(No Model.)

3 Sheets—Sheet 1.

C. G. LUNDBORG.

Construction of Ships.

No. 234,794. Patented Nov. 23, 1880.

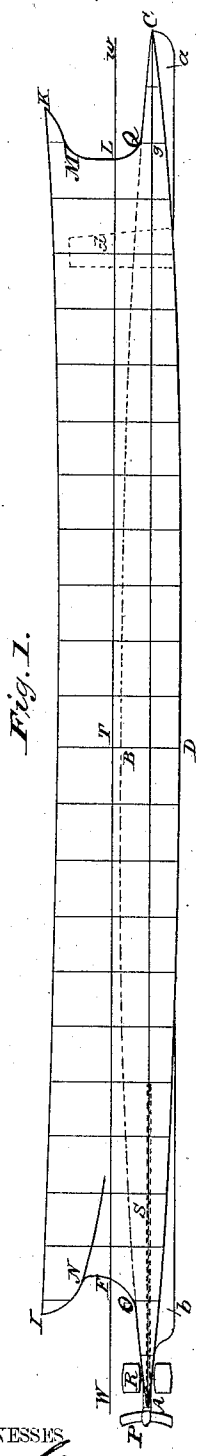


Fig. 1.

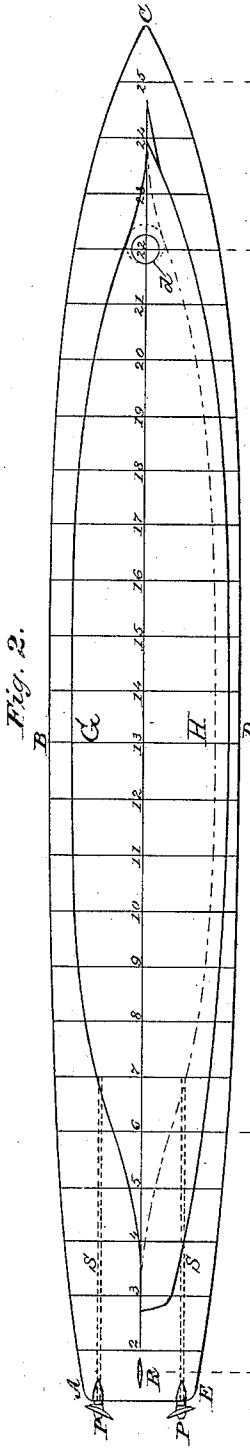


Fig. 2.

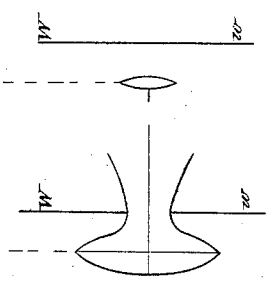


Fig. 3.

Fig. 4.

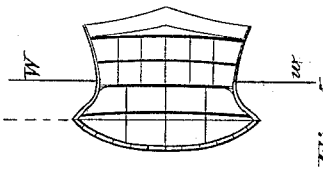


Fig. 5.

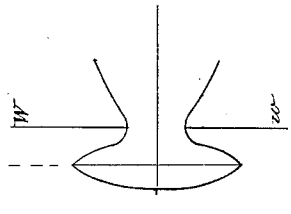


Fig. 6.

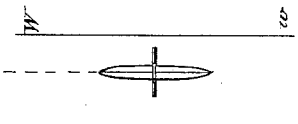


Fig. 7.

WITNESSES.

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(No Model.)

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No. 234,794. Patented Nov. 23, 1880.

