veral modifications of the vertical engine, which, accor­ding to our judgment include ail the best that have yet been introduced. It does not seem to have been practi­cally established that the engine of direct connexion is preferable to the lever engine ; but the plans of Mr Napier appear to have been the best ever adopted.

It is now a considerable time since Mr David Napier relinquished all connexion with such operations on the Clyde; since his retirement, much has been dune for the advancement of steam navigation in Britain, and to this work the ship-builders and engineers of the Clyde have contributed their full share. We have already staled that a regular communication by steam was early established between Liverpool and the river Clyde. This establishment has done much for the advancement of steam navigation. It has afforded scope for two exten­sive companies, who, employing the most eminent steam- engine and ship-builders for the construction of their ships, have produced a very superior class of vessels.

The introduction of wrought-iron hulls for steam ves­sels, has been the means of introducing a great improve­ment in the art. This method of construction enables builders to effect a combination of strength and lightness of draught, peculiarly advantageous in some branches of trade and in certain localities. One of the first iron steam- vessels was the Alburkha, of 55 tons. It was built to accompany the Quorra in the expedition to the Niger in 1832. and gave ve∣y great satisfaction. The builders of the Alburkha, Messrs Laird of Liverpool, immediately afterwards commenced another vessel the Garry-Owen, destined to run between Limerick and Kilrusb. The length of this vessel was 125 feet on deck, its beam 21 feet 6 inches, and its engines were fifty horse power each. The Garry-Owen was driven on shore, with many other vessel-, in the great hurricane which happened about that time, and alone escaped uninjured. This, and other evidence of the power of iron vessels to withstand the casualties of the sea, so raised them in the estimation of builders, that their number was rapidly increased, and their size greatly extended.

For a long period there had been much speculation about the practicability of navigating the Atlantic by steam. So early as 1791, and while the steam-boat was yet in embryo, Fitch, the American, boldly predicted that sailing vessels would soon be superseded in trans­atlantic navigation. In 1819, an American steam-ship, the *Savannah,* of 300 tons’ burden, arrived at Liverpool direct from the United States, having accomplished the passage in 26 days, partly steaming and partly sailing ; and nearly ten years alter, the Curaçoa, an English built vessel of 350 tons and 100 horse power, made more than one successful run in the same manner, between Holland and the Dutch West India colonies. Men of science, however, endeavoured to demonstrate that the navigation of the Atlantic by steam-power alone, was the dream of a visionary, and the tide of public opinion seemed to set in in the same belief; but a strong under­current was at work, and in 1838 the following adver­tisement appeared in the daily papers: *“ Steam to New York.* The well-known steam-ship, Sirius, Lieutenant Roberts, K.N., Commander, is intended to leave London for New York on Wednesday 28th March, calling at Cork harbour, and to start from thence on Monday the 2d of April, returning from New York the 1st of Muy.” Thus, a company of merchants was found sanguine enough to disregard the demonstration of the impossi­bility of an American voyage, and actually to advertise not only the day of sailing, but also the days of arrival and return. The *Sirius* was not expressly built for transatlantic navigation ; she belonged to the St George Steam-Packet Company, and had run with a good repu­tation between London and Cork. Her tonnage was about 700 tons, and her engine about 320 horse power. Although advertised to sail on March the 28ιh, circum­stances delayed her departure till the morning of the 4th April, when she started at ten o’clock, with 94 pas­sengers. Though first in the race, she was only three days in advance; for on the 7th of the same month, the *Great Western,* built and fitted expressly for the pur­pose, followed her. In the interval between the sailing of these vessels and the reports of their arrivals, much doubt prevailed as to the possibility of their ιaccomplishing their task in safety, and the uncertainty was increased by vessels having arrived from America at ports in Britain, without having encountered either of the steam­ships ; people having, for a moment, forgotten that there were more roads than one across the Atlantic. They were at length, however, spoken with by the West­minster, the Sirius on the 21st, within six hours’ sail of New York, and the Great Western on the 22d ; and in due time, reports of their having reached New York arrived, the Sirius on the 22d, being 17 days clear on the passage, and the Great Western on the 23d, be­ing 15 days. The Sirius again sailed on her home­ward passage on May 1st, afternoon, and the Great Western on May 7th, and they arrived, the first on the 18th, and the latter on the 22d, being 16 and 14 days respectively. The average speed, and expenditure of fuel of the Great Western was as follows. The whole distance run from Bristol to New York was 3125 miles, averaging each day 208 miles, each hour 8∙2 miles; the distance run in returning from New York 3192 miles, each day 213 miles, each hour 9 miles nearly. She de­parted with 860 tons of coals, and on her arrival at New York she had 205 tons remaining. She left New York with 570 tons of Newcastle coals, and had on board when the arrived at Bristol 178 tons. Her average daily con­sumption was 27 tons ; and, with the expansion valves up, 32 tons, in page 707 there is given a table exhibiting a comparative view of the size and power of six of the largest of the transatlantic vessels.

The practicability of transatlantic navigation being thus fully demonstrated, preparations for its continuance on a gigantic scale commenced, and the British Queen, the President, and other vessels of enormous size, were launched in rapid succession. In addition to these, the offspring of a state of peace, steam war vessels, of great size, are daily constructing, and call f<>r the highest in­genuity of the ship builders and engineers, in adapting them for taking the advantage of their sails as well as of their steam-paddles.

While the art was thus rapidly advancing, many in­genious men were making attempts to improve the form of the paddle-wheels, or to substitute for them some other impelling apparatus. Of the improvements in the paddle-wheels themselves, we shall have occasion to speak in the sequel. We shall, therefore, in this place, give some account of the most important of the substitutes the Archi­medes screw propeller. The idea of impelling a vessel by means of a screw of a large diameter, lying in the direc­tion of the boat’s motion, was originated some considerable time ago ; but its first successful application was to a ves­sel named the Archimedes, constructed under the direction of the patentee of the screw, Mr Smith. From an interest­ing report of experiments made with this vessel b Cap­tain Chappell, R.N., we condense the following statement: —The burden of the Archimedes is 237 tons, its mean draught of water 9 feet 4 inches. The diameter of the engine cylinder 37 inches, and the length of stroke 3 feet. The screw propeller consists of two half-threads of an 8 feet pitch screw, 5 feet 9 inches in diameter; each is therefore 4 feet in length, and they are set diametrically