Science and Art.

The Steamship Great Eastern.

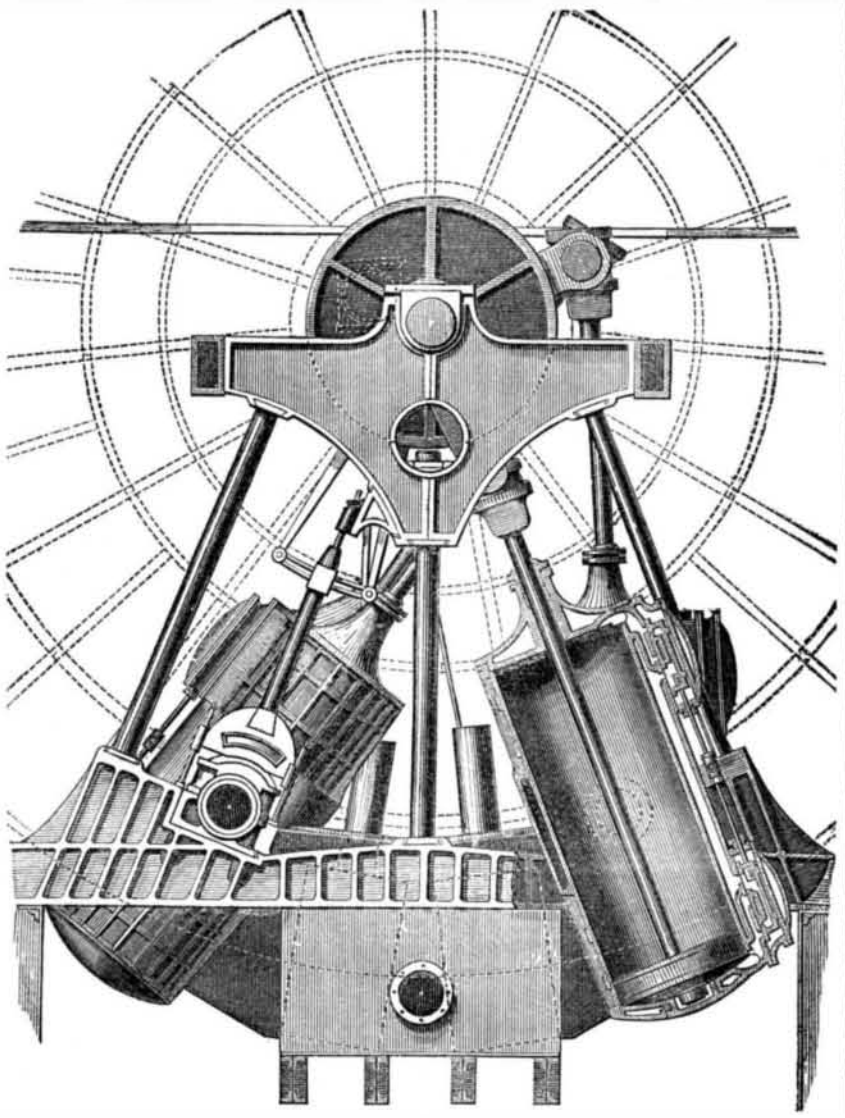
Two Brunels have become distinguished as engineers—Mark Isambard, deceased, and Isambard Kingdom, his son. Both have distinguished themselves for the originality of their enterprises, neither preferring to follow the beaten track, and both have been very generally successful in carrying out their novel and extraordinary undertakings.

The *Great Western*, the first regular steamship between New York and Liverpool, the general design and arrangement of which is credited to the younger Brunel, was 50 feet longer and 8 feet wider than the largest steamer before afloat; but the giant of 1838, measuring 236 feet in length and 35 feet 6 inches in breadth, has become a pigmy in comparison with the succeeding developments in that line.