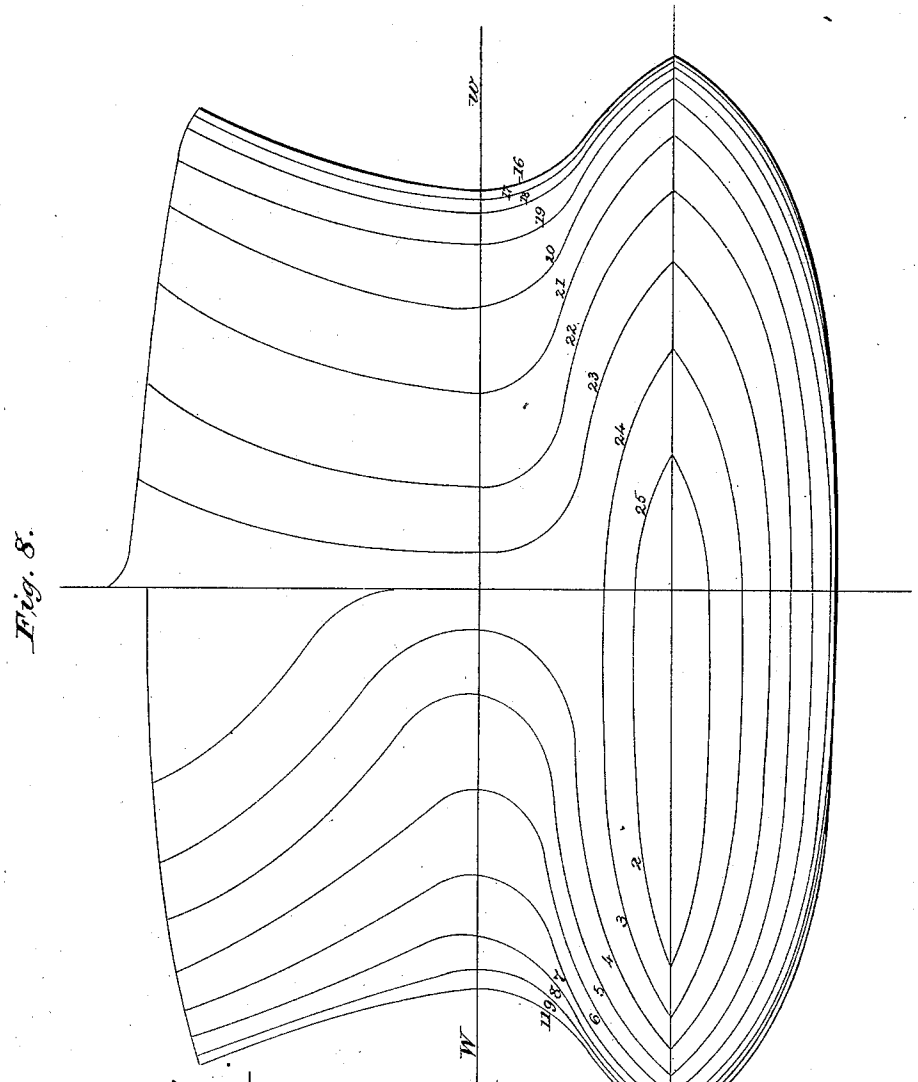


Fig. 8.

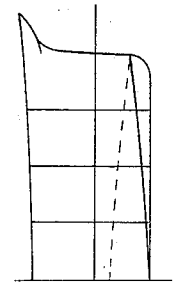


Fig. 9.

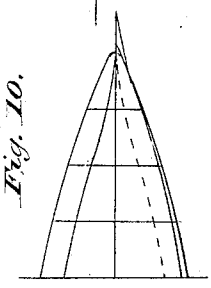


Fig. 10.

WITNESSES

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Construction of Ships.

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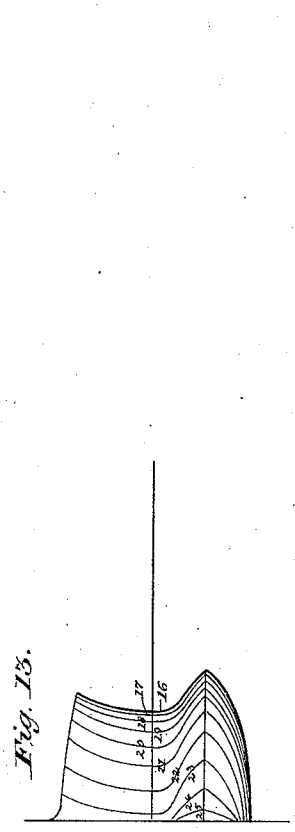


Fig. 13.

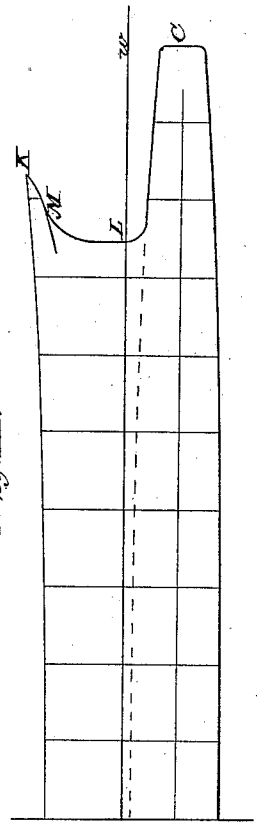


Fig. 11.

