

**SHIPS UPON NEW DESIGNS; 48TH
CONGRESS, 1ST SESSION, MIS. DOC. NO.
36 IMPROVEMENTS IN STEAMSHIPS.
MEMORIAL RELATING TO INVENTIONS
AND IMPROVEMENTS IN STEAMSHIPS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649433254

Ships Upon New Designs; 48th Congress, 1st Session, Mis. Doc. No. 36 Improvements in Steamships. Memorial Relating to Inventions and Improvements in Steamships by Charles G. Lundborg

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Cover @ 2017

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CHARLES G. LUNDBORG

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48 cong. 1st sess. House. Rep. No. 1086.

SHIPS

UPON NEW DESIGNS.

BY

CHARLES G. LUNDBORG.

BY ORDER OF THE HOUSE OF REPRESENTATIVES OF THE
UNITED STATES OF AMERICA.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.





IMPROVEMENTS IN STEAMSHIPS.

M E M O R I A L

RELATING TO

*INVENTIONS AND IMPROVEMENTS IN STEAMSHIPS BY
CAPT. CHARLES G. LUNDBORG, FORMERLY OF THE
ROYAL SWEDISH NAVY.*

FEBRUARY 12, 1884.—Recommitted to the Committee on American Ship-building and Ship-owning Interests and ordered to be printed.

To the Congress of the United States:

An effective navy and an adequate merchant marine are national necessities. The present condition of our Navy fills patriotic citizens with alarm and humiliation, while our merchant marine is inadequate to perform 15 per cent. of our ocean carrying trade. It is demonstrated by reliable statistics that the carrying capacity of our merchant marine has decreased in the last decade in about the same proportion that our exports and imports have increased. These startling facts have for some time challenged public attention, and they are now beginning to excite public concern.

While it is not our purpose in this memorial to discuss the causes of the present condition of our Navy and merchant marine, it may be proper, however, to revert briefly to a few facts in explanation of them. First, the diversion of the active capital of the country into enterprises of internal development; second, failure of the Government to encourage and promote, by wise and liberal legislation, the construction and navigation of an efficient and adequate merchant marine, able to compete successfully with foreign nations for the ocean carrying trade; third, the growth of a false economic doctrine, which holds that the carrying trade of the world belongs to the British because they are able to build and navigate steamships a trifle cheaper than the Americans.

The first of these causes operates to prevent the investment of American capital in shipping enterprises. The second tends to divert the energy and intelligence of American citizens from the ocean. The third encourages in our midst a powerful class who systematically antagonize every effort of enterprising citizens to remove the second cause, or to modify the consequences of the first; and the result is that we are practically without a Navy, and our foreign trade and commerce is carried in foreign bottoms. Unless we misinterpret the public opinion of this country, a crisis has been reached, and a change which will effect a remedy for this condition of things is now demanded. The only question is, What shall be the remedy? Before entering upon the solution of this question it may not be considered inappropriate here to refer to

the sound advice of some of the early statesmen of the Republic, whose views are pertinent to this subject.

Washington said in his second annual message :

I recommend to your serious reflection how far and in what mode it may be expedient to guard against embarrassments from these contingencies [danger to our goods carried in foreign ships, by war] by such encouragement to our own navigation as will render our commerce and agriculture less dependent on foreign bottoms, which may fail us in the very moment most interesting to both of these great objects.

Madison said :

If America should have vessels at all, she should have enough for all the purposes intended; to do all her own carrying, to form a school for seamen, laying the foundation of a navy, and to be able to support herself against the interference of foreigners.

Jefferson said :

Our navigation involves still higher considerations. As a branch of industry, it is valuable; but as a resource of defense, essential. The carriage of our own commodities, if once established in another channel, cannot be resumed in the moment we desire. If we lose the seamen and artisans whom it now occupies, we lose the present means of marine defense, and time will be requisite to raise up others, when disgrace or losses shall bring home to our feelings the evils of having abandoned them.

Are the American people ready to heed the sound advice of these eminent statesmen and patriots? In the past, when the carrying trade of the world was performed in wooden ships, the United States held high rank among maritime nations; and the superior inventive talent, mechanical skill, and executive energy of her citizens enabled her to cope with the most powerful nations upon the high seas. It has always been a distinctive feature of American policy, both governmental and social, to encourage invention and promote innovation, and to this fact may be attributed all our triumphs upon land and sea.

From 1816 to 1840 the tonnage and value of our ocean traffic was greater in proportion to population than that of any other nation. During that period of our country's history we built faster ships and sailed them more skillfully than any other nation in the world. In the latter decades of the sailing era, nearly every important improvement in form, lines, structure, and equipment of vessels emanated from the brain of an American, and was utilized by an American shipbuilder.

When steam first came into use as a marine motor, Americans were the pioneers in its application and development. These are simple truisms of history, but they apply only to the era of wooden ships.

Up to 1860 the Americans had perfected the wooden ship. With boundless forests to supply material, with matchless genius to design, and with incomparable skill to construct, they led the world, and had not iron and steel so largely superseded wood in shipbuilding, the Americans would no doubt still hold the ascendancy on the ocean.

