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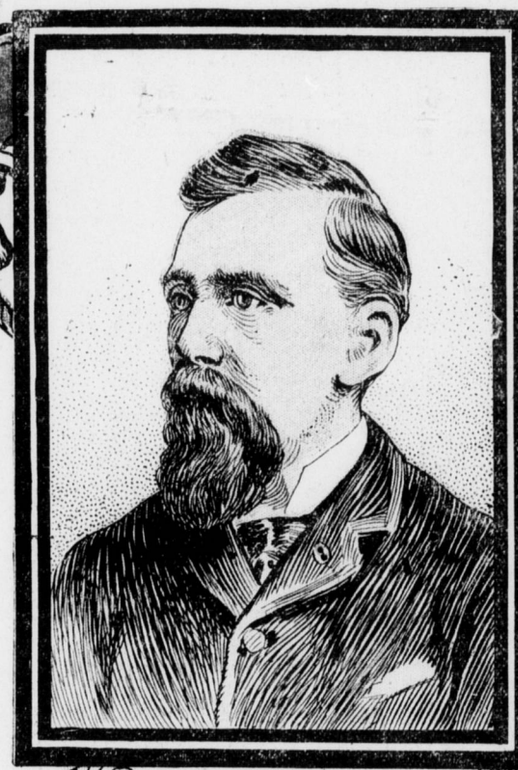
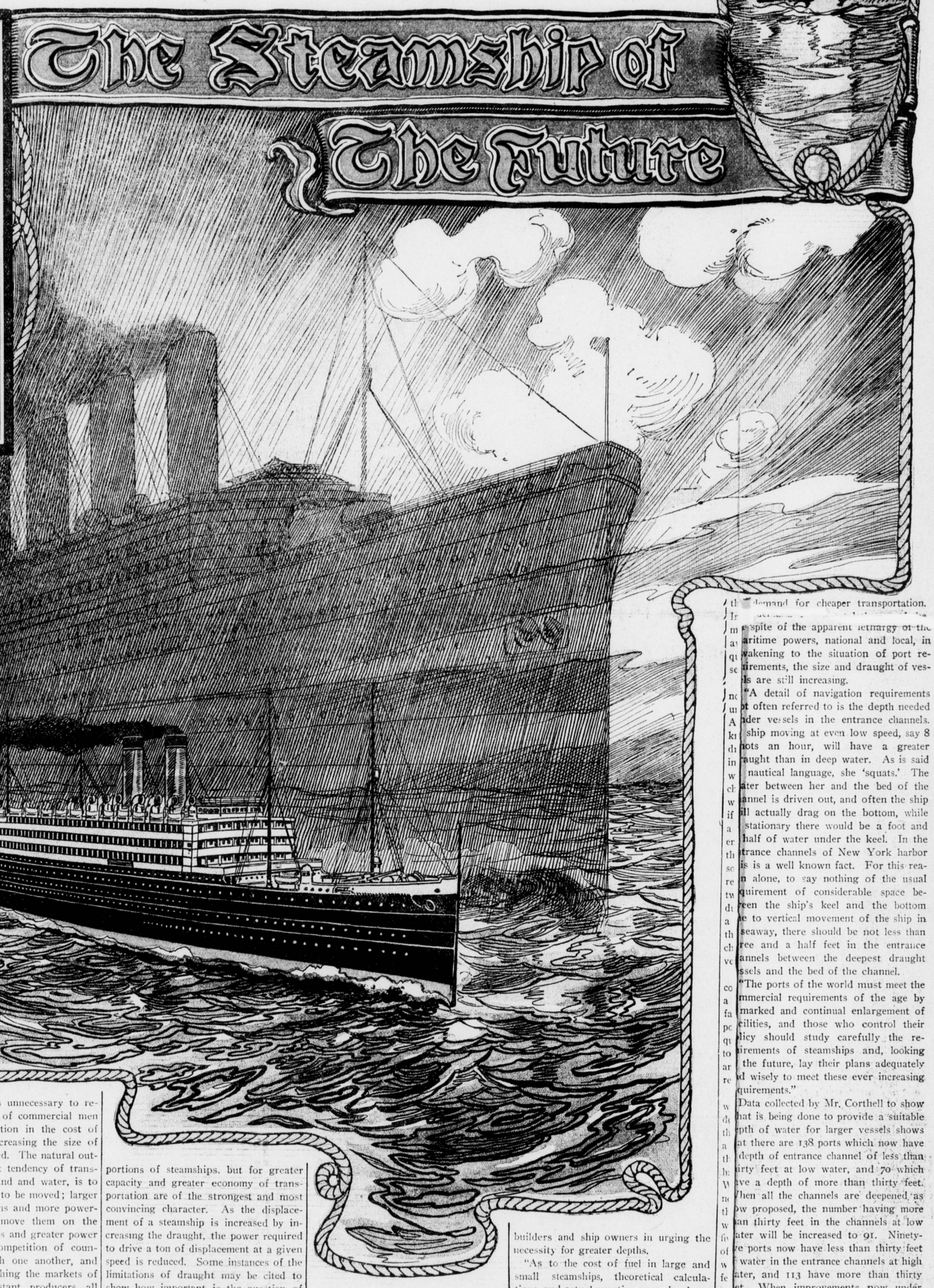


E. L. CORTHELL. C.E., DR. SC.



Steamships of the Future Will Make Those of To-day Look Like Tugs.