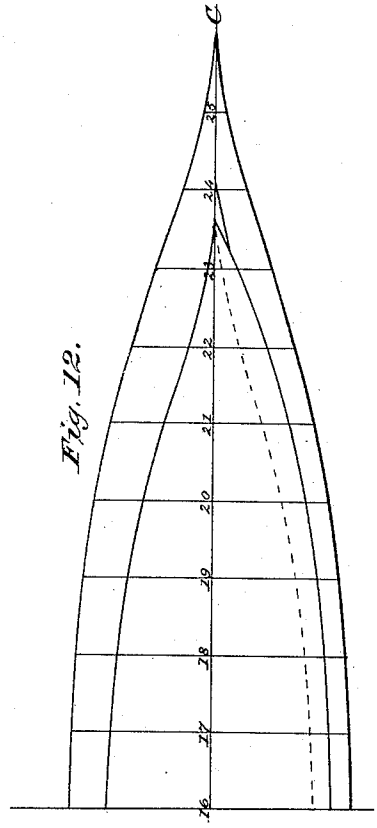


Fig. 12.

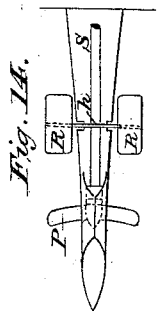


Fig. 14.

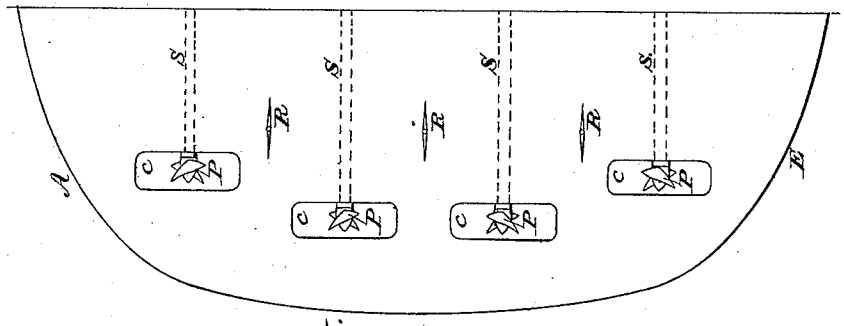


Fig. 15.

WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES G. LUNDBORG, OF HELSINGBORG, SWEDEN.

CONSTRUCTION OF SHIPS.

SPECIFICATION forming part of Letters Patent No. 234,794, dated November 23, 1880.

Application filed July 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. LUNDBORG, a citizen of Helsingborg, residing at Helsingborg, in the Province of Scannia and Kingdom of Sweden, have invented certain new and useful Improvements in Construction of Ships or Vessels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The nature of my invention relates to ships and vessels; and the object is to construct ocean steamships and other vessels of a new form, such as shall unite great strength and the finest possible lines or sharpness with large capacity for cargo and room for the application of very great steam-power, thereby attaining the highest speed and securing safety and comfort to passengers and crew.

The invention consists in the construction and arrangement of parts and lines of ships and vessels, as will be more fully described hereinafter.

The form of vessel which in its progressive motion displaces and deflects the water with the greatest ease or with the expenditure of the least power must, of course, be the most advantageous for speed.

Sharp bow and stern—or, in other words, fine entrance and run—being the indispensable conditions for easy dividing and deflecting the opposing element, the tendency has been to make vessels narrow in comparison with their length, which latter must be made comparatively great in order to give the necessary displacement and room for machinery, coal, passengers, crew, and cargo; and these last conditions will, without speaking of the sea-going qualities, always present obstacles to extreme proportions in the direction of building ships to cut through the water like the blade of a knife.

The resistance to a body moving with a certain velocity through water or any other fluid must, when wholly immersed below the surface, be the same irrespective of any change of position, provided that no alteration takes place with regard to the line of progress. Thus a board, for instance, submerged under the surface and drawn or propelled through the water at a certain speed in the direction of its length must meet with the same resistance whether its flat side is horizontal or vertical, because the transverse area moving against the water is, as well as the surface exposed to friction, in both cases the same, the difference of density of the water at the depth of the upper and lower edge of the board being too insignificant to be taken into account.

My invention, being made in conformity with and based upon this physical law, regards therefore only the form and lines of a vessel, and does not deal with any mechanical way or method of building it, which must depend upon the materials used and the different manner of fitting and adapting them to the purpose.

In the accompanying drawings, Figure 1 is the side view; Fig. 2, the plan or top view; and Figs. 3, 4, 5, 6, and 7 are transverse sections, showing the outlines and form of a vessel according to my invention.

