



Witnesses:  
 Geo. N. Howard.  
 W. A. Daniels &

Inventor:  
 Hermann Hirsch  
 C. S. Whitman, Attorney

# UNITED STATES PATENT OFFICE.

HERMANN HIRSCH, OF MIDDLESEX COUNTY, ENGLAND.

## IMPROVEMENT IN THE CONSTRUCTION OF VESSELS.

Specification forming part of Letters Patent No. **145,347**, dated December 9, 1873; application filed November 14, 1872.

### *To all whom it may concern:*

Be it known that I, HERMANN HIRSCH, of Craven street, Strand, in the county of Middlesex, England, have invented an Improvement in the Form and Construction of Ships and other Vessels; and do hereby declare that the following description, taken in connection with the accompanying sheet of drawings hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvement, by which my invention may be distinguished from others of a similar class, together with such parts as I claim and desire to secure by Letters Patent—that is to say:

My invention relates to an improvement in the form and construction of ships and other vessels, whereby the following advantages are secured, namely: Large capacity for cargo and internal accommodation, strength of structure and a form of stable equilibrium when the vessel is aground, combined with great steadiness and stability when it is afloat, and very small resistance, whereby propelling power can be economised or great speed may be secured. For this purpose I form and construct a vessel substantially as I will describe with reference to the accompanying drawings, of which—

Figure 1 represents a half-plan, Fig. 2 a side view, and Fig. 3 an end view, half from the stern and half from the bow, of a vessel constructed according to my invention. The curves in Fig. 3, marked with the numbers 1 2 3, &c., show the outlines of half-transverse sections on the lines marked with corresponding numbers in Figs. 1 and 2. The curved water-lines in Fig. 1, marked with the Roman numerals I II III, &c., show the outlines of half-sectional plans on the lines marked with corresponding numerals in Figs. 2 and 3. The dotted curves in Fig. 2, marked with the capital letters A B C, &c., show the outlines of vertical longitudinal sections on the dotted lines marked with corresponding letters in Figs. 1 and 3. The keel *a* is even, extending the whole length of the vessel's bottom. In section it swells from its lower edge upward and outward in curves, presenting their concave sides outward, the outward swelling being gradually diminished toward the bow and stern. Amidships the

bilge, starting on either side of the keel from a point, *b*, some distance up the side of the keel, swells outward and downward to the level of the lower edge of the keel, at *c*, and then upward and outward to a point, *d*, some distance below the light water-line. From this point *d* the side and free board might be carried up straight, either vertically or inclined somewhat outward; but I prefer first to sweep a portion of the side, as from *d* to *e*, upward and outward in a curve, presenting its concave side outward and extending to about or somewhat above the load water-line, whence the free board may be carried up straight or preferably with a curvature bulging outward, as shown at *f* in Fig. 3. From this formation the midship section presents the appearance of two vessels with rounded bottoms coupled to one intermediate keel. For some distance along the middle body the sections fore and aft of the midship section present the same general character as the midship section, the width being gradually reduced and the swell of the bilge being lessened both in breadth and in depth. At about one-third of the length of the vessel from bow and stern, as shown at the sections marked 6 and 18, the downward swell of the bilge dies out, and thence, toward the ends of the vessel, the curvature of the sides is carried continuously from the keel outward and upward with the outward curvature, gradually diminishing toward the bow and stern.

From this form and construction it will be seen that, if the vessel lay on a level floor, it would rest with stability on its keel and its two midship bilges.

The appearance of a double vessel presented in the midship section, and for about one-third of the vessel's length along the middle body, gradually dies out in the other sections until, at about one-third of the vessel's length from bow to stern, respectively, as shown by the section lines 1 to 6 and 18 to 23, the two parts appear to coalesce in one vessel.

While the vessel moves, the spaces at *b b* on each side of the keel form channels, through which water from the bow flows toward the stern. The currents thus passing between the keel and the bilges serve to steady the vessel, and when the vessel is fitted with a propeller

they afford it a supply of water on which it acts with greater efficiency.

The curvature of the longitudinal sections marked A B C, &c., in Fig. 2, taken vertically through the bilge, presents the general appearance of a double wave with the crests near the bow and stern, respectively; and the intermediate hollow amidships, and oblique sections through the bilge, would present a like general character, as do the horizontal sections or water-lines marked I II III, &c., in Fig. 1. Such wave-lines, in vertical and horizontal sections, determine a form of small resistance to movement through the water.

The outward curvature which I prefer to employ from the water-line to *e* in the lower part of the free board, combined with the channeled structure presented on each side of the keel between it and the two swelling bilges, as well as the peculiarly-formed keel itself, serves to steady the vessel in the water and to diminish leeway, the keel itself acting as a lee-board. The structure of the keel in combination with the bilges gives great strength, and the downward and outward swell of the bilges and sides gives great floatation and stability and large internal accommodation.

In the figures above referred to I have represented a vessel of certain proportions; but it may be readily understood that a similar

construction is applicable to a vessel of different proportions. A longer or shorter vessel might be designed by extending or contracting the several curves of horizontal and longitudinal sections in the direction of the length of the vessel without proportionally extending or contracting them in the direction of the width or depth, or the curvature of those sections toward the bow and stern might remain the same, the vessel being lengthened or shortened by altering the length of the middle body between the fore and aft portions.

Having thus described the nature of my invention, and in what manner the same is to be performed, I claim—

The keels swelling upward and outward, bilges swelling outward and downward, and sides having an outward curvature near and above the water-line, when so constructed and combined that all horizontal and vertical sections through the bilges will partake of the form of wave-curves, as and for the purposes described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 16th day of October, 1872.

HERMANN HIRSCH.

Witnesses:

JOHN IMRAY,

JNO. P. M. MILLARD.