Other things being equal, vessels move faster through the water in proportion as their size increases. We do not recollect the precise ratio, but it has been ascertained by experiment and observation with considerable care for some kinds of vessels, and in yatch-racing, for example, allowance is always made for the size, assuming that the largest yachts will sail perhaps some 25 per cent. faster than a medium-sized one, built and rigged in the same proportion. This fact favors the large steamers; and in or about the year 1853 the fact that common steamships could not successfully compete with fast-sailing clippers on the long voyages from England to Australia, on account of the expenses and delay incurred in coaling at various intermediate points, induced Mr. Brunel to undertake the designing of a ship of sufficient magnitude, and of such proportions that she might accommodate an immense number of passengers, and take an almost infinite amount of freight, and yet travel at a fair speed, with a sufficient quantity of coal to supply her for a whole voyage out and back—a distance of 25,000 miles. The Eastern Steamship Company, undertook the practical working out of the idea. John Scott Russel & Co, at Millwall, on the Isle of Dogs, in the Thames, contracted to build the iron hull, and James Watt & Co. the engines. The first plate of the hull was laid in May 1855. Russell & Co. have since failed, a fact which, with others, has delayed her progress; but her construction has since been taken in hand by her proprietors themselves, and she is now rapidly progressing. It is confidently expected that the immense leviathan will be launched in July or August of the present year, with her engines on board, and will make her first trip—called by some a trial trip—to Portland, Me., some time next autumn.

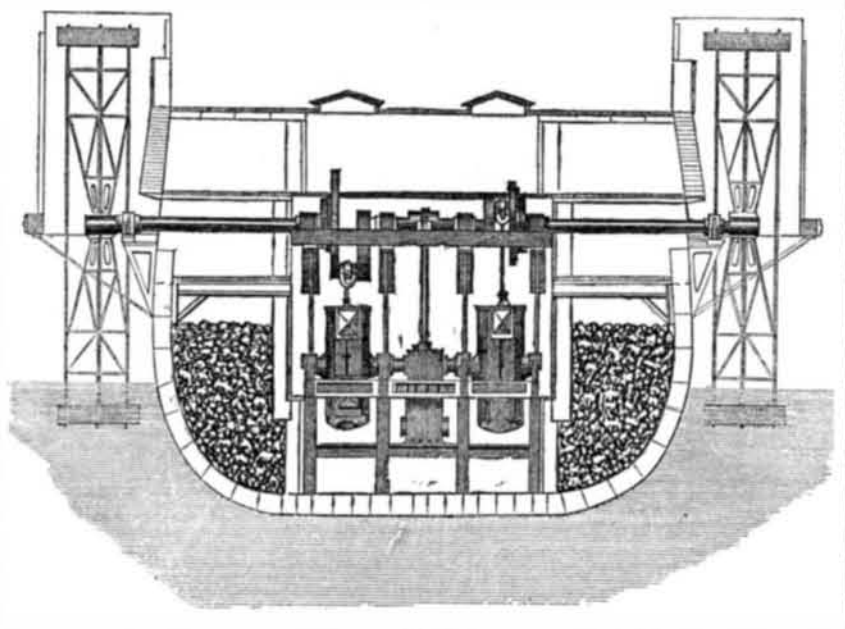
In the accompanying engravings, fig. 1 represents a side elevation of the paddle engines, with dotted lines for the wheels, and fig 2 a cross section of the hull reduced from what are undoubtedly tolerably accurate engravings published in the London *Artisan*, to which valuable engineering work we are indebted for several of the particulars of her progress. The ship is novel in several important respects, aside from her very extraordinary dimensions. The length entire is 680 feet—more than an eighth of a mile; the breadth, at the widest point, exclusive of the paddle boxes, etc., is 83 feet, and the depth, from the upper deck, is 58 feet. Unlike other vessels, whether of wood or iron, she has no keel, and strictly speaking, no ribs. The shell does not diminish in thickness or strength from the bottom upwards, like other vessels, but is of equal strength throughout, like an immense tube. The lower portion, however, up to a line eight feet above her deepest immersion in the water, is constructed of two thicknesses or shells 3 feet apart, the space between being traversed longitudinally by 33 continuous strong and water-tight partitions, thus forming 32 separate iron chambers, each provided with suitable cocks, by which it can be filled or emptied at pleasure, to maintain the proper trim, or to ballast the vessel. There are four decks, each of which strengthens the hull laterally, in the ordinary manner, and the whole structure is crossed by strong and water-tight partitions, each capable of resisting the full pressure of the water in case the hull should be damaged and either compartment filled. There are ten such transverse partitions, sixty feet apart, and the hull is, in fact, designed to be separable, by violence, into several separate vessels or sections; and in addition, there are, through a large portion of the distance, two longitudinal partitions thirty-six feet apart, and extending up to the lower deck. The main deck is also composed

