the ſmalteſt 600 tons, carrying 150 men and 30 guns. Smaller veſſels were occaſionally hired by her from private owners.

In the memorable ſea-fight of Lepanto between the Turks and Chriſtians, *anno 1571, no* veſſels were em­ployed but galleys ; and it would appear from the car- cases of ſome of them, which are ſtill preſerved in the arſenal at Venice, that even theſe were not ſo large or ſo well conſtructed as thoſe of our times. The Invin­cible Armada, as Spaniſh vanity ſtyled it, once the terror and admiration of nations, in the pompous and exaggerated deſcriptions of which the Spaniſh authors of thoſe times dwelt with ſo much apparent pleaſure, consiſted of 130 ſhips, near 100 of which were the ſtatelieſt that had yet been ſeen on the ocean. The lar- geſt of theſe, however, would be no more than a third rate veſſel in our navy, and they were ſo ill conſtructed, that they would neither move eaſily, ſail near the wind, nor be properly worked in tempeſtuous weather. The whole of the naval force collected by Queen Elizabeth to oppoſe this formidable fleet, including hired veſſels, tenders, ſtore-ſhips, &c. amounted to no more than 143.

Ship-building began now to make a conſiderable progreſs in Britain. Both war and trade required an increaſe of ſhipping ; ſo that, in the year 1670, the an­nual charge of the navy was reported to be L. 500,000; and in 1678 the navy consiſted of 83 ſhips, of which 58 were of the line. At this time the exports amount­ed to ten millions *per annum ;* and the balance of trade was two millions. In 1689 there were 173 ſhips, great and ſmall, in the royal navy, and it has been conſtantly increaſing; ſo that in 1761 the ſhips in the navy amounted to 372, of which 129 were of the line; and in the beginning of the year 1795, the total amount was above 430.

As ſhips of the common conſtruction are found to be very defective in many particulars, various methods have therefore from time to time been propoſed to re­move ſome of the bad qualities they poſſeſſed. As it would be an endleſs taſk to enumerate the different in­ventions for this purpoſe, therefore a few of them only will be mentioned.

In 1663 Sir William Petty conſtructed a double ſhip, or rather a ſingle ſhip with a double bottom, which was found to ſail conſiderably faſter than any of the ſhips with which it had an opportunity of being tried. Her firſt voyage was from Dublin to Holyhead; and in her return “ ſhe turned into that narrow harbour againſt wind and tide, among rocks and ſhips, with ſuch dexterity as many ancient ſeamen confeſſed they had never ſeen the like.” This veſſel with 70 more were lost in a dreadful tempeſt.

This ſubject was again revived by Mr Gordon, in his Principles of Naval Architecture, printed at Aberdeen *anno* 1784; where, having delivered his ſentiments on the conſtruction of large Drafts, he ſays : “ Theſe ex­

periments likewiſe point out to us methods by which two veſſels may be laterally connected together, though at a conſiderable diſtance from each other, in a manner ſufficiently ſtrong, with very little increaſe of weight or expence of materials, and without expoſing much surface to the action or influence of the wind or the waves, or obſtructing their motion in any conſiderable degree, and conſequently without being much oppoſed by them on that account under any circumſtances ; and if veſſels are judiciouſly conſtructed with a view to ſuch a junc­tion, it would be no eaſy matter to enumerate all the advantages that may be obtained by this means.” He then enumerates the advantages that double veſſels would have over thoſe of the common conſtruction. Soon after double ſhips were actually built by Mr Mil­ler of Dalſwinton.

Another plan was propoſed by Mr Gordon to make a ſhip ſail fast, draw little water, and to keep a good wind. For this purpole, “ the bottom (he ſays) ſhould be formed quite flat, and the tides made to rise perpen­dicular from it, without any curvature ; which would not only render her more ſteady, as being more oppoſed to the water in rolling, but likewiſe more convenient for ſtowage, &c. while the ſimplicity of the form would contribute greatly to the eaſe and expedition with which ſhe might be fabricated. Though diminiſhing the draught of water is, *cateris paribus,* undoubtedly the moſt effectual method of augmenting the velocity with which veſſels go before the wind ; yet, as it pro­portionally diminiſhes their hold of the water, it ren­ders them extremely liable to be driven to leeward, and altogether incapable of keeping a good wind. This defect may, however, be remedied, in a ſimple and ef­fectual manner, by proportionally augmenting the depth of keel, or, as ſo large a keel would be inconve­nient on many accounts, proportionally increaſing their number ; as, in place of adding a keel eight feet deep to a veſſel drawing six feet water, to affix to different parts of her flat bottom, which would be well adapted for receiving them, six different keels of two feet deep each at equal diſtances from each other, with proper intervals between ; which will be found equally ef­fectual for preventing theſe pernicious effects. Four ſuch, indeed, would have anſwered the purpoſe as well as the eight feet keel, were it not for the ſuperior preſſure or reſiſtance of the lower water @@(a).

Thus then it appears, that a veſſel drawing eight feet water only, keels and all, may be made to keep as good a wind, or be as little liable to be driven to leeward, as the sharpeſt built veſſel of the ſame length drawing 14, nay 20 or upwards, if a few more keels are added, at the ſame time that ſhe would be little more reſiſted in moving in the line of the keels than a veſſel drawing ſix feet water only. Theſe keels, beſides, would ſtrengthen the veſſel conſiderably, would render her more ſteady, and leſs Hable to be overſet, and thereby

@@@(a) This is frequently repeated on the authority of Mr Gordon and others. Theory ſays otherwiſe ; and the experiments of Sir Iſaac Newton ſhow in the moſt unexceptionable manner, that the reſiſtance of a ball depending through the water 13 the ſame at all depths ; nay, the heaping up of the yvater on the bow, occaſioning a hydroſtaticaf preſſure in addition to the real reſiſtance, will make the whole oppoſition to an equal surface, but of greater horizontal dimenſions, greater, becauſe it bears a greater proportion to the reſiſtance.