diſtance l H deſcribe the arch Hi; and from the centre o, the intersection of l*i* and *k* F produced, deſcribe the arch *i k,* and the top timber will be formed,

II. *To deſcribe a main frame of an intermediate capacity, that is, neither too flat nor too sharp.* — Divide the line AX (fig. 6), which limits the head of the floor timber, into three equal parts ; and make a *b* equal to one of them. Divide the line *d* B, the perpendicular diſtance between the load water line and the plane of the upper ſide of the keel, into ſeven equal parts ; and ſet off one of theſe parts from *d* to *c,* and from *c* to *m.* Let GH be the lower deck, join G *m,* and produce it to *q.* Draw the straight line V *a,* biſect it in *n,* and from the points n*, a,* deſcribe arches with the radius G *q* interſecting each other in P, which will be the centre of the arch n *a.* The centre of the arch V *n* is found by deſcribing arches downwards with the ſame radius.

With an extent equal to once and a half of B *e,* describe arches from the points *b, e,* interſecting each other in A, and from this point as a centre deſcribe the arch *e b* ; make a *l* equal to *d m,* and join Am, A l*.* Then, in order to reconcile two arches ſo as to make a fair curve, the centres of theſe arches and of the points of contact muſt be in the ſame ſtraight line. Hence the point *k* will be the centre of the arch *d m,* and *o* the centre of the arch *a l.* The arch l *m* is deſcribed from the centre A.

To form the top timber, ſet back the tenth part of the half breadth from K to S upon the line of the ſecond deck ; then with an extent equal to two-thirds of the whole breadth deſcribe an arch through the points S and H, the upper height of breadth. Again, make MI equal to the fifth part of the half breadth ; deſcribe an arch of a circle through the points S and T, taking the diagonal GB for the radius. As this arch is in­verted in reſpect of the arch dS, the centre will be without the figure. Hence one-half of the main frame is formed, and the other half is deſcribed by ſimilar operations.

*Remark.* This frame may be made more or leſs full by altering the ſeveral radii.

III. *To deſcribe a main frame of a circular form.—* Let the ſeveral lines be drawn as before : Then make O *a* (fig. 7.@@) equal to the half breadth G *a,* and from the centre a, with the radius G *a,* deſcribe the arch *b* G *c* O. Let *d* be the head of the floor-timber, and *d x* the riſing. Aſſume the point *f* in the arch, ac­cording to the propoſed round of the ſecond futtock, and deſcribe the arch *df∙,* the centre of which may be found as in the former method : from the centre *a,* with the diſtance *a d,* deſcribe the arch *dc* O ; make *d c* equal to one-third of *d* O, and the angle *dch* equal to *c d h,* and from the centre *h* deſcribe the arch *d c.* The inverted arch *c O* may be deſcribed as before.

IV. *To deſcribe a very full main frame.—*Let the vertical and horizontal lines be drawn as before : let *b,* fig. 8. be the floor-head, and *b x* the riſing. Divide G *c* into two equal parts in the point *d,* and upon *c d* de- ſeribe the ſquare *d b a c,* in which inſcribe the quadrant *dea.* Divide the line *b d* into any number of equal parts in the points O, N, M, L, and draw the lines Lw, Me, N n, O *b,* perpendicular to *d b.* Divide the line G C, the depth of the hold, the riſing being deducted, into the ſame number of equal parts in the points E,F,I, K, and make the lines E p, F q, I *r,* K s, in the frame,

equal to the lines O *b,* Nn, M *e, Lm,* in the ſquare, each to each reſpectively ; and through the points G, *p, q, r, s, b,* deſcribe a curve. The remaining part of the frame may be deſcribed by the preceding methods.

V. *To deſcribe the main frame of a shiρ intended to be a faſt ſailer.—*The principal lines being drawn as before, let the length of the floor-timber be equal to half the breadth of the ſhip, and the riling one-fifth or one-ſixth of the whole length of the floor-timber, which lay off from x to E, fig. 9. Through the point E draw the line T *x* perpendicular to GC, and *d* E perpendicular to A G. Join T *d,* which biſect in B, and draw BF perpendicu­lar thereto, and meeting C G produced in F, from the centre F, at the diſtance F T, deſcribe the ſemicirclc T *d* D. Divide G T into any number of parts, V W, &c. and biſect the intervals DV, DW, &c. in the points X, Z, &c. ; then, from the centre X, with the

extent XV, deſcribe the ſemicircle *Db* V, interſecting AG in *b.* Let VP be drawn perpendicular to GT, and *b* P perpendicular to AG, and the point of, inter- ſection P will be one point through which the curve is to paſs. In like manner proceed for the others, and a curve drawn through all the points of intersection will be part of the curve of the main frame. The remain­ing part of the curve from E to Y will be compoſed of two arches, the one to reconcile with the former part of the curve at E, and the other to paſs through the point Y, the centre of which may be found by any of the preceding methods. In order to find the centre of that which joins with the curve at E, make TR equal to the half of GD, and join ER, in which a proper centre for this arch may be eaſily found.

The portion G *b* E of the curve is a parabola, whoſe vertex is G and parameter GD.

For GD : G *b : : Gb* : GV by conſtruction.

Hence DG × GV = *Gb2,* which is the equation

for a parabola.

VI. *To deſcribe a main frame of a middling capacity.—* Let the length of the floor timber be equal to one-half of the breadth of the ſhip. Make O *d,* fig. 10. equal to one-fourth of the length of the floor timber, and draw the perpendicular *dc* equal to the rising, and divide it into two equal parts in the point *e.* Deſcribe an arch through *e,* and the extremity *a* of the floor timber, the radius being equal to the half breadth, or more or leſs according to the propoſed round of the floor head.— Then with the radius O *l,* half the length of the floor timber, deſcribe the arch *e* Y.

Draw *lm* perpendicular to OA : biſect A *n* in *p,* and draw the perpendicular *p q.* From the middle of A *p* draw the perpendicular r *s,* and from the middle of A r draw the perpendicular *t u.* Make *nz, p g,* each equal to l *n* : make the diſtances *py, r b,* each equal to *a g ; r* F, *t* E, each equal to *a b* ; and *t x* equal to aE. Then a curve drawn through the points *a, z,y,* F, *X,* T, will form the under part of the midſhip frame.

We ſhall ſiniſh theſe methods of deſcribing the main frame of a ſhip with the following remark from M. Vial du Clairbois \*. “ It ſeems (ſays he) that they

have affected to avoid ſtraight lines in naval architec­ture; yet, geometrically ſpeaking, it appears that a main frame formed of ſtraight lines will have both the ad­vantage and ſimplicity over others.” To illuſtrate this, draw the ſtraight line M N ( fig. 9. ) in such a manner that the mixtitineal space M *a d* may be equal to the

@@@[mu] Plate CCCCLVI.

@@@[m]\* Architecture Navale, p. 22.