(No Model.)

R. BELL & D. SELKIRK.

SCREW PROPELLER.

No. 285,212. Patented Sept. 18, 1883.

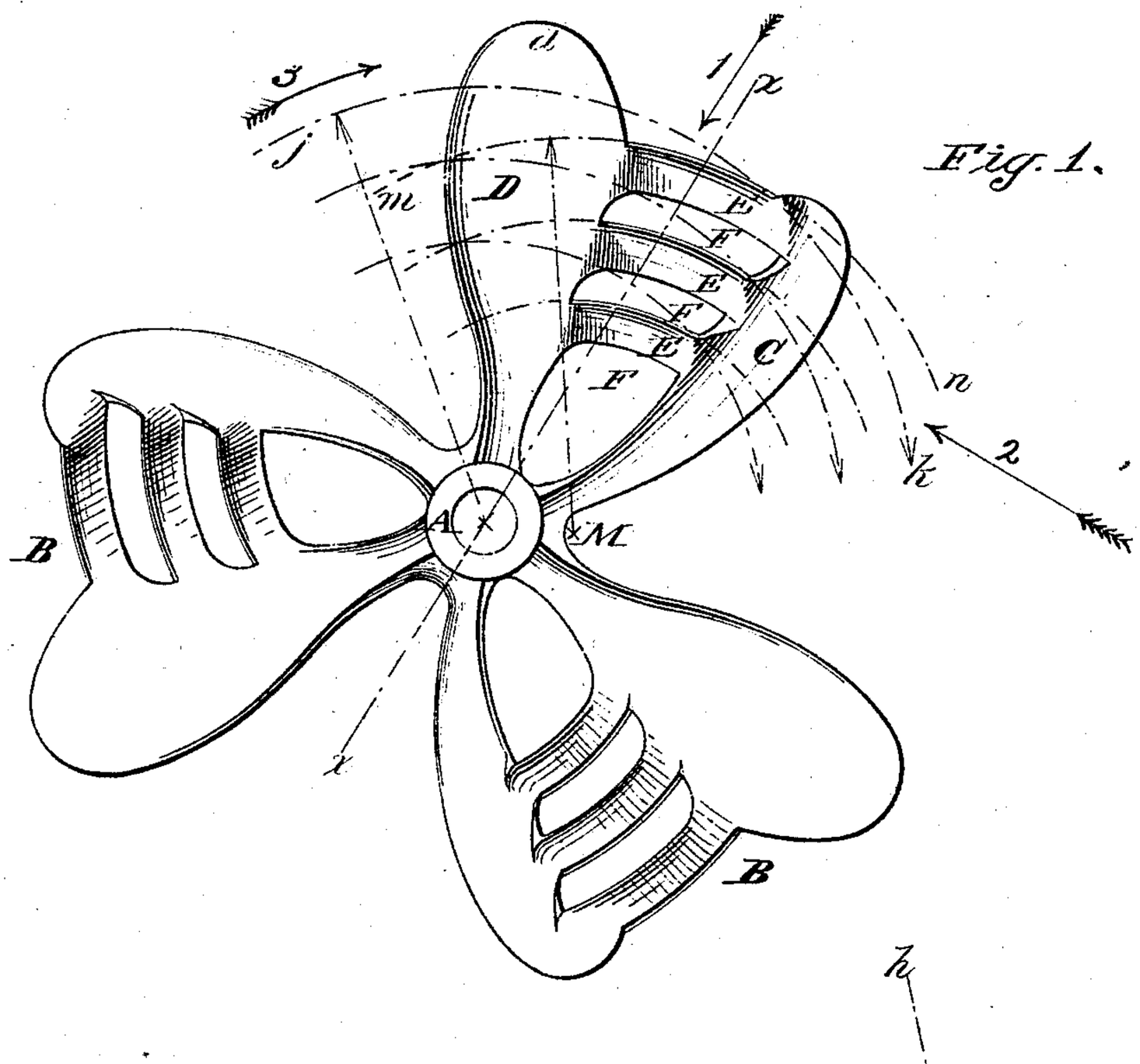


Fig. 1.

Fig. 2.

