obtained the iower knuckle at the side. From the two knuckles draw in the hollow of the upper counter, and from the lower knuckle to the fore part of the after edge of the wing-transom draw in a curve for the hollow of the lower counter.

Now if the top-side had no “ tumbling home,” the side counter-timber above the upper knuckle would be parallel to the midship counter-timber ; and further, in proportion as the “ tumbling home” is great or small, so will the beads of these timbers approximate to or recede from each other.

To obtain a point for the head of the side counter-timber, it will be first necessary to draw the round-aft of the stern. Strike a straight line at pleasure, the length of which is equal to the breadth of the stern at the lower knuckle. At the middle of this line erect a perpendicular, and on it set off the round-aft of the stern ; through this last point, and the extremities of the line, draw a circular arc, from which we may obtain the round-aft of the stern, square to its rake, at any breadth. For instance, to procure the round-aft at the head of the side counter-timber, set off the half breadth of the ship at that height from the middle of the chord of the arc ; then take the distance of this point (square to the chord) from the circular arc ; this distance is the round- aft required, which, when set off square to the midship counter-timber, determines the aft side of the side counter­timber at its head. We have now to obtain spots for draw­ing in this timber between the head and the upper knuckle.

As before remarked, the stern above the upper knuckle is cylindrical, and as all sections of a cylinder parallel to its axis are bounded by straight lines, while those sections which are oblique to its axis are bounded by curves, it fol­lows, that in the sheer plan the midship counter-timber, as explained above, is a straight line, while the side counter­timber is a curve.

Further, as all sections of a cylinder made by a plane square to its axis are circles, while those sections which are oblique to its axis are ellipses, it follows, that in the half­breadth plan the round-aft of a plane, which in the sheer plan is at right angles to the rake of the stern amidships, w ill be circular, while the round-aft in the half-breadth plan of all other planes will be elliptical.

Bearing this in mind, we proceed to show the manner of obtaining the elliptical round-aft of the level line Q at the height of the upper knuckle *a* at the sides (Plate CCCCLIII. fig. 31). In the sheer plan, from the point *a* draw *ab* at right angles to the midship counter-timber produced. Pro­ject the point *a* in the sheer plan to the middle line of the half-breadth plan, as *e.* From *e* draw *ef* at right angles to the middle line, and on *ef* set off the half breadth of the ship at the lower knuckle. Draw *eg* equal to *ab,* and through *g* and *f* draw a circular arc *ghf,* the radius of which arc will be equal to half the diameter of the cylinder ; then will *ghf* be the round-aft of the stern square to its rake. Again, in the half-breadth plan draw any number of lines W, X, parallel to the middle line, intersecting the round-aft *ghf* in the points *h* and *i.* Take the horizontal distances of *h* and *i* from *ef,* and set these distances off on the line *ab* from the point *a*. Through the points thus obtained on *ab* in the sheer plan, draw lines parallel to the rake of the stern. Square down the points of intersection of the last- named lines, with the level line Q, to the corresponding lines W and X in the half-breadth plan. Lastly, through the intersections thus obtained draw a curve, which will represent the elliptical round-aft of the stem when cut ho­rizontally. Further, as all parallel sections of a cylinder are similar curves, we infer that the round-aft just obtained will serve for the round-aft of any number of level lines drawn above the upper knuckle.

Therefore draw level lines above the upper knuckle, at a distance of from two to three feet apart, both in the sheer and body plans. Run off these level lines in the half­

breadth plan. Square down the intersections of each of these lines in the sheer plan, with the midship counter-tim­ber, to the middle line of the half-breadth plan. From these points draw the horizontal round-aft of the stem, and the intersections of this round-aft with the corresponding level lines will be the terminations of the said level lines. Square up these terminations to the respective level lines in the sheer plan, and through these spots draw a curve, which will be the projection of the after edge of the side counter­timber.

To represent the projection of the side counter-timber in the body plan, take the distances square from the middle line in the half-breadth plan of the termination of each level line, and transfer these distances to the corresponding level lines in the body plan ; through the spots so obtained pass a curve, which will represent the required projection of the side counter-timber. (Plate CCCCLIII. fig. 33.)

Following the previous directions, the decks above the lower deck may now be drawn.

The joints of the frames are drawn perpendicular to the keel. The previous explanation on the frame-timbers of a ship renders any further remarks on this subject unneces­sary. The ports are drawn to the sheer of the ship. Their number, size, and distance apart, of course, depend on the determined armament.

The main-breadth, top-breadth, top-side, and other lines, have been already explained ; and with respect to the chan­nels, head-rails, and other details, our limits preclude the possibility of entering into a description. We must there­fore conclude our account at present of the sheer plan by referring to Plate CCCCL., and proceed to a brief de­scription of the body plan. Fig. 25 represents the body plan. A horizontal line is drawn for the upper edge of the keel. On this line three perpendiculars are raised, at a dis­tance apart equal to half the moulded breadth of the ship. The middle of these three lines represents the middle line of the ship, or rather the projection of the vertical longitudinal plane which divides the ship into two equal parts. The other two lines are the boundaries of the ship at the widest part, or dead-flat, (+). The curves A, B, C, &c. in the fore-body, and 1, 2, 3, &c. in the after-body, represent vertical trans­verse sections of the ship, at the corresponding joints A, B, C, &c. 1, 2, 3, &c. in the sheer plan, It is to be understood that these sections correspond to the exterior surface of the timbers, on the supposition that the plank of the bottom and top-side is not yet on the ship.

Independent of the joints of the frame, many other lines in the body plan originate in the sheer plan, as port-sill lines, top-breadth, top-side, water-lines, &c. We shall pre­sently describe the manner of transferring them from the sheer to the body plan. But there are other lines which may be said to originate in the body plan. Among this class may be mentioned buttock, bow, and diagonal lines. But­tock lines are vertical lines drawn at discretion at any dis­tance from and parallel to the middle line. They are mark­ed Nos. 1, 2, 3, &c. Plate CCCCLII. The position of the diagonal lines drawn in the body plan is not, however, arbitrary, because it has reference to two considerations, the length of the timbers, and the station of the ribbands and harpins : thus those marked floor-head, first futtock- head, second futtock-head, &c. show the lengths of the floors and futtocks, together with the heights of their heads and heels above the keel ; while those marked first sirmark, second sirmark, third sirmark, &c. show the heights and situations of the various harpins and ribbands, which are placed between the heads of the respective timbers, in or­der to give support to the ship whilst in frame. Fig. 30.

The half-breadth plan is in most draughts placed below the sheer plan, the stations being squared down to its middle line. (Plate CCCCL.). Occasionally, however, the upper edge of the keel in the sheer plan answers to the middle line