN.

Witnesses:

JAY HYATT,

JAMES C. BROWN.