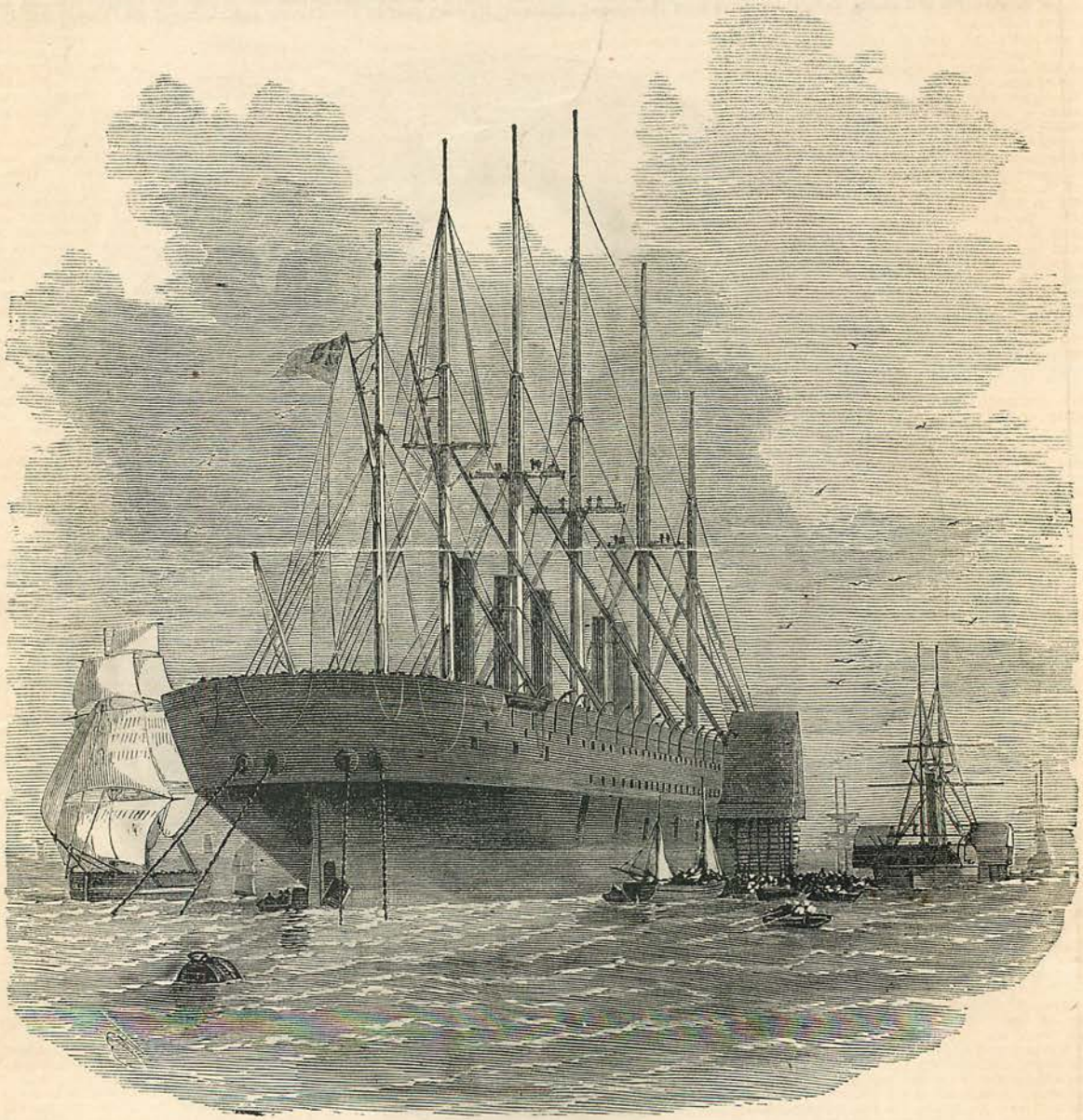
THE GREAT EASTERN STEAM-SHIP.

AN attempt has been here made to collect as much information as possible on the interesting subject of the "Great Eastern" steam-ship. It has been the object to bring together in a narrative form the past history and the future prospects of an undertaking which it is not too much to say is of national importance in connection with the most wonderful specimen of naval architecture that science and skill have ever devised and created.

