ſhould have a great breadth and depth in proportion to its length, a full bottom, and a long and flat floor. But a ſhip of this conſtruction will neither ſail faſt, nor carry much ſail.

If a ſhip be filled out much towards the line of float­ation, together with low upper works, ſhe will require little ballaſt : and that ſhip which is ſtiff from conſtruc­tion is much better adapted for failing faſt than one which, in order to carry the ſame quantity of canvas, is obliged to be loaded with a much greater weight : for the reſiſtance is as the quantity of water to be re­moved, or nearly as the area of a tranſverſe ſection of the immerſed part of the body at the midship frame ; and a body that is broad and ſhallow is much ſtiffer than one of the ſame capacity that is narrow and deep. “ The advantages (ſays Mr Gordon) are numerous, important, and obvious. For it is evident, that by en­larging, perhaps doubling, the breadth of veſſels, and forming their bottoms flat and well furniſhed with keels, they muſt, in the firstplace, become much ſteadier, roll little, if any, and be enabled to carry greatly more ſail, and that in a better direction, at the ſame time that they would be in no danger of being diſmaſted or overſet, unleſſs the maſts were of a moſt extraor­dinary height indeed. *Secondly,* They would have little or no occaſion for ballaſt, and if any was uſed, could incur leſs danger from its ſhifting. *Thirdly,* That there would be much more room upon deck, as well as ac­commodation below ; the breadth being ſo much increaſed without any diminution of the height above the load-water line. *Fourthly,* That they would deviate much leſs from the intended courſe, and penetrate the water much eaſier in the proper direction : for doubling the breadth, without any increaſe of weight, would diminiſh the depth or draught of water one half ; and though the extent of the directly oppoſmg ſurface would be the ſame as before, yet the veſſel in moving would meet with half the former reſiſtance only : for so great is the difference between the pressure, force, or reaction, of the upper and the under water. *Fifthly,* That they would by this means be adapted for lying unſupported in docks and harbours when dry, be ren­dered capable of being navigated in ſhallow water, and of being benefited by all the advantages attending that very important circumſtance ; and it is particularly to he obſerved, that making veſſels which may be naviga­ted in ſhallow water, may, in many reſpects, juſtly be regarded as a matter of equal importance with increa­ſing the number of harbours, and improving them, as ha­ving identically the ſame effects with regard to naviga­tion ; at the ſame time, that the benefits which would result from ſuch circumſtances are obtained by this means without either expence, trouble, or inconveniency : beſides, it would not only enable veſſels to enter many ri­vers, bays, and creeks, formerly inacceſſible to ſhips of burden, but to proceed to ſuch places as are moſt land locked, where they can lie or ride moſt ſecure, and with leaſt expence of men and ground tackle. As ſhips of war would carry their guns well by being ſo Ready, there could be but little occaſion for a high topside, or much height of hull above water ; and as little or no ballaſt would be required, there would be no neceſſity, as in other veſſels, for increaſing their weight on that account, and thereby pressing them deeper into the water. Theſe are very important circum­

ſtances, and would contribute much to improve the sailing of ſuch veſſels.” From whence it appears, that there would be united, what has hitherto been deemed irreconcileable, the greateſt poſſible ſtability, which is nearly as the area of a tranverſe lection of the immerſed part of the body at the midſhip frame : and a body that is broad and ſhallow is much ſtiffer than one of the ſame capa­city that is narrow and deep. A ſhip of this conſtruc­tion may take in a conſiderable cargo in proportion to her ſize ; but if deeply loaded will not ſail fast, for then the area of a ſection of the immerſed part at the mid­ſhip frame will be very conſiderable, and as the sails of ſuch a ſhip muſt neceſſarily be large, more hands will therefore be required.

The leſs the breadth of a ſhip, the fewer hands will be neceſſary to work her ; as in that caſe the quantity of ſail will be leſs, and the anchors alſo of leſs weight. We ſhall gain much (ſays M. Bouguer) by making the extreme breadth no more than the fifth or ſixth part of the length, if, at the ſame time, we diminish the depth proportionally ; and likewise this moſt ſurpriſing circumſtance, that by diminiſhing these two dimenſions, or by increaſing the length, a ſhip may be made to go ſometimes as fall as the wind.

In order to obtain the preceding properties, very op­poſite rules muſt be followed ; and hence it appears to be impoſſible to conſtruct a ſhip ſo as to be posſeſsed of them all. The body, however, muſt be ſo formed, that as many of theſe properties may be retained as poſſible, always obſerving to give the preference to thoſe which are moſt required. If it is known what particular trade the ſhip is to be employed in, thoſe qualities are then principally to be adhered to which are moſt eſſentially neceſſary for that employment.

It may easily be demonſtrated that ſmall ſhips will not have the ſame advantages as large ones of a similar form, when employed in the ſame trade : for a large ſhip will not only ſail faster than a ſmall one of a simi­lar form, but will alſo require fewer hands to work her. Hence, in order that a ſmall ſhip may poſſeſs the ſame advantages as a large one, the correſponding dimenſions will not be proportional to each other. The reader will ſee in Chapman’s Architect*ura Navalis Mercatoria* ample tables of the ſeveral dimenſions of ſhips, of dif­ferent claſſes and sizes, deduced from theory combined with experiment. Tables of the dimenſions of the principal ſhips of the Britiſh navy, and or other ſhips, are contained in the Ship builder’s Repository, and in Murray’s Treatiſe on Ship-building.

Chap. II. *Of the different Plans of a Ship.*

When it is propoſed to build a ſhip, the propor­tional ſize of every part of her is to be laid down ; from whence the form and dimenſions of the timbers, and of every particular piece of wood that enters into the conſtruction, is to be found. As a ſhip has length, breadth, and depth, three different plans at leaſt are neeceſſary to exhibit the form of the ſeveral parts of a ſhip : theſe are uſually denominated the *Jheer plan,* the *half breadth* and lody *plans.*

The sheer *plan* or *draught,* otherwiſe called the *plan oſ elevation,* is that ſection of the ſhip which is made by a vertical plane paſſing through the keel. Upon this plan are laid down the length of the keel ; the height and rake of the item and ſternpoſt ; the situation