J. W. WHITTAKER.
Screw-Propellers.

No. 197,437. Patented Nov. 20, 1877.

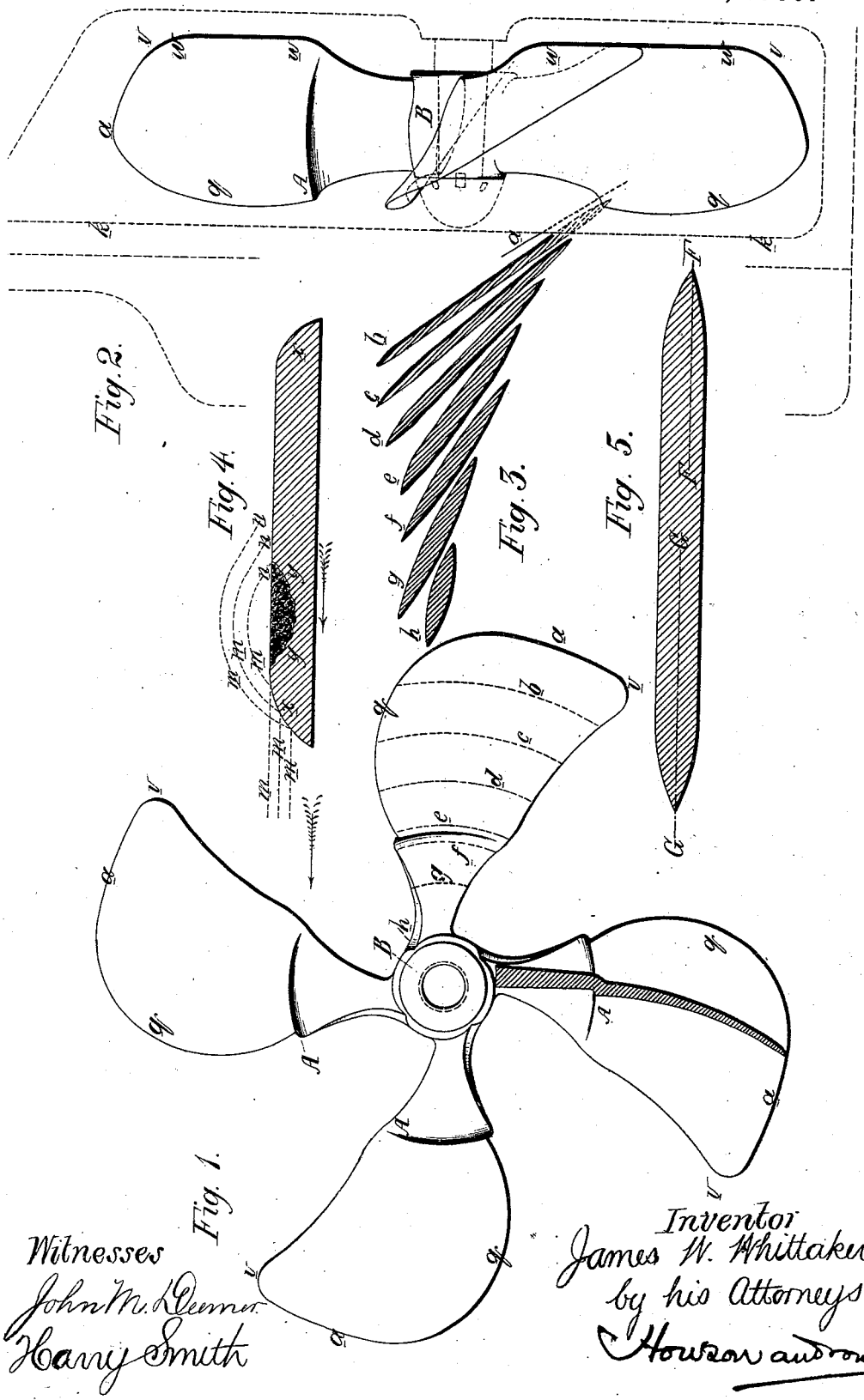

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

Fig. 1.

Witnesses
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by his Attorneys
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UNITED STATES PATENT OFFICE.

JAMES W. WHITTAKER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO WILLIAM P. STREET, OF SAME PLACE.

IMPROVEMENT IN SCREW-PROPELLERS.

Specification forming part of Letters Patent No. **197,437**, dated November 20, 1877; application filed May 31, 1877.

To all whom it may concern:

Be it known that I, JAMES W. WHITTAKER, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Propellers, of which the following is a specification:

The objects of my invention are, first, to increase the efficiency of a propeller the blades of which represent sections of true screws; second, to prevent the deterioration by corrosion of the after surface of iron screw-blades, which always takes place with propellers making long voyages at sea, and which entirely destroys the efficiency of an iron screw in the course of two or three years.

These objects I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a face view of my improved propeller, on one blade of which is shown a radial section; Fig. 2, an edge view of the same; Fig. 3, sections of one of the blades at different points; Fig. 4, an enlarged sectional view of a blade as ordinarily constructed, and Fig. 5 an enlarged sectional view of a blade of my improved propeller.

