mixtilineal ſpace D N Y. Hence the capacity of the main frame formed by the ſtraight lines MN, NY will be equal to that of the frame formed by the curve *Ma* D Y ; and the frame formed by the ſtraight lines will for the moſt part be always more ſuſceptible of recei­ving a bow that will eaſily divide the fluid. It is alſo evident, that the cargo or ballaſt, being lower in the frame formed of ſtraight lines than in the other, it will therefore be more advantageouſly placed, and will ena­ble the ſhip to carry more ſail @@(c) ; ſo that having a bow equally well or better formed, ſhe will ſail faſter.

Prob. VI. To deſcribe a ſtern having aſquaretuck.

Let AB (fig. ii.) be the middle line of the poſt, and let CD be drawn parallel thereto at a diſtance equal to half the thickneſs of the poſt. Make CE equal to the height of the lower part of the ſaſhion- piece above the keel : make CT equal to the height of the extremity G of the tranſom above the plane of the keel produced, and CH equal to the height of the tran­ſom bn the poſt, HT being equal to above one-ninth or one-tenth of GT, and deſcribe the arch GH, the centre of which will be in BA produced : make EK equal to five-twelfths of ET ; through K draw KL perpendicular to CD, and equal to EK ; and with an extent equal to EL deſcribe the arch EL. Make GI equal to the half of ET, and from the centre I deſcribe the arch GM, and draw the reconciling curve ML.— Let the curve of the faſhion-piece be produced upwards to the point repreſenting the upper height of breadth, as at O. Make ON equal to the height of the top- timber, and BN equal to the half breadth at that place, and join ON. Through N and the upper part of the counter, let arches be deſcribed parallel to GH, The tafferel, windows, and remaining part of the ſtern, may be finiſhed agreeable to the fancy of the artiſt.

In fig. 12. the projection of the ſtern on the plane of elevation is laid down, the method of doing which is obvious from inſpection.

If the tranſom is to round aft, then ſince the ſaſhion pieces are always ſided ſtraight, their planes will interſect the ſheer and floor planes in a ſtraight line. Let G *g* (fig. 14.) be the interſection of the plane of the faſhion-piece with the floor plane. From the point *g* draw *g* W perpendicular to *g* M : make *y k* equal to the height of the tuck, and W *k* being joined v. ill be the interſection of the plane of the faſhion-piece with the ſheer plane. Let the water lines in the sheer plane pro­duced meet the line *k W* in the points a, *s, b,* and draw the perpendiculars aa, ss, hh*.* From the points *a,s,* a, s, h (fig.14.) draw lines parallel to Gg to interſect each corresponding water line in the floor plane in the points 3, 2, 1. From the points G, 3, 2, 1 in the floor plane draw lines perpendicular to *g* M, interſecting the water lines (fig. 13.) in the points G, 3, 2, 1 ; and through theſe points deſcribe the curve G 3 2 1 *k* ; and WG 3 2, 1 *k* will be the projection of the plane of the faſhion- piece on the ſheer plane. Through the points G, 3, 2,

1 (fig. 13.) draw the lines GF, 3 A, 2 S, 1 H, per­pendicular to W *k* ; and make the lines WF, *a* A, *s* S,

h H, equal to the lines *g* G, *a* 3, *s 2, h* 1 (fig. 14.) reſpectively, and WFASH *k* will be the true form of the plane of the aft side of the faſhion-piece. When it is in its proper poſition, the line WF will be in the ſame plane with the ſheer line ; the line *a* A in the same plane with the water line *a* 3 ; the line *s* S in the ſame plane with the water line s 2 ; and the line h H in the ſame plane with the water line *k* 1. If lines be drawn from the ſeveral points of interſection of the water lines with,· the rabbet of the port (fig. 13), perpendicular to *g* M, and curved lines being drawn from theſe points to G, 3, 2, 1 (fig. 14.) reſpectively, will give the form and dimenſions of the tuck at the ſeveral water lines.

Prob. VII. To bevel the faſhion-piece of a ſquare tuck by water-lines-

As the faſhion-piece both rakes and cants, the planes of the water-lines will therefore interſect it higher on the aft than on the fore-ſide : but before the heights on the fore-side can be found, the breadth of the timber muſt be determined ; which let be *bn* (fig. 15.) Then, as it cants, the breadth in the direction of the water­line will exceed the true breadth. In order to find the true breadth, form the aft-ſide of the faſhion-piece as directed in the laſt problem.

Let *t* 5 (fig. 13.) be the aft-ſide of the rabbet on the outſide of the poſt, WM the common section of the plan of the faſhion-piece and the ſheer-plan. Before this laſt line can be determined, the ſeveral water-lines 1, 2, 3, 4, and 5, muſt be drawn parallel to the keel, which may repreſent ſo many tranſoms.— Let theſe water lines be formed and ended at the aft- ſide of the rabbet, as in ſig. 14. where the rounds aft of the ſeveral tranſoms are deſcribed, limiting the curves of the water lines. Now the line WM muſt rake ſo as to leave room for half the thickneſs of the poſt, at the tuck : in order to which, produce Wg to *r* ; make *rg* half the thickneſs of the poſt ; through *r* draw a line parallel to *g* M to intersect G in *b* : then with the ra­dius *r b,* from .v the point of the tuck as a centre, de­ſcribe an arch, and draw the line WM juſt to touch the back of that arch.

The linc WM being drawn, let any point *k* in it be aſſumed at pleaſure : from *k* draw *k* y perpendicu­lar to gM : through y draw y *f* (fig. 14.) parallel to g G, intersecting the line M f drawn perpendicular to *g* M in the point f*.* From M draw M *i* perpendicular to *yf,* and from y draw y *n* perpendicular to WM (rig. 13.) Make Μ n (fig. 15.) equal to Mi (fig. 14.) ; then MI (fig. 15. ) being equal toy *k* (fig. 13 ), join *n* 1, and the angle 1 n M will be the bevelling to the horizontal plane. Again, make Mz, Mf(fig. 15. ) reſpectively equal to yn (fig. 13.) and Mf (fig. 14.), and join *z J* ; and the angle Mzf will be the bevelling to the ſheer plane.

The bevelling being now found, draw the line *a b* (fig. 15.) parallel to *z n, a z* or *b n* being the ſcantling of the timber. Then *n x* will be the breadth of the timber on the horizontal plane, and *z e* its breadth on the ſheer plane, and *a c* what it is within a ſquare.

Now as the lines *g G, a 3, s 2, h 1, yi,* repreſent

(c) It is not a general rule, that lowering the cargo of a ſhip augments her ſtability. This is demouſtrated by the Chevalier de Borda, in a work publiſhed by M. de Goimpy upon this ſubject. See alſo L'A*rchitecture Na­vale par M. Rial du Clairbois,* p. 23,