T. M. RANKIN.

PROPELLERS FOR VESSELS.

No. 174,854. Patented March 14, 1876.

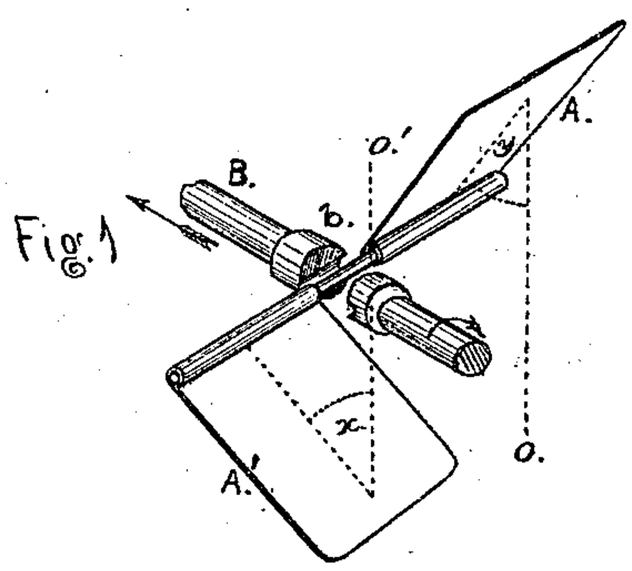

Fig. 1

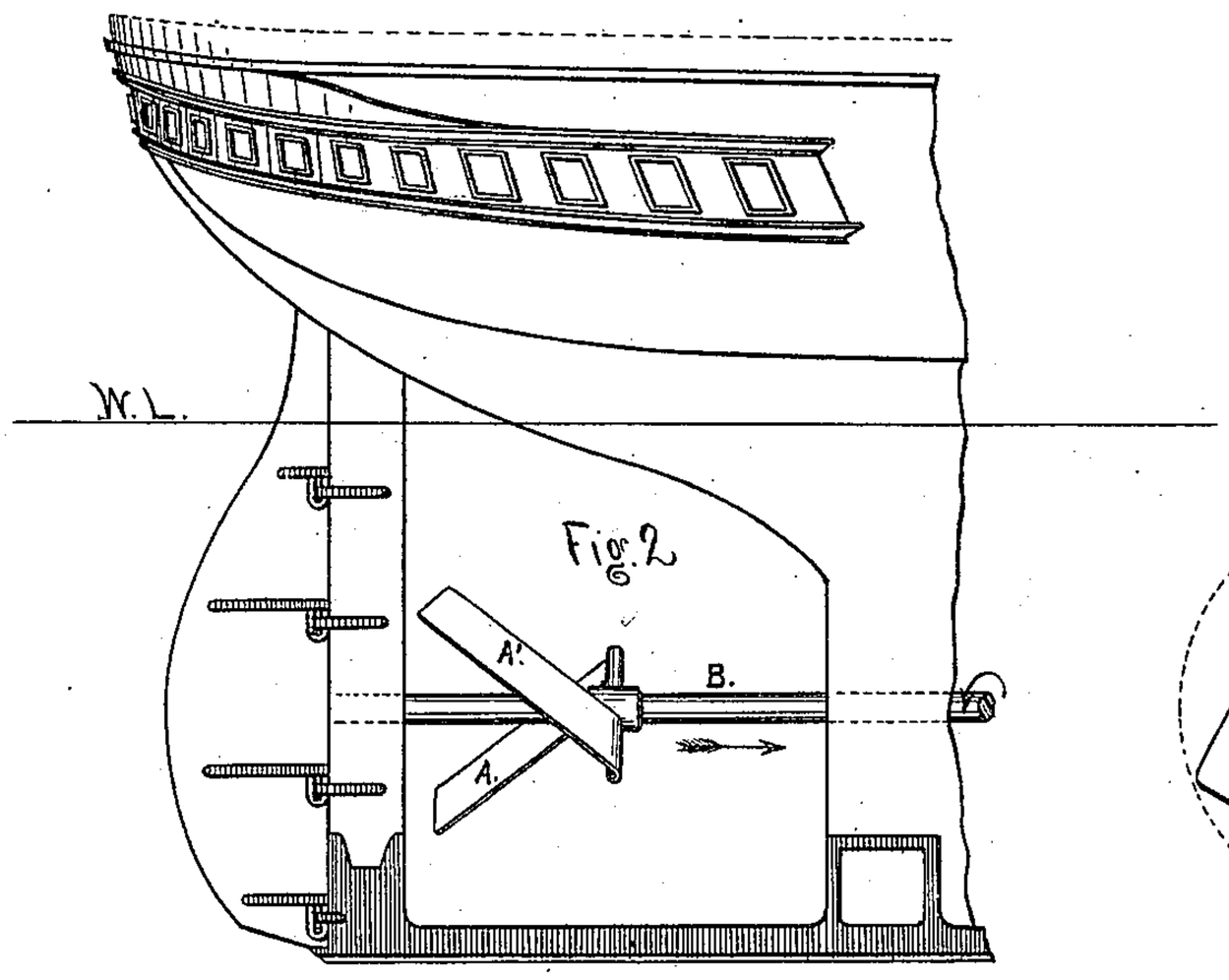

Fig. 2

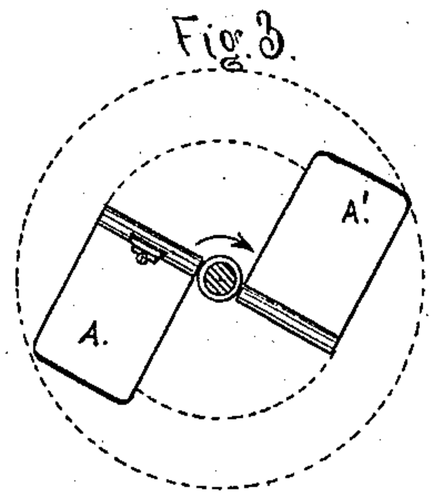

