top-timber line above EL. A curve drawn through these points will form the toptimber line.

This line is more eaſily drawn by means of a Curved or bent ruler, ſo placed that it may touch the three points F, R, and K.

PROB. II. To deſcribe the ſtem;

Let K (fig. 3.) be the upper part of the ſtem, thro’ which draw KS parallel to the keel, and equal to twice KR : Through the termination of the wales on the ſtem draw TW parallel to QR. Then from the centre S, with the diſtance SK, deſcribe an arch : Take an extent equal to the neareſt diſtance between the paral­lels WT, QR ; and find the point W, ſuch that one point of the compaſs being placed there, the other point will just touch the neareſt part of the above arch; and from this point as a centre deſcribe an arch until it meets the keel, and the ſtem will be formed.

Prob. III. To deſcribe the ſternpoſt.

Set off QV (fig. 3.) for the rake of the post: draw VX perpendicular to the keel, and equal to the height of the wing tranſom, join QX, and will repreſent the aft side of the poſt.

Prob. IV. To deſcribe the half breadth line.

Let MN (fig. 4.) be the given length : Make N0 equal to five-twelfths of MN ; draw the line P per­pendicular to MN, and equal to the proposed extreme half breadth. Let ME be the round aft of the ſtern or wing tranſom ; make EO perpendicular to MN, and equal to the given half breadth at the ſtem, which is generally between two-thirds and three-fourths of the main half breadth ; and deſeribe the arch MO, the centre of which is in the middle line. Space the frames (A), A, B, &c. and ( 1), 1, 2, &c. From the centre fjy, with the radius ∈7P, deſcribe the quadrant PRS ; deſeribe also the quadrant PCT. Through the point O draw ORU parallel to MN ; divide the ſtraight line RU ſimilar to M(^! ; and through theſe points of division draw lines perpendicular to MN, and meeting the arch. Transfer theſe lines to the correspondent frames each to each, and a curve drawn through the extremities will repreſent that part of the side contain­ed between the main frame and the ſtern. Again, thro’ the extremity of the foremoſt frame, draw QV pa­rallel to MN. Or make PV a fourth or third part of PU, according as it is intended to make the ſhip more or leſs full towards the bow. Divide VC ſimilar to (g;C ; through theſe points draw lines perpendicular to MN, and terminating in the quadrantal arch : Transfer theſe lines to the correſponding timbers in the fore part, and a curve dtawn through the extreme points will li­mit that part of the ſhip’s side contained between P and Continue the curve to the next timber at X. From

Q draw QZ perpendicular to QX ; make the angle ZNQ\_equal to ZQN, and the point Z will be the cen­tre of the arch forming the bow. Remark, if it is propoſed that the breadth of the ſhip at the frames adja­cent to the main frame ſhall be equal to the breadth at the main frame ; in this caſe, the centres of the qua­drantal arches will be at the points of interſection of theſe frames with the line MN ; namely at ( A) and ( 1 ). Alſo, if the height of the ſhip at the frames (A) and ( 1 ) is to be the ſame as at dead flat, the quadrantal arches in fig. 3. are to be described from the points of interſection of theſe frames with the lice EL⅛

Theſe rules, it is evident, are variable at pleaſure ; and any perſon acquainted with the firſt principles of mathe­matics may apply calculation to find the radii of the ſeveral ſweeps.

Prob. V. To deſcribe the main frame or dead- flat.

This frame is that which contains the greateſt ſpace, and the particular form of each of the other frames de­pends very much on it. If the ſhip is intended to carry a great burden in proportion to her principal dimenſions, this frame is made very full ; but if ſhe is intend­ed to ſail fast, it is usually made ſharp. Hence ariſes diverſity of opinions reſpecting its form ; each conſtructor uſing that which to him appears preferable. In or­der to save repetition, it is judged proper to explain certain operations which necessarily enter into all the different methods of conſtructing this frame.

In the plane of the upper side of the keel produced, draw the line A B ( fig. 5. ) equal to the propoſed breadth of the ſhip ; biſect AB in C, and draw AD, CE, and BF, perpendicular to AB. Then, since the two ſides of a ſhip are ſimilar, it is therefore thought ſufficient to deſcribe the half of each frame between the main frame and the ſtern on one side oſ the middle line CE, and the half of each of thoſe before the main frame on the other side of it. The firſt half is called the after-body*,* and the other the *fore-body.* The after-body is com­monly described on the left side of the middle line ; and the fore-body on the right side of it : hence the line AD is called the si*de line* of the *after* body, and BF the side line of the for*e* body. Make AD and BF each equal to the height of the ſhip at the main frame. Make AG, BG, and AH, BH, equal to the lower and upper heights of breadth reſpectively, taken ſrom the ſheer plan. Let 11 be the load water line, or line of floatation when the ſhip is loaded, and KK the height of the riſing line oſ the floor at this frame. Make CN, CO, each equal to half the length oſ the floor timber, and N, O, will be the heads of the floor timber, thro' which draw perpendiculars to AB. Make C *m,* E *m,* each equal to half the thickness of the ſternpoſt, arid C *n,* E *n,* equal to half the thickneſs of the ſtern, and join *mm, n n.*

Method I. *Of describing a main frame.—*From the centre a (fig. *5.),* in the lower breadth line, deſcribe the lower breadth ſweep *Ge ;* make N *b* equal to the propoſed radius of the floor ſweep, and from the centre *b* deſcribe the floor ſweep N *f.* Let the radius of the reconciling ſweep be *Lg,* equal to about the half of AC ; then make A *h* equal to N *b,* and A *m* equal to G *a.* Now from the centre *a,* with an extent equal to *g m,* deſeribe an arch, and from the centre *b,* with the extent *g h,* deſeribe an arch intersecting the former in *c,* which will be the centre of the reconciling ſweep *ef.* Join N *m* by an inverted curve, the centre of which may be in the line *b* N produced downwards ; or it may be joined by two curves, or by a ſtraight line if there is little rising ; and hence the lower part of the main frame will be described.

In order to form the top timber, make Fk equal to ſuch part of the half breadth, agreeable to the propo­ſed round of the side, as one-ſeventh ; join H *k,* and make *k i* equal to about two-thirds of H *k* : make the angle H *i l* equal to *i* H l; and from the centre l at the