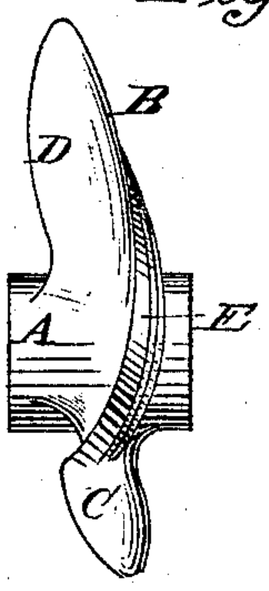
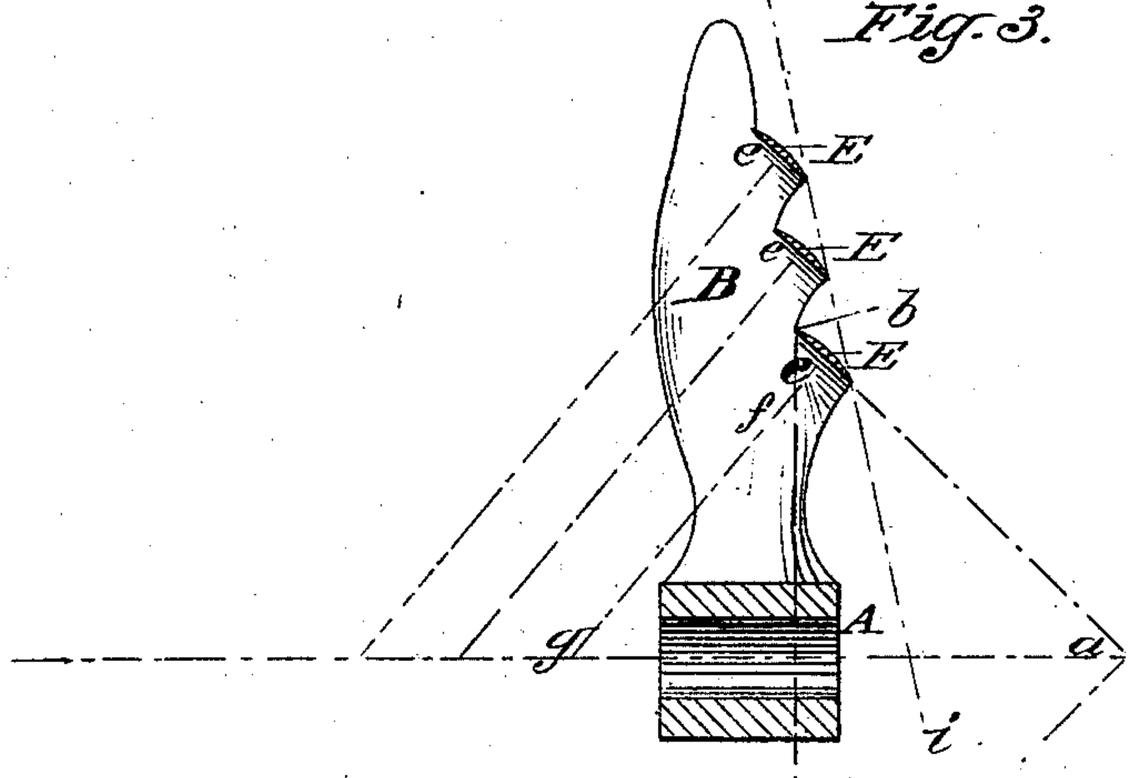


Fig. 3.



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UNITED STATES PATENT OFFICE.

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SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 285,212, dated September 18, 1883.

Application filed September 16, 1882. (No model.)

To all whom it may concern:

Be it known that we, RICHARD BELL and DAVID SELKIRK, both citizens of Great Britain, and residents of Liverpool, England, and Brooklyn, Kings county, New York, United States of America, respectively, have invented a new and useful Improvement in Screw-Propellers, of which the following is a specification.

The object of our invention is to provide a screw-propeller of an improved construction by which the water acted on by the blades as the propeller revolves will be thrown backward and toward the center of the propeller-shaft, and which will obviate the tendency usual in propellers as hitherto constructed to carry the water around with the blades, and thus will act with greater efficiency of propulsion and produce less commotion in the water than propellers of former construction.

