royal and in the mercantile shipping. One of these plans, see fig. 37, Plate CCCCLIV., called “ Lang’s safety keel,” from the inventor, Mr Lang, the master shipwright of Wool­wich yard, has, we believe, been very extensively applied to the keels and garboards of steam-boats ; and several of Her Majesty’s ships have been built with their garboards so worked. A represents the keelson, B the floor-timber, C the keel, D the outer keel, E the false keel, F, F solid pieces continued fore and aft the vessel, as substitutes for the chocks on the floors and the planking of the bottom.

The pieces of timber, either secured or placed to re­ceive the heels of the several masts, are called steps, as the main, fore, or mizen step. The heel of the bowsprit is also, in small ships, sometimes on a step. In general, the bowsprit steps on a frame-work, called the bowsprit partners. The frame-work of timber which is formed round the mast-holes in each deck is called mast-partners. Partners, generally, are the principal timbers in a framing formed for the support of any thing passing through a deck, as the masts and cap­stans. Carlings are pieces of timber forming a part of the framing for a deck, lying in a fore and aft direction, and from beam to beam, to receive the half beams, to aid in supporting the deck, and for various other purposes. Ledges are pieces also forming a part of the framing of a deck, ge­nerally smaller than carlings, and which are placed athwart­ships in the same direction as the beams. Coamings are pieces of timber generally faying on carlings, and raised higher than the flat of the deck, forming the fore and aft boundaries to openings in it, as hatch or ladder ways. Head­ledges in the same manner form the athwartship boundaries to these several openings.

The knee of the head, which has been already inciden­tally noticed in the laying off, is a prolongation of the fore part of the ship, principally of use as a security for the bow­sprit, which is firmly lashed to it by portions of the rigging, called the gammoning and the bob stays. The cheeks are knees fayed on each side of the knee of the head, and also against the bows, in the direction of the sheer, in order to afford support to the knee of the head.

We do not profess that this is a perfect list of the com­ponents of the hull of a ship. We have merely enumerated some of the more important pieces, or combinations, of tim­ber, the names of which may occur again in our further re­marks. It would be impossible, in an article so limited in extent as the present, to enter much into the detail of prac­tical building. We shall content ourselves with endeavour­ing to illustrate some few general principles, which may guide the practical builder in his arrangements.

There are several very voluminous works explanatory of the detail of practical ship-building. By far the most per­fect information on the practice, as it exists in Her Majesty’s yards, will be found in the very excellent plates to Fincham’s Outline of Ship-Building. We believe the most modem work on the construction of the mercantile navy is Hed- derwick’s Treatise on Naval Architecture, which contains very minute details of the practical building in the mer­chants’ yards.

We shall now consider the most important disturbing forces which are in action, either to injure or to destroy the several combinations of the hull of a ship. Some of these forces are inherent to the form of the body, while others are only brought into action when the body is in motion. In the theoretical portion of this article it has been ex­plained, that when the ship is at rest on still water, the to­tal weight of the vessel is equal to the upward pressure of the water ; but it does not necessarily follow, that the weight of every portion of the vessel shall be equal to the upward pressure of that portion of water which is immediately be­neath it. On the contrary, the shape of the body is such, that these weights and pressures are very unequal. We will suppose the vessel to be divided by transverse vertical sections into a number of laminae of equal thickness, which will all be perpendicular to the vertical longitudinal section. Γt is evident that the after laminæ comprised in the over­hanging stern above water, and the fore laminæ comprised in all the projecting head, also above water, cannot be sup­ported by any upward pressure from the fluid, but their weight must be wholly sustained by their connexion with the supported part of the ship. The laminæ towards each extremity immediately contiguous to these can evidently derive a very small portion of their support from the water ; but as their stations in both the fore and the after bodies approach towards the middle of the ship’s length, a greater proportionate bulk is immersed, and the upward pressure of the water is increased ; so that at some certain station from the middle of the length in each body, the upward pressure will equal the weight of the superincumbent lamina, and all the laminæ comprising that portion of the body between these two stations will be subjected to an excess of pressure above their weight, tending to force them upwards, which upward pressure will be the greatest at the lamina having the greatest transverse area of section.

Now, as we know that the total pressure upwards is equal to the total weight of the vessel, this excess of upward pres­sure, to which the midship part of the length of the body is subjected, must be just equal to the excess of weight over the upward pressure in the parts of the vessel before and abaft those laminæ at which we have represented the pressure and weight to be in equilibrio.

A ship floating at rest may be considered as a beam loaded at each extremity with a weight, and supported at two points in its length, which are at some distance on each side of its centre, while the part between its points of support is sub­jected to a force acting upwards equal to the sum of these two weights. A beam thus acted upon would have a ten­dency to assume a curved shape ; and it would gradually as­sume such a form, as the effect of the weights and forces overcame the rigidity of its particles. This is precisely the effect of the action on the ship ; and the upward curvature, when it does ensue, is what is technically called “ hogging.” As long as the fastenings remain unaffected from the con­tinued operation of the disturbing forces, and the abutments of the several timbers and plank composing the fabric also maintain their close contact, this curvature will not take place ; but when these become partially deranged, the up­ward pressure, and the downward gravitation of the several portions of the body, can no longer be considered as ten­dencies only to deterioration of the fabric, but as active agents in the work of destruction.

It does not necessarily follow, from all that has been said, that the hogging will give a regular curvature to the form : on the contrary, the various actions of the weight and pres­sure will produce varied effects. Thus, before the introduc­tion of the additional keelsons, the body frequently “sagged,” the contrary or opposite curvature to hogging, under the weight of the main-mast.

A corresponding action to that described as hogging, takes place in relation to the breadth of the vessel, especially on account of the weight of the ordnance ; so that the central portion of the body is subjected to an upward pressure forcing it above the water, and the outer portions are strong­ly acted upon by their unopposed gravity immersing them beneath it. The effects of this action will be modified by the form of the vessel ; longitudinally it produces the up­ward curvature that we have described, and transversely it either tends to a separation of the sides both above and be­low throughout their extent, or, if the “ tumbling home” be great, a separation at the main breadth and below it, and a collapsing of the sides above it.

Another force tending to alter the form of the ship when she is at rest, arises from the horizontal pressure of the fluid on the surface below the load water-section, which tends to