Fig. 3.

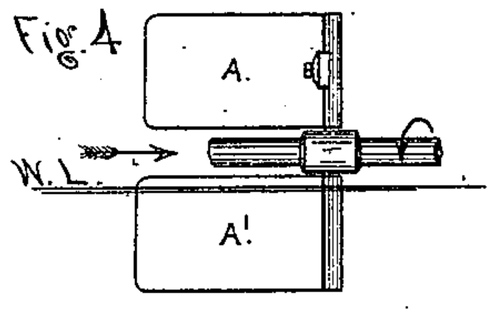

Fig. 4

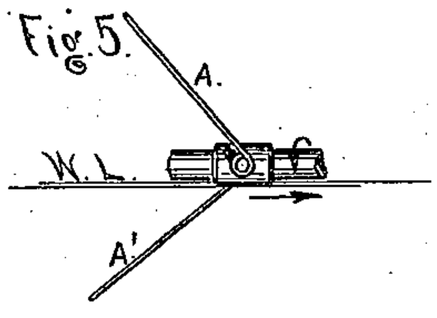

Fig. 5.

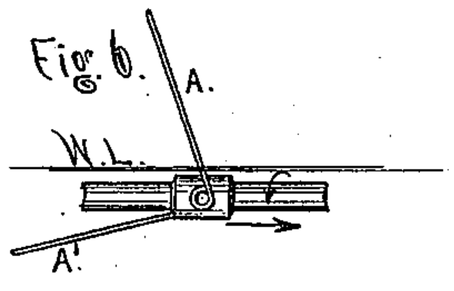

Fig. 6.

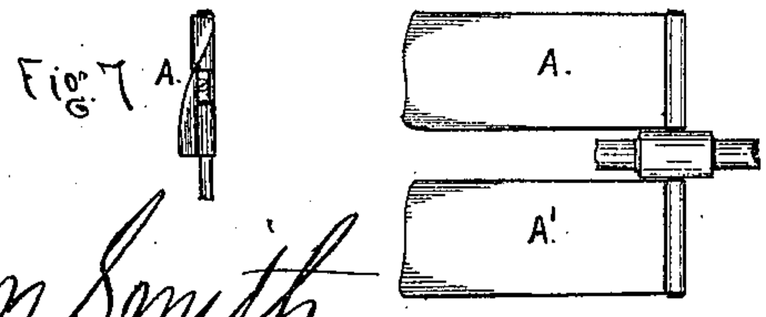

Fig. 8.