WHEN the rising generation is big enough to spend its honeymoon, or to incur the disagreeable necessity of escaping the attentions of process servers, it will travel on steamships which will make those of to-day seem like tugs. To be more specific, not later than forty-two years hence the largest twenty steamships in existence will have these average dimensions: Length, 1,000 feet; breadth, 100 feet; draught, 33 feet; gross tonnage, 30,000. As the average dimensions of the present largest twenty are, length, 640, breadth 68.9, draught 32.1, and gross tonnage, 17,151, it will be seen that the steamships will have to do some tall growing.

These confident predictions are made by Elmer Lawrence Corthell, B. A., M. A., Dr. Sc., of New York and Chicago. As Mr. Corthell is not a professional prophet, but an engineer who has done a notable part of the world's work in the past, and is still engaged in some great undertakings, his predictions regarding the future of the world's commerce are of the liveliest interest.

E. L. Corthell played an important part in convincing Congress in 1874 of the wisdom of authorizing the construction of the famous Eads jetties at the mouth of the Mississippi, and was engineer in charge of the construction of the jetties, which increased the depth of water in the South Pass from nine feet to more than thirty feet. He made surveys for the Tehuantepec Ship Railway in 1880, and subsequently, by means of a number of notable addresses delivered in the principal cities of the United States, attracted the world's attention to the project. He built bridges over the Mississippi river at Hannibal, La., and St. Louis, Mo., and at New Orleans. He planned and executed the harbor improvements at Tampico, which increased the depth of water from eight feet to twenty-six feet and made that city the second port in Mexico. He reduced the nebulous idea of the Chicago World's Fair to a tangible proposition by solving the engineering problems of that great undertaking, and subsequently carried out some important works that were instrumental in making the Fair a success. He was also one of the leading spirits in organizing the International Engineering Congress, held during the Fair. Ten years ago the works of various kinds constructed under Mr. Corthell's supervision footed up an aggregate value of $100,000,000. In 1898 he represented the United States government at the International Congress of Navigation at Brussells. He was also at the Paris Congress in 1900 and at the Milan Congress in 1905. At present he is president and chief engineer of the company which is making important improvements in the harbor of Rio Grande Do Sul, Brazil, the difficulties of which have baffled some of the world's foremost engineers. He is a member of something like a score of scientific societies in America and Europe.

In 1898, when Mr. Corthell's first prediction was made, the number of steamships in existence was 11,271, having a total tonnage of 17,889,006. He predicted that in five years this number would increase to 12,002, with an aggregate tonnage of 20,801,205. The actual number in existence in 1903 was 13,381, representing a tonnage of 26,158,358. The average tonnage of steamships in 1898 was 1,587. Mr. Corthell predicted that this average would increase to 1,704 by 1903. In reality the average at the end of five years proved to be 1,955 tons. The average dimensions of the largest twenty steamships in 1898 were: Length, 541 feet; breadth, 61 feet; draught, 29 feet; gross tonnage, 10,717. He predicted an increase in the next five years to a length of 586 feet, a breadth of 64.8 feet, a draught of 29.4 feet and a gross tonnage of 13,374. When the five years had elapsed the actual dimensions were found to be: Length, 640 feet; breadth, 68.9 feet; draught, 32.1 feet; gross tonnage, 17,151. Steamships of 500 feet or more in length had increased from twenty-two to ninety-three—an increase of 323 per cent. Now Mr. Corthell predicts that in 1948 there will be a total of 16,685 steamships, representing a total tonnage of 45,000,000, or an average of 2,700 tons. The average dimensions of the largest twenty steamships will be: Length, 1,000 feet; breadth, 100 feet; draught, 33 feet; gross tonnage, 30,000.

Other interesting features of Mr. Corthell's predictions, which are based on the developments of the past, are that the speed of the fastest steamships in 1948 will be thirty knots, that the total number of sailing vessels will have decreased from 56,281 in 1873 to 10,800 in 1948, and their tonnage from 14,185,836 to 3,241,000. The weight of sea-borne commerce in 1948 will have increased to 435,000,000 tons, and the value of the combined exports of the leading ten nations of the globe will have reached the stupendous total of $10,000,000,000.

