The few selections from the valuable magazine of practical facts presented in this table, serve to show how much is to be gained even without the assistance of new inventions, by judicious construction and treatment of ascertained and practical kinds of boilers and ordinary fuel. Λ saving of 50 per cent over ordinary practice is gained in Cornwall by large fire grates, thick fires, slow combustion, internal flues, extensive fire surface, and external coverings. He who desires to improve the construction or management of his boilers, has only to fulfil the conditions that are now brought under his attention.

The common waggon boiler stands contrasted in all points with the Cornish boiler. Yet it is cheering to see how much advantage may be gained by judicious

construction of fire grate, and a proper system in managing the fire, as is shown in Mr Parkes's experi­ments on his boiler at Warwick. The only peculiarities of the Warwick treatment appear to have been a largo fire grate, 15/4 square feet to the horse power, and slow combustion, the high result of 10 lbs. of water evaporated by each pound of fuel, and the economical result of only 6 lbs. of fuel to each H.P. per hour, appear as the re­ward of this treatment.

The locomotive-engine boiler is in every point con­trasted with the Cornish boiler. To pursue this part of the investigation more minutely than its exhibition in the table, would not coincide with the objects of this section.

STEAM NAVIGATION.

Tue application of steam-power to navigation is one of the most wonderful triumphs of human ingenuity.@@1 By this power vessels of gigantic size are impelled across the trackless ocean ; and, in spite of its storms and resist­ing tides, establish a chain of communication between the shores of the remotest regions, as safe and as cer­tain as if connecting the cities of a continent. Thirty years have βcarcply yet elapsed since the first steam-ship of traffic was launched op the Hudson, and now there is hardly a navigable river or an inland lake whose waters are not agitated by the steam-boat paddle, and its atmo­sphere darkened by her smoke; while even the ocean itself is crossed in almost every direction by lines of steam-ships of immense size, and of beautiful construc­tion. Many individuals have claimed the merit of in­venting an art so pregnant with interest to mankind ; and almost every civilized country contends for the hon­our of its birthplace. If the mere suggestion of the application of steam-power to the purposes of navigation entitle an individual to the credit of having invented the art, there are, doubtless, many who may be regarded as its inventors ; for this suggestion was repeatedly made almost as early as the invention of the steam-pump, al­though from the nature of steam machinery, then and for long after, no advantage could be derived from it. To show how the ingenious of that time were led to pro­pose steam as a motive power in navigation, we shall give a brief account of the contrivances which had been devised for the propulsion of vessels.

The substitution of other apparatus than oars, and of other power than human labour, to impel vessels in a calm or against the wind, is of unknown antiquity. The Egyptians are said to have used, in their boats, wheels like the paddle-wheels of the present day, but moved by oxcn working in a gin on the deck of the vessel. Valturius, in his treatise *De Be Militari,* gives an account of paddle-wheel boats used by the Romans as transports, the paddle-wheels being driven by men or by horses ; and we have, from many sources, abundant evidence of the existence of similar boats elsewhere. In a book published in London in 1578, called *Inventions and Devices,* by William Bourne, we find the following passage : “ And furthermore, you may make a boat to go without oars or sail, by the placing of certain

wheels on the outside of the boat, and so turning the wheels by some provision, and so the wheels shall make the boat goe.’’ Thus we see that the means of making the boat go by paddle-wheels was already dis­covered, and the “ some provision,” by which these pad­dle-wheels were to be moved, was the desideratum. Horses, oxen, and human power had already been used for this purpose ; and the first indication of some differ­ent power occurs in the Marquis of Worcester's *century of Inventions,* published in 1663. The marquis, describ­ing his *quintessence of motion,* says, “ By this I can make a vessel of as great burthen as the river can bear to go against the stream, which, the more rapid it is the faster it shall advance, and the moveable part that works it may be, by one man, still guided to take the best advan­tage of the stream, and yet to steer the boat to any point. And this engine is applicable to any vessel or boat what­soever, without being therefore made on purpose, and worketh these effects—it *rοweth,* it *draweth,* it *driveth,* (if need be,) to pass London Bridge against the stream at low water ; and, a boat laying at anchor, *the engine may be used for loading or unloading.”* What the marquis's quintessence of motion was, or how applied to, the mov­ing of the vessel, we have not now the means of discovering ; but, in his proposed applications of it, he has more than anticipated all that has yet been done ; for we do not yet employ our steam-engines for loading or unloading. Savary, the inventor of the next steam en­gine, proposed to apply his engine to impel boats. The only way, however, in which a rotatory motion could bo derived from his engine was, by it to raise water into an elevated cistern, whence it could fall upon the floats of a water-wheel. This clumsy machine was not well adapted for a boat; and we hear nothing of its application. About the year 1688, the ingenious Dr Papin, who had been engaged with the project of an atmospheric vacuum­engine for moving machinery, proposed to form a vacuum in his cylinder with gunpowder, as had been proposed by Hautefeuille ten years before, and by Huyghens in 1680; but this scheme being found impracticable, he proposed, about two years afterwards, “to turn a small surface of water into vapour, by fire applied to the bot­tom of the cylinder which contains it, which vapour forces up the plug or piston in the cylinder to a considerable height, and which, as the vapour condenses, descends again by air pressure, and is applied to raise water out of the mine.” Besides raising water from mines, be proposed also

@@@1 For these historical notices, ending in p. 693, we are not in­debted to the same contributor who wrote the rest of the article.