It is generally acknowledged by engineers that the best propellers are those the blades of which are sections of true screws.

In making propellers of this class it is usual to make the blades of the same pitch throughout—that is, from hub to periphery. This plan is defective, however, in one particular, which I will proceed to explain preparatory to describing the manner in which I remedy the defect. In continuing a true screw-blade to the hub, that portion of the blade nearest the hub is at such a low angle, with reference to the direction of the motion of the ship, that, instead of performing any propelling duty, it assumes the character of a paddle operating at right angles to the direction of the ship's advance, thus absorbing power of the engines without compensating effect. With the view of remedying this defect the blades of propellers have been made with a pitch decreasing regularly from periphery to hub. Screw-propellers have also been made with large spherical hubs, with a view of eliminating the low angle at the hub; but by the first arrangement the advantages of a true screw are lost, and by the second the frictional surface is increased to a detrimental extent.

I retain the advantages of the true screw, and at the same time obviate the defects above referred to, by making the working surface of each blade which has to perform the active duty—that is, the portion of the blade from the outer edge or periphery *a* to the line A, Fig. 1—of a proper pitch suited to the diameter of the propeller, power of engines, and midship section of the vessel. The portion of the blade from the said line A to the hub B, I make of such a less pitch (about ten per cent.) that it will not have the paddle-like action above referred to, but will pass through the water edgewise, and perform its sole and proper duty of carrying the effective working part of the blade.

The line A, where the two pitches meet, is, by preference, at a point where the working-surface pitch assumes an angle of forty-five degrees in respect to the shaft. I never carry the working surface inward beyond the said angle of forty-five degrees.

Heretofore it has been the usual practice to round or sharpen the edges of propeller-blades entirely at the back, as shown at *x x* in the enlarged sectional view, Fig. 4. This is the cause of the corrosion, above referred to, of the rear of the blade at and beyond the point where the sharpening of the edge begins, as shown in black at *y*. This corrosion continues until the blade is entirely eaten through and the edge drops off.

As the blade passes in the direction of the arrow through the water the latter must be deflected, as indicated by the lines *m m*, the water being thrown clear of the surface, and carried into the blade again by direct pressure at *n n*. A space is thus left between the water and blade, and this space is filled with free air and carbonic-acid gas collected from the sea-water, thus causing the above-mentioned corrosion.

I remedy this defect by rounding or sharpening the edges of the blades both from the rear and front. For instance, the line G, Fig. 5, represents the central line of the thickness of one of the blades, and from this line I round both edges of the blades, as shown.

This corrosion may be prevented from taking place on the back of the blade by thus rounding or sharpening from the front only; but this would cause the blade to corrode on its front surface. I therefore round the edge or sharpen from both surfaces, for the additional reason that such an edge on a propeller-blade reduces the resistance by dividing it equally, and not throwing the whole resistance on the back of the blade, which tends to retard the advance of the ship.

The following edge of the blade I sharpen to a line one-third from the working face F, Fig. 5, for the reason that the thrust or slip of the screw has set the whole body of water in motion by the time it has reached that point, and the currents of water on both sides of the blade will, by this means, be permitted to flow quickly together without leaving a space behind the edge of the blade for free air and gases from sea-water to collect and corrode the metal.

Another feature of my invention will be best understood by reference to Fig. 2, which gives a general outline edge view of the propeller and its relation to the "propeller-well," or space between stern and rudder posts of the ship occupied by the propeller, this space being indicated by dotted lines.

It will be observed that each blade is cut away and rounded off at the after edge *q*, between the point A, where the pitch changes, and the periphery *a*, while the forward edge is continued in a straight line, *w w*, from the pitch-line A, before mentioned, entirely out to the periphery *a*, excepting a slight cutting around the sharp outer corner *v* to prevent its breaking off. This narrowing of the blade, or the reduction of its area as it approaches the periphery *a*, is the reverse of the usual practice, the ordinary plan being to narrow from both edges, or entirely from the forward one; yet there are good grounds for the theory and practice of reaching forward into dead water, rather than reaching aft to follow up water already set in motion by the effective surface of the working face of the propeller; therefore, whatever reduction or narrowing of the blades may be found necessary as they recede from the hub, that reduction or narrowing is taken from the after edges of the blades, and not from the forward edges.

An additional advantage of this reduction is the space gained between the outer after edge *q* of the propeller-blades and the rudder-post *k*, Fig. 2. Owing to this space the water is not thrown directly against the rudder and post, thus relieving the ship of the constant jar and shake at its after end, which is so annoying to passengers and so destructive of stern-fixtures and steering apparatus.

I claim as my invention—

1. A screw-propeller each blade of which presents on its working face, from the periphery *a* to about the line A, a section of a true screw of one uniform pitch, and from the said line A to the hub B a section of a uniformly true screw of a less pitch, as and for the purpose set forth.

2. A screw-propeller each blade of which is rounded or sharpened from both sides, as and for the purpose described.

3. A screw-propeller constructed substantially as described, each blade being cut away or reduced in area at its after edge only from about the line A to the periphery of the screw, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES W. WHITTAKER.

Witnesses:

HERMANN MOESSNER,

HARRY SMITH.