In the accompanying drawings, Figure 1 represents an end elevation, showing the rear surface of a screw-propeller constructed according to our present invention. Fig. 2 is an edge view of the same, (seen in the direction of arrow 1 of Fig. 1,) showing the form of one of the compound blades. Fig. 3 is a vertical section of the same, taken on the line *x x* of Fig. 1, and seen in the direction of arrow 2.

A is the propeller-hub. B are the blades, or, as we will here call them, "compound blades." Each blade B is composed of a smaller blade, C, forming the forward or cutting edge of the blade B, a larger blade, D, forming the rear or main surface, and one or more or a series of cross-blades, E, uniting the front and rear portion, C D, of the compound blade B, and leaving openings F between each other and the said portion C D. The terms "front" and "rear" are here used relative to the motion of the propeller, which, when working, revolves in the direction indicated by arrow 3 in Fig. 1. The blades D C have the same pitch and are constructed in the manner as ordinary propellers; but the cross-blades E have, in addition to the helical pitch common to the blades D C, a pitch or inclination toward the axis of the propeller-shaft; or, in other words, they are so placed, as shown in Fig. 3, that their working-surface at any cross-section (*e*) will lie in a line parallel with the side surface of a cone, *a b c*, having its apex *a* situated in the axis of the propeller-shaft at a point forward of the propeller. By this construction it is evident that the water cut during the revolution of the propeller by the cross-blades E will be thrown back toward the extended axial line of the propeller-shaft in rear of the propeller, or in the direction of line *f g*, forming about a right angle with the working-surface of the cross-blades E at the cross-section *e*. In order not to cut through the water in the same plane at the same time, the outer cross-blades are set a little in rear of the inner ones, or so that the line *h i*, tangenting the cutting-edge of all the cross-blades simultaneously, will form an angle with the axis of the propeller other than a right angle, or, in other words, will have an inclination toward the propeller-shaft, as shown in Fig. 3. Viewed from the end of the propeller-shaft, as in Fig. 1, the edge curves of the cross-blades E are not concentric with the periphery and shaft of the propeller, but are spiral or eccentric thereto; or, in other words, they are circle arcs whose center M lies outside of the center of the propeller in such a position that the radial distance from the center of the propeller-shaft to the forward end of each cross-blade is greater than the radial distance from the same center to the rear end of the same cross-blades. This causes the cross-blades to make a slanting cut through the water, and allows the large blade D to act upon a column of water glancing off from the cross-blades, centralized or solidified, as it were, by them. With reference to Fig. 1 this will be clear. For instance, the curve *m n* of a cross-blade, E, drawn on the center M, intersects the arc *j k*, drawn on the center of the propeller-hub A through the forward end of the cross-blade, and as the propeller revolves in direction of arrow 3, a portion of the outer end, *d*, of the large blade D, at a distance radially beyond the rear end of the cross-blade, intercepts the said arc *j k*. The combined action of the helical cut of the blade D and the additional conically helical and spiral cut of the cross-blades E not only prevents the water from moving around with and from being thrown out laterally by the blades, but compresses it centrally rearward, thereby increasing the effect of propul-

sion of the vessel; or, as it is technically termed, the propeller "makes solid water," and consequently more "thrust."

We depend for effect on the cross-blades E and the large blade D, the smaller blade C serving the purpose, mainly, of strengthening the cross-blades, which otherwise might be broken by striking against accidental obstruction. In the absence of any obstructions the blade C might just as well be entirely dispensed with. Any number of blades and cross-blades may be used, and the whole propeller may be either cast in one solid piece or composed of separate pieces.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A propeller-blade formed of a radial blade, D, having helical pitch, and of one or more cross-blades, E, having a helical and also a conical pitch, and emanating from the radial blades, substantially as specified.

2. A propeller-blade formed of a radial blade, D, having helical pitch, and of one or more cross-blades, E, emanating from the radial blades, said cross-blades having a helical and also a conical pitch and a spiral location by being curved on a center, M, situated outside of the propeller center, substantially as specified.

3. A propeller-blade formed of a radial blade, D, having helical pitch, and of cross-blades E, having a helical and also a conical pitch, and emanating from the radial blades, said cross-blades being situated in different planes of axial cross-sections, as well as at different radial distances from the propeller center, substantially as hereinbefore set forth.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 21st day of August, 1882.

RICHARD BELL.
DAVID SELKIRK.

Witnesses:
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