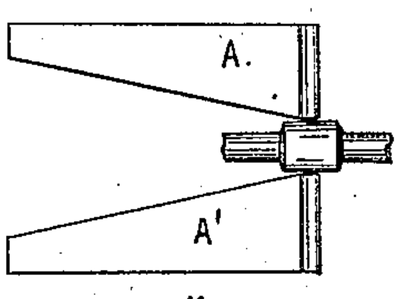

Fig. 9.

Fig. 7 A.

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THOMAS M. RANKIN, OF MODESTO, CALIFORNIA.

IMPROVEMENT IN PROPELLERS FOR VESSELS.

Specification forming part of Letters Patent No. **174,854**, dated March 14, 1876; application filed April 5, 1875.

To all whom it may concern:

Be it known that I, THOMAS M. RANKIN, of Modesto, in the county of Stanislaus and State of California, have invented a new and useful Propeller or Motor for Vessels, of which the following is a specification:

The object of my invention is the production of a substitute for the screw-propeller which will reduce the jar or vibration of the hull, caused by the blades of the screw acting improperly upon the water, and remove the liability of breaking either of the blades.

The construction of my propeller is illustrated by Figure 1 of the drawing, and its application to a vessel by Fig. 2. In Fig. 3 is shown a view of the propeller from behind, and in Figs. 4 and 5 its position in the water at different points of revolution of the shaft. Fig. 6 illustrates the action of the blades as the pressure upon one or the other varies. Figs. 7, 8, and 9, show different forms of blades.

The propeller consists essentially of two blades, A A′, fixed upon a shaft, *a*, at an angle with each other, and connected with and secured to the driving-shaft of the engine or other motive power. The blades A A′ are made of thin metal, of a strength and thickness proportionate to the size of propeller, either in one piece or of several sheets of metal, riveted together and strengthened by means of ribs and flanges to hold them in shape against the action of the water. They are secured to the shaft *a* either in a fixed manner or by devices that will permit them to be adjusted and held at any angle with each other.

In the figures of the drawing, the blade A′ is fixed to the shaft *a*, while the other, A, is adjustable around it, and thus, in adjusting the propeller to the vessel and to the work required from it, the angle between the faces of the blades can be changed as desired; but the set-screw shown in this case to hold the blade A upon the shaft would not answer in applying the propeller in a practical manner, and other and stronger means, therefore, would be necessary to hold the blade properly in position; or, in cases where the proper pitch or angle of the blades is established, the adjustment before mentioned may be dispensed with, and the two blades may be secured rigidly to their shaft. The shaft *a* passes through the collar *b* or enlarged portion of the driving-shaft B, and is held always perpendicularly to the driving-shaft, but yet with sufficient play to permit the shaft *a* to turn, or rotate, in it; so that, although the motion of the blades around the driving-shaft is always positive, and in a circle, of which the shaft and collar is the center, yet the blades and their shaft *a* are free to turn, as the water in which they are immersed acts upon their surface with different degrees and changes of pressure.

From this manner of constructing and arranging the propeller, it will be seen, by reference to Fig. 1 of the drawing, that as the driving-shaft B is revolved in the direction of the arrow, the under surface of the blade A is pressed down upon the body of water beneath it, and, by virtue of its angular position in the water, it must act to move the shaft B, and the vessel in which it is moved, in the direction indicated by the straight arrow; and further, it will be seen that, while the blade A is pressing down upon the water beneath it, the other blade A′ is acting in a similar manner upon the body of water above and in contact with its upper surface. Under these conditions the tendency of each of the blades, when in the position shown in Fig. 1, is to take a perpendicular position, or the one offering the least resistance; but, as they are fixed upon the shaft *a*, the pressure upon one blade holds the other against the pressure of the water; thus the equilibrium is preserved and the pressure equalized between them as they revolve.

