varies in height and width, now rising to a great altitude and now sinking into low depressions. At Panama it is scarcely 50 miles wide; at another point, 31 miles; at Nicaragua, following the natural depression, 186 miles, and at Tehuantepec, 134 miles, between navigable waters. At the southern extremity of the Isthmus there exists a region of calms and baffling winds termed "Doldrums." This region is shunned by navigators of sailing vessels, who often run a thousand miles out of their course. The nautical conditions that exist at the northern part of the Isthmus near Tehuantepec are much different and much more favorable to sailing vessels. Lying nearly 10 deg. north of Panama, the climate at Tehuantepec is much more healthy and the heat less intense. In reference to the commercial advantage of this northern route, it needs no argument to prove that that route is the shortest, and, other things being equal, the best which lies nearest the axial line of productions, population and business, which approximately may be estimated to pass through Hong Kong, San Francisco, New York and Liverpool. The Tehuantepec route is shorter than the Panama by from 700 to 2,200 miles, depending upon the ports to be connected. In general, the advantages of this northern route are: Favorable winds, a healthy climate, great saving in distance, good harbors, and a location in a strong neighboring republic and not in an insurrectionary country with an unstable government.

The great importance to this country to possess a route advantageous to sailing vessels will be seen from the fact that there are sailing under the American flag 6,214 sailing vessels engaged in over-sea commerce, and only 422 steamships. We can build wooden sailing ships cheaper than any other nation; the cost is about $50 per registered ton, whereas in England it is $75; but England can build iron ships for $55 per ton, whereas the cost in this country is $75. The inter-oceanic route that would prohibit sailing vessels would drive our commerce from the seas. These facts all point to the Tehuantepec route as being the one most desirable for the United States, and especially the Pacific Coast. It will be interesting to study the means by which Captain James B. Eads proposes to utilize the route.

The ship railway involves no new principle, but the application on a large scale of the principles and appliances that are well known among scientific and practical men. The hauling of vessels and of boats overland is no new thing. It has been done in various countries and at different times in all parts of the civilized world, from 400 years before Christ, when the Athenians transported their immense triremes of about 150 tons weight over the Isthmus of Corinth, to this day, when large ships are hauled out of the water on marine railways, or lifted on hydraulic docks and then hauled ashore. Captain Eads simply utilizes for a great work what science has taught and developed during the last 2,300 years, inventing, however, many new mechanical appliances rendered necessary by the exigencies of the case.

A basin will be excavated to admit the vessels to the lifting dock, which will be made of steel plates with substantial bulkheads in each direction, and will be about 450 feet long, 75 feet wide, and from 12 to 15 feet deep, and capable of raising vessels of from 6,000 to 7,000 tons weight. It is arranged to float or sink in a basin, in which its vertical movement is guided. On each side of the basin there will be twenty or thirty iron rods arranged vertically and secured to the bottom of the basin. These rods will be capable of holding the pontoon so as to prevent it rising above the level of the railway when the ship and cradle have been taken from off it. The deck of the pontoon is laid with rails which will correspond exactly with those on the permanent land line when the pontoon is floated. When in this position a cradle on wheels, and capable of carrying the ship, is run on to the pontoon, which is then submerged by admitting water into it through sluice gates, which are regulated from the top of two quadrangular water-tight towers attached to the deck of the pontoon, and between which there is sufficient width for the cradle and the ship to pass. When the pontoon has been submerged to a sufficient depth for the bottom of the ship to clear the supports upon which it is intended she shall rest, the vessel is floated in from an adjacent basin and secured over the top of the carriage or traveling cradle. The pontoon is then pumped out by means of a powerful pump, and its deck rises up to a given height above the water, its further progress being stopped by the heads of the vertical rods before alluded to. The rails on the deck of the pontoon now range precisely with those on the land, and while the pontoon is in this position locomotives are backed up and attached to the traveling cradle, and it is started on its journey across the Isthmus. On reaching the end of the line the traveling cradle is run on another pontoon, which is submerged and the ship floated off into another basin on its way to its destination. It will be seen that the principle of raising and lowering the ship is broadly that adopted in the Victoria Docks, London, and elsewhere, subject, however, to certain important modifications.

In order to make the ship railway practicable it is absolutely necessary that the weight of the ship should be evenly distributed over the wheels of the cradle, so as to limit the weight upon each wheel to that ordinarily imposed upon the driving wheels of locomotives of the present day. This is effected by placing in the deck of the pontoon throughout its length and breadth a number of hydraulic rams. One line of these rams extends through the centre of the pontoon longitudinally, and these are designed to support the keel at points six feet and nine inches apart throughout its whole length. On each side of this centre line there is arranged another shorter line of hydraulic rams, which are intended to support the bottom of the ship. On the outside of these lines are two other still shorter lines for supporting the bottom nearer to the bilges, while two other shorter lines outside these again support the bilges and sides of the vessel. There are, therefore, across the middle portion of the pontoon no fewer than seven lines of rams, while a little nearer to the bow and stern there are but five lines. Still nearer to the bow and stern there are but