From 1802, when an experiment was made on the Forth or Clyde Canal to propel a small vessel by means of a steam-engine, down to the year 1816, year by year, the size of steam vessels was increased, and it was found that every increase of size was followed by increase of speed. The onward march of improvement in this respect was for some time checked owing to the fact that, for long voyages, such as those to India, China, &c. ships of ordinary size could not carry fuel sufficient for the whole voyage and were obliged to make *détours* in their course in order to call at the coaling stations. It was, however, evident that this could only be a question of size, and the problem being, as it was, of the highest importance to the interests of commerce and the progress of the human race, naturally attracted the attention of the scientific, and it was at last solved by the projection of a leviathan ship, large enough to carry coals for the longest voyage which could be undertaken, and yet with sufficient space left to accommodate an enormous number of passengers and a gigantic cargo. It was found on examination that as the larger the vessel the greate



THE "GREAT EASTERN" AT HER MOORINGS.—FROM "THE ILLUSTRATED LONDON NEWS."

could be the proportionate carrying power, so the cost per ton of a vessel of the size projected would be cheaper than that on an ordinary steamer. A company was formed to carry out this design, and capital was raised; and the culminating point of the triumphs of ship-building was reached when, in November, 1857, the Great Eastern was declared ready to be launched. At a cost of £640,000 a vessel was erected, of which the following are the particulars, which cannot but be deemed most interesting to the most casual and the least scientific reader.

The Great Eastern is 20,000 tons larger than any other ship in the world; her length between the perpendiculars is 680 ft.; length on the upper-deck 692 ft.—within twenty-eight feet of double the length of the height of St. Paul's, and more than double the extreme length of the new United States' screw-frigate Niagara, about which the Transatlantics are talking so much. The height from the bottom of the ship to the underside of the planking of the upper deck is 58 ft.; the extreme breadth is 83 ft., or as wide as Pall-mall; the breadth across the paddle-boxes 120 ft., or as broad as Portland-place. Nearly 8000 tons, or 60,000 superficial feet of wrought iron, have been used in the 30,000 plates of her hull. To secure these, upwards of 2,000,000 wrought-iron rivets have been welded in, all inserted and hammered while white hot, and the contraction of the iron in cooling secures the plates with remarkable closeness and rigidity. The floor of the ship is perfectly flat, the keel being turned inwards, and rivetted to the inner ship's keel. The bow and stern have additional strength imparted to them by strong iron decks at those parts. At the bottom the plates are an inch thick, in all other places but three-quarters of an inch. For three feet above the water mark the hull is constructed double (on the cellular principle, adopted in the top and bottom of the Brittania Tubular Bridge), the inner hull or skin, as it is called,

being 2 ft. 10 in. apart from the outer. In this space at intervals of 6 ft., run longitudinal webs of iron plates, which are again subdivided by transverse plates into spaces of about 6 ft. square. This gives an enormous addition to the strength of the whole frame, and by this construction the danger of collision at sea will be very much lessened, for, should the outer skin be pierced, the inner one remaining uninjured, no damage to either passengers or cargo could ensue, except in very extraordinary circumstances.

The interior of the ship is thus arranged: Running crosswise are twelve water-tight bulkheads or walls, extending the entire height to the upper deck, with no openings below the lower deck; the ship is thus cut off into ten or more compartments, generally about 60 ft. long, any one of which might be filled with water up to the level of the lower deck without flooding any of the others—a matter of great importance in the event of shipwreck. Five of the compartments near the centre of the ship form five complete hotels for passengers; each comprising upper and lower saloons, bedrooms, bar, offices, &c.; and each cut off from all the others by the iron bulkheads. It is as if five hotels, each measuring about 80 ft by 60, and 25 ft. high, were let down into an equal number of vast iron boxes. Vertical longitudinal walls separate each compartment into central saloons, and side-cabins, or bedrooms, and decks separate the height into two series of such rooms

The upper deck is flushed fore and aft, and consequently affords a promenade of more than a quarter of a mile; it has an iron basis, double and cellular, like the hull, divested of all the annoyance resulting from the shipped water splashing the heels and ruffling the temper of the passengers. The arrangements are planned with an amount of room and comfort for each passenger never attempted in other ships: the upper saloons being 12 ft. in height, and the lower nearly 11 ft. She will carry twenty large boats on deck; some of them are new patents on most ingenious principles. In addition to these, she will also carry, suspended aft of her paddle-boxes, two small screw steamers 100 ft. long each, and of between 60 and 70 tons burden These will, of course, be raised and lowered by the small auxiliary engines. Both will be kept in all respects perfectly equipped for sea, and may be used for embarking and landing the passengers, with all their luggage, &c, when the ship does not go alongside a wharf. This will be onerous service, for the Great Eastern will be fitted to accommodate 800 first-class passengers, 1500 second-class, and 2500 third-class in all 4800 passengers; or if employed in the transport of troops, she can carry upwards of 10,000 men, in addition to a crew of 400.

STEAM POWER AND ENGINES.

