a very ſenſible angle of incidence on the sails, and by no means hugging the wind. For as this evolution is chiefly performed by the rudder, it is neceſſary to give the ſhip a good velocity. When the ſhip is obſerved to luff up of herſelf, that moment is to be catched for beginning the evolution, becauſe ſhe will by her inhe­rent force continue this motion. The helm is then put down. When the officer calls out Helm’s a lee, the foreſheet, fore-top bowline, jib, and flag sail ſheets for­ward are let go. The jib is frequently hauled down. Thus the obſtacles to the ſhip’s head coming up to the wind by the action of the rudder are removed. If the mainſail is ſet, it is not unuſual to clue up the weather side, which may be conſidered as a headſail, becauſe it is before the centre of gravity. The mizen muſt be hauled out, and even the ſail braced to windward. Its power in paying off the ſtern from the wind conſpires with the action of the rudder. It is really an aerial rudder. The ſails are immediately taken aback. In this ſtate the effect of the mizen-topſail would be to obſtruct the movement, by preſſing the ſtern the con­trary way to what it did before. It is therefore either immediately braced about ſharp on the other tack, or lowered. Bracing it about evidently tends to pay round the ſtern from the wind, and thus aſſiſt in bring­ing the head up to the wind. But in this poſition it checks the progreſſive motion of the ſhip, on which the evolution chiefly depends. For a rapid evolution, there­fore, it is as well to lower the mizen-topſail. Mean­time, the headſails are all aback, and the action of the wind on them tends greatly to pay the ſhip round. To increaſe this effect, it is not unuſual to haul the fore-top bowline again. The ſails on the mainmaſt are now almoſt becalmed; and therefore when the wind is right ahead, or a little before, the mainſail is hauled round and braced up ſharp on the other tack with all expedi­tion. The ſtayſail ſheets are now ſhifted over to their places for the other tack. The ſhip is now entirely un­der the power of the headſails and of the rudder, and their actions conſpire to promote the converſion. The ſhip has acquired an angular motion, and will preſerve it, ſo that now the evolution is ſecured, and ſhe falls off apace from the wind on the other tack. The farther action of the rudder is therefore unneceſſary, and would even be prejudicial, by cauſing the ſhip to fall off too much from the wind before the ſails can be ſhifted and trimmed for ſailing on the other tack. It is therefore proper to right the helm when the wind is right ahead, that is, to bring the rudder into the direction of the keel. The ſhip continues her converſion by her inhe­rent force and the action of the headſails.

When the ſhip has fallen off about four points from the wind, the headſails are hauled round, and trimmed ſharp on the other tack with all expedition; and al­though this operation was begun with the wind four points on the bow, it will be ſix before the ſails are braced up, and therefore the headſails will immediately fill. The after-ſails have filled already, while the head­ſails were inactive, and therefore immediately check the farther falling off from the wind. All fails now draw, for the ſtayſail ſheets have been ſhifted over while they were becalmed or ſhaking in the wind. The ſhip now gathers way, and will obey the smallest motion of the helm to bring her cloſe to the wind.

We have here ſuppoſed, that during all this opera­tion the ſhip preſerves her progreſſive motion. She

muſt therefore have deſcribed a curve line, advancing all the while to windward. Fig. 13. is a repreſentation of this evolution when it is performed in the completeſt manner. The ſhip Handing on the courſe E*a,* with the wind blowing in the direction WF, has her helm put hard a-lee when she is in the poſition A. She immediately deviates from her courſe, and deſcribing a curve, comes to the poſition B, with the wind blowing in the direction WF of the yards, and the ſquare-ſails now ſhiver. The mizen-topſail is here repreſented braced ſharp on the other tack, by which its tendency to aid the angular motion (while it checks the progreſ­ſive motion) is diſtinctly ſeen. The main and fore- ſails are now ſhivering, and immediately after are taken aback. The effect of this on the headſails is diſtinct­ly ſeen to be favourable to the converſion, by puſhing the point F in the direction Fi; but for the ſame reaſon it continues to retard the progreſſive motion. When the ſhip has attained to the poſition C, the main­ſail is hauled round and trimmed for the other tack. The impulſe in the direction F*i* ſtill aids the converſion and retards the progreſſive motion. When the ſhip has attained a poſition between C and D, ſuch that the main and mizen topſail yards are in the direction of the wind, there is nothing to counteract the force of the headſails to pay the ſhip’s head off from the wind. Nay, during the progreſs of the ſhip to this interme­diate poſition, if any wind gets at the main or mizen topſails, it acts on their anterior ſurfaces, and impels the after parts of the ſhip away from the curve *abcd,* and thus aids the revolution. We have therefore ſaid, that when once the ſails are taken fully aback, and particularly when the wind is brought right ahead, it is ſcarce poſſible for the evolution to ſail; as ſoon there­fore as the maintopſail (trimmed for the other tack) ſhivers, we are certain that the headſails will be filled by the time they are hauled round and trimmed. The ſtayſails are filled before this, becauſe their ſheets have been ſhifted, and they ſtand much ſharper than the ſquare-ſails; and thus every thing tends to check the falling off from the wind on the other tack, and this no ſooner than it ſhould be done. The ſhip imme­diately gathers way, and holds on in her new courſe dG.

But it frequently happens, that in this converſion the ſhip loses her whole progreſſive motion. This sometimes happens while the ſails are ſhivering before they are taken fully aback. It is evident, that in this caſe there is little hopes of aucceſs, for the ſhip now lies like a log, and neither ſails nor rudder have any action.. The ſhip drives to leeward like a log, and the water act­ing on the lee-ſide of the rudder checks a little the dri­ving of the ſtern. The head therefore falls off again, and by and by the ſails fill, and the ſhip continues on her former tack. This is called **missing stays,** and it is generally owing to the ship's having too little ve­locity at the beginning of the evolution. Hence the propriety of keeping the sails well filled for ſome little time before. Rough weather, too, by raiſing a wave which beats violently on the weather-bow, frequently checks the firſt luffing of the ſhip, and beats her off again.

If the ſhip loses all her motion after the headſails have been fully taken aback, and before we have brought the wind right ahead, the evolution becomes uncertain, but by no means deſperate; for the action