THE PADDLE ENGINES OF THE GREAT EASTERN.



of two skins with ribs between them, laid longitudinally, like those in the shell, instead of transversely, the whole frame-work being designed mainly to resist longitudinal and hogging strains, instead of simple pressures from the sides, which latter are possibly most severe on short sailing vessels.

As it is not designed to make this ship an extraordinary vessel for speed, the power will be quite moderate in proportion to her tunnage; but it is, in the aggregate, very great.



To concentrate it all in one engine, or pair of engines, either for paddle wheels or a screw, would involve considerable difficulty; the power of the *Great Eastern*, therefore, is divided, and the mass is impelled by both a pair of paddle wheels and a screw. The paddle wheels are to be fifty-six feet in diameter, and are to be provided each with twenty-eight paddles, thirteen feet in length and three in depth. These will be driven not simply by one engine, as is common on our coasting steamers, nor again by two, as is common on most of our ocean steamers, but by four engines coupled in pairs, one pair for each paddle wheel; but the main shafts and wheels, though thus capable of working independently—so that one may be worked while the other is idle, or both may be worked in opposite directions if desired, Mississippi steamboat fashion—are to be coupled or uncoupled at pleasure by a strong friction clutch. These engines have each a stroke of fourteen feet—as great, we think, as any in the world, except the single one on our Hudson river steamer *New World*, which is fifteen feet. The diameter of each cylinder is seventy-four inches—considerably less than those of most of our large steamers. The engines are oscillating, with slide valves, and the general arrangement of each pair is shown in the engravings. These engines will work with a nominal power of 1,600 horses. These with the accompanying boilers, and the coal for the same, are located somewhat forward of the center of the mammoth hull.

The screw is twenty-four feet in diameter, with a pitch of thirty-seven feet. The propeller shaft is twenty-four inches in diameter. This will also be driven by four engines, to subdivide the power, and either may be disconnected at pleasure in case of disarrangement. Screw engines are necessarily of short stroke. These have a stroke each of four feet, while the diameter of the cylinders is eighty-four inches.

A detailed description either of the common or novel features of the ship throughout, the details of the engines and boilers, the pumps, the arrangement for steering, communicating orders, and performing all the various important and unimportant duties, cannot be compiled correctly from the scattered notices within our reach; and it is quite probable that the facts already given may be incorrect in some of the minor points.

There will be in all 22 engines, including all sizes: 4 for working the screw, 4 for working the paddle wheels, 2 for working the capstan, getting up anchors, and pumping out ship, 2 for revolving the screw (to prevent its creating resistance when uncoupled and the ship is working under sail and paddle wheels,) and 10 donkey engines or steam pumps, for filling up boilers. The large screw engines are also fitted with a separate steam cylinder, to aid in starting and reversing, which cylinder might almost be rated as a still additional engine.

The tunnage of this ship by our government measurement, would be about 22,000 tuns. The displacement of water, or the actual supporting capacity, will be about 27,000 tuns. The weight of the hull, rigging, and enginery will be about 7,000 tuns, and a sufficient quantity of coal for a full Australian voyage is estimated at from 5,000 to 6,000 tuns, leaving a clear capacity for freight of about 14,000 tuns.

If the very gigantic clipper ship *Great Republic*, the mammoth steamship of war *Niagara*, and the Collins' steamer *Adriatic*—at this date the largest steamship afloat—were each to be fully loaded and then transferred bodily, with their loads, into the hold of the *Great Eastern*, it would appear from the figures that the whole would make but a fair cargo for this novel craft.

We wish the enterprise the highest possible degree of success, as an experiment which will help to solve many questions relating to the practicability and profit of perhaps still larger constructions.