The immersed portion of the hull below the load water-line W *w* is so constructed that its lowest part, A O B Q C D, Fig. 1, and A B C D E, Fig. 2, which forms the main body of the displacement, has but little depth or height (B D, Fig. 1) between its top line, A O B Q C, and its bottom line, A D C, in comparison with its width, (B D, Fig. 2,) the said height decreasing toward the ends A and C, where the top and bottom sides meet at or about the middle depth of this part of the hull, and form a sharp edge, A and C, Fig. 1, and A, E, and C, Fig. 2. This edge thus makes a cut-water, C, Figs. 1 and 2, and stern A, Fig. 1, and A E, Fig. 2, that lie horizontal instead of vertical, as with vessels of usual construction, and which cut-water and stern therefore must, during the progress of the vessel, divide the water in a horizontal direction. The angle of obliquity at the bow and stern, which determines the fineness of entrance and run, is therefore here vertical instead of horizontal, as in other vessels, and it is clear that this angle of obliquity at the bow, (Q C *g*, Fig. 1,) and corresponding angle at the stern, is quite

independent of the vessel's width or breadth of beam; or, in other words, the breadth of beam of the lower part of the immersed body of the vessel may be increased to any desired extent, thus enlarging the displacement and capacity without adding to its length or its depth, and yet maintain the same angle of obliquity—that is to say, the same sharpness of entrance and run.

The width of the vessel is shown contracted toward the forward end and broad toward the stern, in order to give sufficient room for two propellers and their engines.

The upper part of the immersed body of the vessel, F O B Q L T, Fig. 1, forms only a compartively small part of the displacement, and the upper part of the vessel, F N I K M L, Fig. 1, above the load water-line W *w* presents about the common appearance of ships, having cut-water Q L M and stern O F N, that are nearly vertical, as usual. F G L H, Fig. 2, show the plan of this upper part of the vessel in the load water-line W *w*.

Fig. 8 shows an enlarged end view of the frames at transverse sections, corresponding to the numbers on Fig. 2. Figs. 11, 12, and 13 show the side view, plan, and sections of a modification of the submerged forward end of the hull, in which the cut-water is vertical, or nearly so, and the frames or transverse sections from thence expand toward the sides or wings and gradually assume the form as shown in Figs. 1, 2, and 8.

In moving forward the vessel at first, by the forward part of the submerged hull just described, divides the water vertically, and then, by the middle body and stern, in a horizontal direction.

The upper part of the vessel above the load water-line may be made longer or shorter in comparison with the immersed hull without changing the general features of the invention.

The buoyancy of the vessel will, of course, increase the nearer the ends or the bow and stern of the upper part of the vessel above water approach the ends of the submerged hull, and when the part above water extends so as to have its cut-water vertical, or nearly so, above the extreme end of the submerged hull, as shown in Figs. 9 and 10, the anchors may be let go from the bow of the upper part of the vessel, as usual; whereas when the vessel is so constructed as to have the bow of the upper part some distance astern of the submerged end of the hull the anchor and cable may be let down through a well, *d*, built in the middle line of the forward part of the vessel.

The propellers P have their shafts S passing through the horizontal edge of the submerged hull, or near thereto. The depth of the propeller's center below the surface of the water will therefore be about equal to half the depth B D of the lower part of the hull, plus the depth B T, Fig. 1, below the load water-line W *w* of the upper part.

The propellers may be protected by a surrounding projection or shield extending horizontally from the edge.

The rudder R, Figs. 1, 2, 14, and 15, is placed between the propellers, the rudder-head *h* passing vertically through the top and bottom of the hull some short distance forward from the edge A E, where the space between the top and bottom is sufficiently large to admit the fixing of the tiller and the support of the rudder-head in its place, which may move on friction-rollers fixed in a collar resting on a circular plate at the top or bottom of the hull, and the openings around the rudder-head may be closed by packing-boxes applied on the outside of the hull of suitable shape, so as to offer the least resistance to the water.

Blades may be attached to the rudder-head above as well as below the hull, and forward as well as abaft, as shown in the drawings, the rudder thereby being nearly perfectly balanced, so that little power will be required to move it.

In order to facilitate the steering of the vessel, a keel, *a*, and *b*, Fig. 1, is shown under the fore and aft parts. A corresponding vertical projection on the upper side of the submerged stern may also be applied, if desired.