The advent of the iron ship, however, radically altered the conditions and the abundant cheap supply of the material entering into its construction, together with the more general adoption of the steam-engine instead of sails, gave to England even greater advantages than had been previously enjoyed by the Americans in the era of the wooden ship. But while the materials of construction and the means of propulsion were undergoing these great changes, the essential conditions of shape and form of the hull remained practically the same. The sole endeavor of the English, in the prosecution of their supremacy upon the ocean, has been to build larger ships and to increase their speed, simply by the application of great engine power, without altering in any essential property their models. If we except the questionable improvement of greatly

increasing the proportion of length to breadth, the form of the ship of this period is essentially the same as it was fifty years ago, and, although great improvements have been made in almost every other branch of human pursuits, it would seem that the inventive genius of our age has here come to a stand-still. The invention of your memorialist, to which your attention is respectfully invited, is the first radical deviation, based upon scientific principles, from the prevailing ship model, and among the principles and advantages claimed for it we specify the following:

1st. The design makes it possible to combine the finest lines for high speed with great carrying capacity.

2d. The form of the aft part of the immersed hull with its submerged stern, which divides the water horizontally, permits, in the highest possible degree, great sharpness stern, or what is called "*a clean run*," which is the indispensable condition for high speed.

3d. The great width of the aft part of the ship's hull, which is a consequence of the submerged horizontal stern, affords ample room for the application of the greatest engine power compatible with the displacement.

4th. The design is eminently adapted for the use of twin screws, as the form of the submerged stern affords a perfect support to the propeller shafts. The great importance of this advantage will especially appear whenever it shall be desired to reach a very high speed, attainable only by a ship carrying engines of such great power that it cannot be economically used upon only one propeller of moderate size, or safely transmitted through one shaft, in which case it becomes necessary to divide the power upon two propellers and adopt twin screws. In a vessel of the ordinary type the propeller shaft must be hung up on brackets extending into the water, outside the ship for a considerable distance, and the difficulty of supporting and protecting shafts of very great weight in such an exposed position will be easily perceived; but this objection is entirely removed by the present design, which permits the propeller shafts to be carried all the way inside and supported firmly within the ship's hull.

5th. The propellers act constantly in solid water undisturbed by the proximity of the stern-post, rudder, and the overhanging part of the stern, as in ships of the usual model. This must cause an economy of power or a corresponding increase of speed.

6th. A vessel of this form will not roll or pitch as much as vessels of the common type, because the body of water over the projecting part of the hull will offer considerable resistance to such motion. Less pitching will also in a great measure tend to prevent "*racing*" by the propellers partly lifting out of the water; and this greater steadiness of the ship during its progress through the water must economize power or add to the speed.

7th. The rudder (or rudders, if two are used) may be made lighter, and have considerably less area than in ships of the ordinary kind, because the stern of the vessel, on account of its form, offers less resistance to lateral motion, thus requiring less power to swing or move it sideways. The resistance to the vessel's progress due to the rudder being proportionate to its surface, it follows also that the diminished area must lessen the resistance and tend to increase the speed.

8th. Owing to the increasing width of the hull below the load water-line, the ship will stand upright, and may be moved about or go to sea without ballast. Indeed, the more the vessel is lightened the greater becomes the stability, because the meta center rises with the greater beam much more rapidly than the center of gravity, and the same will

also, on account of the expanding side above water, take place if the ship should be loaded deeper than to the assumed load water-line. The great advantage of this property inherent to the design becomes evident from the known fact that most large ocean steamers must carry a considerable quantity of permanent ballast, the lost freight on which causes corresponding diminution of the earnings.

9th. The use of two propellers, having their shafts effectually supported and protected within the ship's hull, must add greatly to the security against accidents at sea, such as might disable a vessel with only one propeller, or where the propeller shafts, as usual with twin screws, run outside of the ship.

10th. The arched form of the hull, with the projecting sides below water, and the general absence of any plane surface exposed to the sea, admits of very great strength of construction, and with judicious application of water-tight compartments such a vessel may be made exceedingly strong, offering the best possible security against the violence of the sea and the perils of collision.

This invention is a bold step forward, but in strict conformity with and adherence to the scientific principles of naval architecture, and it is covered by letters patent in this country and in Europe. It has been examined by leading shipbuilders in this country, who approve and commend it, as appears from their testimonials hereto attached. May it not, therefore, be assumed that if this invention possesses the merit conceded for it by the eminent shipbuilders who have examined and approved it, that its development and application by the United States Government will be the surest and most speedy means of laying a reliable foundation for an effective navy, and for a merchant marine adequate to the demands of our ocean carrying trade in the transportation of American mails, passengers, and products, which are now carried in foreign bottoms, and for which the American people pay annually to foreign ship-owners over \$140,000,000 †

We respectfully submit this important invention to your most favorable consideration, for such action as may seem to be wise and expedient, in the hope that it may be the means of speedily restoring the United States to her former position of power and prestige upon the high seas.

Very respectfully,

CHARLES G. LUNDBORG,
Inventor and Naval Architect.

TESTIMONIALS OF PERSONS WHO HAVE EXAMINED THE INVENTION AND THE SCIENTIFIC PRINCIPLES UPON WHICH IT IS BASED.

WASHINGTON, D. C., October 24, 1882.

DEAR SIR: I beg to express my congratulations in relation to the probable establishment of a line of transatlantic steamers built on your designs.

Your letters from the most eminent shipbuilders and experts in our country tend to confirm me in my ideas formed last winter, when you kindly showed me your elements of design, model, and drawings, that vessels built in accordance therewith, furnished with the usual power for the displacement, will have great speed with increased carrying capacity, and great steadiness in heavy weather. Having made a study of strength in naval construction, I feel warranted in saying that with the same thickness of material, riveting, &c., your vessels will prove unusually strong.

Very respectfully, yours,

DANIEL AMMEN,
Rear-Admiral, United States Navy.

Capt. C. G. LUNDBORG,
Late of the Royal Swedish Navy.