The distinguishing feature in the character of the Great Eastern, in addition to her vast size, is the combined application of steam power, through the paddle-wheel and the screw. The engines are very considerably larger than any hitherto made for marine purposes, and their actual power will be very far greater than their nominal power. The vessel will have ten boilers and five funnels, and each boiler can be cut off from its neighbour, and used or not as desired. The boilers are placed longitudinally along the centre of the ship, and entirely independent of each other. Each boiler (weighing 45 tons) has ten furnaces, and that gives to the whole the large number of 100 furnaces.

The engines for the screw propeller are the largest ever manufactured for marine purposes; they were made by Messrs. James Watt and Co., Soho Works, Birmingham, and will be supplied with steam by six of the boilers, working to a force of 1600 horses, the real strength of the combined engines being 3000 horses.

The screw-propeller, 24 ft in diameter, with four fans or vanes, the largest ever made, is placed in the stern of the vessel, and will be worked in the usual manner. The shaft is 150 ft. in length, weighs 60 tons, and was forged by Messrs. Mare and Co., at Blackwall.

The paddle-wheels will be worked by four engines, constructed by Messrs Scott Russell and Co.; they are direct acting, with oscillating cylinders, each 18 ft. long, and 6 ft. 2 in. in diameter. The stroke is 14 ft. In casting each of these enormous cylinders 33 tons of metal were poured into the mould, and, now they are finished off, each cylinder weighs about 28 tons, or 62,720 lb.

These engines stand nearly 50 ft high, and have a nominal force of 1000-horse power, the motive power being generated by the remaining four boilers; they are constructed on the disconnecting principle, in order that they may be used jointly or separately, so that both or either of the paddle-wheels can be put in independent motion.

There are also two auxiliary high-pressure engines, each of 10-horse power. These engines are adapted to receive connections for working pumps, and the necessary machinery for hoisting sails, weighing anchor, and many other laborious tasks usually performed by sailors.

The diameter of the paddle-wheels is 56 ft. (which gives a circumference larger than the circus at Astley's), and each float board is 13 ft. long.

The number of anchors are ten, and the prodigious weight of them, and the 800 fathoms of chain-cable necessary for their service—together 153 tons—is in proportion to the other items.

The vessel will draw 30 ft. of water when laden, 20 ft only when light. The speed of the vessel is estimated by Mr. Brunel at fifteen to twenty knots an hour, without diminution or cessation, under any weather, which would accomplish the voyage between England and Australia, viâ the Cape of Good Hope, in about thirty-three days, and to India in about thirty days; half the time occupied by the fastest clippers afloat.

The arrangements effected for the propulsion of the vessel, besides the aid of steam power, are as follow:—

She will have six masts, the two principal being crossed by yards, as in a line-of-battle ship, the remainder being schooner-rigged; there will be upwards of 6500 square yards of canvas available. A bowsprit is dispensed with; each mast is of hollow wrought iron, except the mizen-mast, which is wood.

The following are the dimensions of this great structure:—

Length over all	692 feet	Length of forecastle	140 eet
Breadth	83 „	Height of ditto	8 „
„ across the paddle-boxes	120 „	Height of saloons on lower deck	13 ft. 8 in.
Depth from deck to keel.. ..	58 ft. 6 in.	Number of saloons .	5
Number of small transverse bulkheads or water-tight compartments	12	Height of saloons on upper deck	12 feet
Ditto, partial	7	Number of ditto	5
Longitudinal bulkheads running fore and aft at a distance of 36 feet apart for a length of 350 feet	2	Length of upper saloons ..	60 feet
Width of space between the two skins of ship	2 ft. 10 in.	Ditto lower	60 „
		Thickness of iron plates in keel	1 inch
		Ditto inner and outer skins ..	½ „
		. bulkheads	½ „
		„ iron deck	½ „
		Weight of ditto (about)	130 tons