Figs. 14 and 15 show the side view and plan of the submerged stern of a vessel with four propellers. The propeller-shafts do not in this case pass through the hull at the edge A E, but reach only to a point where the propellers P work in holes or wells *c c c c* through the hull, which at that place has a depth or height about equal to the diameter of the hubs of the propellers. Three rudders, R, similar to that already described, are shown, one rudder being placed between two propellers. Their tillers being united by a cross-piece or other suitable mechanism, they may all be turned simultaneously by the same steering apparatus.

The aft part of the hull, from the wells *c* to the edge A E, has an arched form, and may be built of great strength, so as to fully protect the propellers and rudders against shocks and collisions.

The form of ships and vessels as herein described admits of the greatest possible sharpness, and yet leaves ample room for engines and machinery of very great power, besides abundant space and capacity for coal, cargo, passengers, and crew, because the great breadth of beam (width) may be increased to any desired extent, thus adding to the displacement without causing any alteration in the draft of water or in the angles of obliquity Q C *g* at the entrance and run.

The lower part of the immersed hull, which divides the water horizontally, and which makes up by far the principal part of the displacement, having thus the most advantageous form for dividing and deflecting the water, and permitting at the same time the application of almost an unlimited amount of propelling

power, the highest speed can, of course, be attained. The upper part of the immersed body, which divides the water vertically, adds but little to the resistance, because its part of the displacement is comparatively small and the lines of entrance and run very sharp. The depth below the surface of that part of the vessel depends upon the distance of the bow from the end of the lower hull, while the depth diminishes toward the middle of the vessel.

By the peculiar form of the stern a very clean run is obtained, the propellers always working in solid water, free from any disturbing elements, such as may be caused by the stern-post and rudder. The area of the rudder may also be considerably smaller than for vessels of the common model, because the power required to move the stern sidewise, or, which is the same, to turn the head of the ship, will be much less.

The form of vessel herein described admits the highest degree of strength, as will be readily seen by inspecting the section of frames of the immersed hull. Transverse and longitudinal water-tight compartments, judiciously applied, will make such a vessel, when built of good material, (iron or steel,) strong enough to withstand shocks of almost any degree of violence. Such a vessel will therefore combine the conditions requisite for very high speed with great strength and large capacity. A ship thus built ought also to be easy in a seaway, more so than one of the common model, and less exposed to heavy seas in a gale, because the sea would break its force against the projecting sides of the lower hull before reaching the upper part containing passengers and crew.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A ship or vessel consisting of an upper part of ordinary form, or nearly so, from the load water-line upward, and a lower submerged part or portion thereof having the depth or height between the top and bottom sides of the transverse sections, which are of great comparative width, diminishing as the sections approach the ends, where the top and bottom sides of the submerged hull meet in a sharp edge, forming below the surface of the water a horizontal cut-water and stern, which, during the vessel's progress, divide the water horizontally when the vessel is upright, substantially as shown and described.

2. A ship or vessel consisting of an upper part of ordinary form, or nearly so, above the load water-line, and a lower submerged portion thereof having the body and form of its aft part and stern defined by the top and bottom sides of the submerged hull, which, gradually approaching each other, meet at the ends and sides below the surface of the water in a sharp horizontal edge, dividing the water in a horizontal direction during the vessel's progress, such aft part and stern having thus a flattened or lens shape, constituting the run of the ship, with propeller-shafts passing through and being surrounded on all sides by water above as well as below such run, substantially as shown and described.

3. A ship or vessel consisting of an upper part of ordinary form, or nearly so, above the load water-line, and a lower submerged part provided with a lens-shaped stern having horizontal sharp edges at its sides, that will, during the vessel's progress, divide the water in a horizontal direction, substantially as described.

4. A ship or vessel consisting of an upper part of ordinary form, or nearly so, and a lower submerged part provided with a flattened lens-shaped bow having horizontal sharp edges at its sides, that will, during the vessel's progress, divide the water in a horizontal direction, substantially as described.

5. A ship or vessel having a submerged stern provided with one or more vertical openings or wells for one or more propellers working therein, the propellers acting in the water above as well as below such stern, and being protected against shocks, such as collisions or ramming, by said stern formed around said propellers, substantially as set forth.

6. A ship or vessel constructed with an upper part of ordinary form, or nearly so, as described, and provided with one or more rudders, with the rudder-heads passing through the top and bottom of the submerged stern, such rudders being operated singly or simultaneously by suitable tillers and mechanism applied to the rudder-head within the space contained between the top and bottom of such stern, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

C. G. LUNDBORG.

Witnesses:
GEO. M. LOCKWOOD,
JOSEPH E. HOLMES.