In discussing the outlook for the future Mr. Corthell said:

"There is no reason why steamships should not continue to increase in size, and there is every reason why they should do so. It is unnecessary to repeat the arguments of commercial men regarding the reduction in the cost of transportation by increasing the size of the mass to be moved. The natural outcome of the present tendency of transportation, both on land and water, is to increase the volume to be moved; larger cars and longer trains and more powerful locomotives to move them on the land, and larger ships and greater power on the sea. The competition of countries and ports with one another, and the necessity of reaching the markets of consumption by distant producers all serve to increase the freight capacity of steamships; and the longer the course the greater the demand for size.

"A very important feature of the subject is the urgent necessity of increasing the draught of steamships. The length and breadth have far outstripped this other most important dimension. The draught, of course, is rigidly limited by the depth of water in channels and at docks.

"The reasons insistently and persistently stated by naval architects for increased draught, not only for greater stability, speed and generally better proportions of steamships, but for greater capacity and greater economy of transportation are of the strongest and most convincing character. As the displacement of a steamship is increased by increasing the draught, the power required to drive a ton of displacement at a given speed is reduced. Some instances of the limitations of draught may be cited to show how important is the question of providing greater draught and greater depth of channels to meet this draught. The Deutschland, one of the largest vessels of to-day, like all the swiftest mail steamers, carries very little freight because of the limits imposed by her departure draught. It has been stated that this great ship of more than 23,000 tons displacement can carry only 500 to 600 tons of cargo. If her draught could be increased one foot, about 950 tons more cargo could be carried, and two feet increase would represent about 1,800 tons more cargo. The freight earning capacity would thus be nearly trebled for one foot extra draught, or made fivefold for two feet, with a very trifling loss of speed, even at a deeper draught.

"The Moldavia, of the Peninsular and Oriental Line, on a draught of 27 feet 4½ inches, carries about 3,000 tons of cargo. Each additional foot of draught gives an increased carrying power of about 650 tons. Three feet increase would, therefore, add about 2,000 tons, or 66 per cent to her freight earning capacity. There would be some decrease in speed, but nothing sensibly affecting her time on passage. Facts such as these explain the insistence of shipbuilders and ship owners in urging the necessity for greater depths.

"As to the cost of fuel in large and small steamships, theoretical calculations and actual practice agree in showing that the consumption of coal per 100 ton miles is about 8 to 4.4, as between a 390 foot ship and a 750 foot ship—the one having a loaded displacement of 8,640 tons and the other 26,150 tons, the one with a draught of 24 feet 6 inches and the other 32 feet 4½ inches.

"The operation of the law controlling the development of steamships, particularly in respect to their draught, is inexorable. The naval architect and the steamship companies feel its effects first of all, because behind them urging them on to greater and deeper ships are the world's commercial requirements and the demand for cheaper transportation.

"In spite of the apparent lethargy of the maritime powers, national and local, in awakening to the situation of port requirements, the size and draught of vessels are still increasing.

"A detail of navigation requirements not often referred to is the depth needed under vessels in the entrance channels. A ship moving at even low speed, say 8 knots an hour, will have a greater draught than in deep water. As is said in nautical language, she 'squats.' The water between her and the bed of the channel is driven out, and often the ship will actually drag on the bottom, while if stationary there would be a foot and a half of water under the keel. In the entrance channels of New York harbor this is a well known fact. For this reason alone, to say nothing of the usual requirement of considerable space between the ship's keel and the bottom due to vertical movement of the ship in a seaway, there should be not less than three and a half feet in the entrance channels between the deepest draught vessels and the bed of the channel.

"The ports of the world must meet the commercial requirements of the age by marked and continual enlargement of facilities, and those who control their policy should study carefully the requirements of steamships and, looking to the future, lay their plans adequately and wisely to meet these ever increasing requirements."

Data collected by Mr. Corthell to show what is being done to provide a suitable depth of water for larger vessels shows that there are 138 ports which now have a depth of entrance channel of less than thirty feet at low water, and 70 which have a depth of more than thirty feet. When all the channels are deepened as now proposed, the number having more than thirty feet in the channels at low water will be increased to 91. Ninety-five ports now have less than thirty feet of water in the entrance channels at high water, and 113 have more than thirty feet. When improvements now under way are completed the number having more than thirty feet at high water will be 136.

The most fortunate port in the United States in this respect is Tacoma, where the entrance channel is five hundred feet deep and the depth at the wharves is forty to forty-eight feet. Seattle comes next with a channel two hundred feet deep and a depth at the wharves of thirty-seven to fourty-four feet. New York will be third when the Ambrose channel is completed to give a depth of forty feet at mean low water, and New Orleans will be fourth with a depth of thirty-five feet.