To illustrate this, let the broken line *o* represent one element in the pressure upon the blade A, and the corresponding line *o′* an element in the pressure upon the blade A′. So long, therefore, as the pressure of these elements is equal upon these blades their position will remain the same; but if the pressure of the element *o′* should be increased the blade A′ would be turned down and the angle of resistance, *x*, would be lessened, but the angle *y* of the other blade, A, would be increased; therefore, the pressure against the surface of the blade A would increase. Con-

sequently, as the shaft *a* is free to turn in the collar *b*, the blades will turn and adjust themselves till the pressure is equalized between them. In some cases, where, from the rolling and pitching of the vessel, one of the blades may be exposed above the water, this principle of adjustment will prevent any injury to the propeller by the breaking of the blades, for, as the blade again enters the water it will assume a position of least resistance and cut into the water, instead of striking against it and forcing its way below the surface by displacement.

This action may be illustrated by Figs. 4, 5, and 6 of the drawing, where W L may represent the water-line, or surface of the water in which the propeller is working, and the arrows may show both the direction of the motion of the driving-shaft and the travel of the vessel. If, therefore, at any time the blades are thrown above the surface W L, Fig. 4, the continued revolution of the driving-shaft will cause the blade so exposed to enter the water in the positions shown in Figs. 5 and 6, thus causing it to cut edgewise into and below the water.

In the points of defective action and liability to be broken, found in the propellers now in use, my invention is a great improvement, and the mode of acting upon the water, already described, renders its operation smooth and regular.

No excessive strain is thrown upon one portion at any time at the expense of the other part, as the acting-surface of the blades is as broad at the part near the driving-shaft as at the other end; so this part that is the weakest point in the screw-propeller can be strengthened without decreasing the force of the propeller by adding to it such matter that will only tend to increase its weight without giving it greater acting-surface. And, further, as its operation when immersed is similar to the action of natural motors, as illustrated in the movements of a fish, no cutting up or thrashing of the water is produced, but a regular pressing and pushing movement is done by the blades with but a small amount of disturbance of the water, and consequently no power is thrown away.

In the several views of the drawing, the blades A A′ are shown as set at an angle of a little less than ninety degrees to each other; but this may be changed, as I do not confine my construction to any particular angle, though I prefer to set them at about right angles. But this may depend upon the conditions attending the application of my propeller to different kinds of vessels, and the power required from it, for, in employing a propeller of this kind to drive canal or other boats traveling in shallow water, I should make the blades longer and narrower in proportion to those shown in Figs. 1, 2, 3, and 4, so that they would have a form something like those shown in Figs. 8 and 9, and in such cases it might be necessary to make the angle less, as otherwise they would have too wide a sweep. It might also be desirable in these cases to make the ends of the blades of curved form, or of the shape shown in Figs. 7 and 8; but these are modifications in the construction of this propeller that are not essential to the principle of its operation, and do not change the character of my invention.

It will be seen, by referring to Figs. 1 and 2 of the drawing, that, as the motion of the driving-shaft B is reversed, the blades A A′ turn over and take hold of the water in a position opposite to that taken by them before—the shaft in Fig. 2, being rotated in the direction of the curved arrow, produces a motion of the vessel *c* in the direction indicated by the straight arrow, while its rotation in the other direction, as shown in Fig. 1, throws the blades over and causes them to act upon the water in the contrary direction, and thus move the vessel backward.

Having thus fully described my invention and the manner of applying it, what I claim, and desire to secure by Letters Patent, is—

A propeller for vessels, having the following elements, viz: a driving-shaft, a cross-shaft passing at right angles through said driving-shaft, and capable of rotary motion therein, and blades attached to said cross-shaft, substantially as and for the purposes set forth.

THOS. M. RANKIN.

Witnesses:
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EDWARD E. OSBORN.