It only remains to add to the history of the vessel, that after the first attempt to launch her on the 2nd November, 1857, failed, the most strenuous efforts were made to complete the operation: and at length, on the 31st January, 1858, she was got afloat physically and materially, but financially, and for all practical purposes, she was as hard a-fast as ever. In fact, the original company the Eastern Steam Navigation Company—having, with commendable effort struggled through the monetary and commercial panic of the year 1857, found themselves, in May of the year 1858, in the unenviable, not to say disastrous, position of having brought the vessel only into such a condition as that she could float at her moorings off Deptford; of being £90,000 in debt; of having exhausted their power of making calls on the shareholders, while those among them who were inclined to increase their stake in the concern were prevented by legal difficulties from taking any steps towards action, except on terms obviously unjust In this dilemma the directors, aided by a committee of consultation, devised and made public a plan for raising a sum of £220,000, by means of annuities. It was, however, soon found that the advance of money by way of annuity was not a favourite mode of investment in the English money market; and the proposition met with little or no success, and ultimately the scheme proved a failure. At this time another plan had been proposed, which was favourably received by many influential proprietors in the Eastern Steam Navigation Company, by which a new company was to be formed to take the vessel into their hands on mortgage, and to fit her for sea. This plan was perfectly successful, the required capital was raised, and the vessel placed in the hands of Mr. Scott Russell, who contracted to fit her for sea Early in the month of August, 1859, the Great Ship had so far advanced towards completion that invitations were sent out to a large number of the aristocracy, the members of the House of Commons, and the friends of the directors to two entertainments, which took place on board, and ample opportunity was afforded for the inspection of the vessel. In the following week she was thrown open to the visits of the public, and thousands of persons availed themselves of the occasion to witness the effect of the completion of the most striking specimen of naval architecture. On the 27th of August all access to the ship was closed; and, on the 3rd of September, she left the river, preparatory to starting on her trial trip. From this point her actual future may be said to date.

In concluding the above *resumé* of the history of the past fortunes, and directing attention to the future prospects, of the Great Eastern ship, it would be difficult to add anything to the able and eloquent manner in which the public journals have addressed their remarks to the subject, and have dealt with a question of such importance to every interest, commercial and social, not only of this country but the world, and of the humanising and harmonising influences which must result from constant intercourse between the inhabitants of the different nations of the world, it would be trite and superfluous now to dilate It needs no proof, requires no argument; and it only needs that it should be pointed out how vast an agent such a vessel as this must be in the extension of that principle. It is stated, and truly, that it will be in the power of the Great Eastern to throw 10,000 soldiers on any given spot of her Majesty's dominions in a space of time hitherto undreamed of. Be it so—if that stern necessity should arise; but it is far more agreeable to contemplate the idea of her bearing, on every voyage she undertakes, ten thousand heralds of peace, in the shape of the good men and true whose mission it is to carry the blessings of civilisation and the tidings of goodwill by the insensible action of their presence among the less advanced of mankind! We have invaded China in arms. We have, by pacific means, obtained an entrance into the hitherto sealed regions of Japan!—thus opening up new spheres of progress and of duty for Englishmen. Who shall say what effect the shortening of the voyage between Great Britain and those distant lands, by such agency as that of the Great Eastern affords, may not have on those strange and unapproachable people? In the Electric Telegraph much has been done to annihilate time; by such vessels as this, a long step has been made in the way of annihilating space. In another point of view the matter has been well considered by an eloquent writer, who says, while dealing with the real practical result of the grand experiment of the Great Eastern:—

"The Roman poet, Horace, as he surveyed [the vast sublunary scene of restless industry and adventure before him, was struck by nothing so much as the triumph of man over the sea. He expresses himself as more than struck—as shocked! He argued that the sea was a providential appointment, and that it was impious [in man to struggle against it; he had no right to unite what God had separated, and connect land with land, when the Divine power had inserted water between. We have long seen the weakness of the argument, and arrived at a much better doctrine of final causes than this: but if any one wants to see a grand finishing blow to the Horatian argument, he may see it given by the Great Eastern. That mighty fabric, indeed, will not talk, but it will act—its act being a month's voyage to India or to Australia. That act, while it is a speechless, is, at the same time, the most powerful answer that the religious scruples of the awe-struck poet could receive. A reflecting mind will see in such a voyage a much more natural, proper, wise, and obedient fulfilment of the designs of Providence, than any timid self-confinement and servile deference to a barrier of nature would have been. It will appear that the sea was made to alternate with the dry land, not that continents might be disconnected, but that man should have the opportunity of exerting his skill and invention in connecting them. The result of this great experiment of shipbuilding, if it answer—of which there is little or no doubt—will be a consolidation of the British empire such as we have never yet seen. Half of the distance which separates the various sections of it from the mother country and from each other will be removed. Our colonies will be brought comparatively close to us, and what is almost of as much importance as the actual vicinity gained, they will be more than twice as near to us in imagination. The difference between a month's voyage and two or three months is all the difference to the imagination. We think of a place as within reach, and within a home distance, if it is only 'a month off.' The whole empire is thus brought idto a home compass, and obtains the addition of strength which so much greater union gives. We shall find ourselves paying visits to, and receiving from, India, Australia, and America. Our friends will come over for the summer with return tickets, and the British empire will become, in virtual compass, a province."

It must be a matter of congratulation to the public of this country, that all which has hitherto been dwelt upon in imagination is about to be realised, and that the Great Eastern has become one of the greatest of facts!