the fore and after cant timbers, which will be more particu­larly explained in the sequel.

*3d.* The body plan (fig. 25) is simply a representation of vertical transverse sections, before, at, and abaft the widest transverse section, which is termed “ dead flat,” and usually denoted by the symbol (+).

The sections in the body plan in the fore-body are dis­tinguished by letters, A, B, C, &c., those in the after-body by figures, 1, 2, 3, &c., corresponding with the same letters and figures in the sheer and half-breadth plans. It must be un­derstood, that the sections in the body on the right of the middle line represent the starboard fore-body, whilst those on the left of the middle line represent the larboard after­body, of the ship.

It is thus seen, that from the aforesaid three plans we may derive correct ideas of the form of a ship, which form is obtained

From the sheer plan, { by vertical fore and aft sections parallel to the vertical longitu­dinal plane, as seen by the but­tock and bow lines ; From the vody plan, { by athwartship vertical sections, square to the keel, and at right angles to the vertical longitudi­nal plane; From the half-breadth plan, { 1st, by water-lines, or by planes parallel to the water; 2d, by level lines, or by planes parallel to the keel; *3d,* by diagonal lines, or by planes inclined at any angle to the horizon. The reader will also perceive from the preceding remarks, that

The sheer plan, The body plan, The half-breadth plan { is a projection { on a vertical longitudinal plane; on a vertical athwartship plane, on a horizontal plane.

As before remarked, the three above-described plans con­stitute the draught of a ship. We shall presently see their mutual dependence on each other, so that any two being given, the third may be obtained.

Besides the sheer draught, it is customary to furnish the architect with a profile of the inboard works before ex­plained ; the “ disposition,” or the appearance of the tim­bers which constitute the frame, showing the heads and heels, and general arrangement of the futtocks ; the mid­ship section, on which is described the moulding, or athwart­ship size of the timbers, the thickness of the exterior and interior planking, the connection of the beams to the side, the dimensions of the water-ways, shelf-pieces, the descrip­tion and fastening of the knees, &c. These, together with a scheme of scantlings, which is a document containing the dimensions, and other particulars, of the principal pieces which enter into the construction of the fabric, constitute all the preparatory information required by the builder.

After these general observations, we shall now enter more in detail into the description of the draught of a ship ; but as laying off and practical building are so intimately con­nected, that a perfect knowledge of the one cannot be at­tained without some acquaintance with the other, it becomes previously necessary to describe, in general terms, the me­thod in which the timbers of a ship are combined and dis­posed, both in the square and cant bodies.

This constitutes another division of our subject.

The timbers of a ship are combined together in assem­blages which are technically called “ frames these are put together in a certain predetermined order, depending on a variety of circumstances, as the size and form of the ship to be built, the nature and dimensions of the timber to be used, the skill and judgment of the architect employed. We will suppose each frame to consist of a floor crossing the dead­

wood, a first futtock stepping against the dead-wood, a second futtock on the head of the floor, a third futtock on the head of the first futtock, a fourth futtock on the head of the second futtock, and, lastly, a top-timber on the head of the third futtock. The above arrangement ac∞rds with the old sys­tem of building. An economical modification of the plan was introduced of late years, by diminishing the length, and therefore by increasing the number, of the timbers. Thus the long floors are abolished, and their place is substituted by shorter floors, called cross timbers. To the sides of these cross timbers, giving scarph to and projecting beyond them, are bolted and dowelled pieces, called half floors. The first futtock will then but on the head of the cross timber, the second futtock on the head of the half floor, the third fut­tock on the head of the first, the fourth on the head of the second, the fifth on the head of the third, the sixth on the head of the fourth, and the top-timber on the head of the fifth. Occasionally lengthening pieces are added to the upper timbers, when required by the conversion. See figs. 34, 35, 36.

Figure 49, Plate CCCCLVII., represents a disposition with the buts of the frame arranged like those of a shift of plank, there being three timbers between every two buts, while in the usual disposition there is only one timber be­tween every two buts.

By reference to the disposition of the frame, Plate CCCCLIV., it is seen that the timbers are not in contact sideways, but are kept apart a certain distance; although, for the sake of simplicity in laying off, we suppose them to touch each other from the keel to the top-side. This imaginary junction of the futtocks of a frame is called the joint. The joints of the frames are, with one exception, equidistant. This exception is seen in fig. 24, Plate CCCCL., in which the distance between the joints 3 and (2) is greater than be­tween the other joints. This variation is for the purpose of introducing an additional timber, called the “ single tim­ber,” so that there will be five timbers in the space 3 (2), whereas there are only four timbers between the other joints. Hence the opening in question is called the five-fourth open­ing; and one frame, instead of consisting, like all the others, of two adjacent timbers, will consist of an assemblage of three timbers. The reason of the introduction of the single timber is, because the position of the various futtocks is re­versed in the fore and after bodies, *i. e.* those which in the fore-body are on the fore side of the joint, arc placed in the after-body on the aft side of the joint. Hence, were it not for the single timber breaking the shift of the heads and heels, we should have a series of two buts together, as two first-futtock heads, and so on. The timbers being square to the keel, the joints will obviously be represented in the sheer and half-breadth plans by straight lines square to the keel.

As before explained, these joints and their corresponding frames are distinguished in the fore-body by letters, as A, B, C, D, &c. and in the after-body by figures, as 1, 2, 3, 4, •&c. Thus it is seen that the sides of the timbers already described are athwartship vertical planes. This arrange­ment, however, is departed from at the two extremities of the ship; for if the sides of the frames were athwartship, timber of much larger scantling would be required, which would be more costly, more liable to decay from converting older trees, and would be still farther objectionable, from the fastenings, which ought to be square to the curve, cut­ting the timbers more obliquely. To obviate these incon­veniences, the timbers, in technical language, are “ canted."

It has been before explained, that the sides of square timbers are vertical planes ; so also are those of cant tim­bers. Again, the intersection of the plane of the square tim­ber with the vertical longitudinal plane of the ship, is a verti­cal straight line: the same remark is applicable to the cant­timber. Further, the plane of the square timber is at right