AN

UNIVERSAL DICTI

OF THE

M A R I

OR,

A COPIOUS EXPLANATION

OF THE

TECHNICAL TERMS and PHRASES

EMPLOYED IN THE

CONSTRUCTION, EQUIPMENT, FURNITURE, MACHINERY, MOVEMENTS, and MILITARY OPERATIONS

OF

A S H I P.

ILLUSTRATED WITH

Variety of Original DESIGNS of SHIPPING, in different Situations; Together with ſeparate VIEWS of their Maſts, Sails, Yards, and Rigging.

To which is annexed,

A Tranſlation of the FRENCH Sea-Terms and Phraſes, collected from the Works of Meſſ. DU HAMEL, AUBIN, SAVERIEN, &c.

By WILLIAM FALCONER,

AUTHOR of The SHIPWRECK.

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MDCCLXIX.

TO

THE RIGHT HONOURABLE

THE LORDS COMMISSIONERS

FOR EXECUTING THE OFFICE OF

LORD HIGH ADMIRAL

OF

GREAT BRITAIN, &c.

THIS WORK

IS,

By their LORDSHIPS PERMISSION,

WITH THE UTMOST RESPECT,

INSCRIBED,

BY

The AUTHOR.

PREFACE.

THE following work has engaged my utmoſt application for ſome years. Several performances on the ſame ſubject have already appeared; as Sir H. Manwaring's *Seaman's Dictionary*; Boteler's *Sea Dialogues*; Guillet's *Gentleman's Dictionary*, and Blanckley's *Naval Expoſitor*, &c. Far from exhibiting an enlarged and comprehenſive view of naval affairs, theſe productions are extremely imperfect, according to the very circumſcribed plan which their authors have adopted. There are beſides, the *Dictionaire de Marine* of M. Aubin, publiſhed in Holland; and that of M. Saverien, publiſhed in France. Theſe are indeed voluminous, but very deficient in the moſt neceſſary articles. Beſides a circumſtantial detail of the local oeconomy of different marine departments, they are ſwelled out with aſtronomy, navigation, hydrography, natural hiſtory, &c. all of which are abundantly better treated in other compoſitions. Of the machinery of a ſhip; the diſpoſition of the rigging on her maſts and yards; and the comparative force of her different mechanical powers, their accounts however are often vague, perplexed, and unintelligible.

telligible. With regard to her internal government in action; to the general regulations of the line of battle; and to the principal movements in ſailing, they are almoſt totally ſilent. Had any of theſe works been executed with tolerable ſucceſs, it might have rendered mine unneceſſary; or probably have introduced it in the form of a tranſlation.

I acknowledge with great pleaſure the advantages I have derived in the proſecution of this work, from ſeveral authors of diſtinguiſhed reputation: in reality however none of thoſe above-mentioned are of the number. In that part which is dedicated to the theory and art of ſhip-building, I owe conſiderable obligations to the ingenious M. Du Hamel. The principal pieces uſed in the conſtruction of a ſhip, together with their combination and diſpoſition, are copiouſly and accurately deſcribed in his *Elements of Naval Architecture:* and his general account of the art itſelf is perſpicuous and comprehenſive. Many of his explanations I have therefore implicitly adopted.

In treating of the artillery, I have occaſionally conſulted *Le Blond*, *Muller*, and *Robins*, beſides ſelecting ſome valuable materials from the manuſcripts of officers of long experience and eſtabliſhed reputation in that ſervice. Whatever relates to the rigging, ſails, machinery, and movements of a ſhip; or to the practice of naval war, is generally drawn from my own obſervations; unleſs where the author is quoted.

As

PREFACE.

As there are abundance of books profeſſedly written on aſtronomy, and the theory of navigation, I have totally omitted the terms of the former, as foreign to my plan; and ſlightly paſſed over the latter: becauſe no reader could acquire a ſufficient idea of thoſe ſciences from ſo partial a deſcription. Many of the leaſt important parts of a ſhip, as well as of her rigging, are very generally defined. To explain the track of every particular rope, through its different channels, would be equally uſeleſs and unintelligible to a land reader: to mariners it were ſuperfluous: and even the youths who are trained to the ſea, would reap little advantage from it; becauſe their ſituation affords them much better opportunities of making theſe minute diſcoveries.

I have in general endeavoured to give the etymology of the moſt material expreſſions, unleſs when their evident analogy to common words rendered this unneceſſary. Many reaſons may be alledged for introducing the French ſea-terms and phraſes; particularly that obvious one, of underſtanding their pilots, when we may have occaſion for their aſſiſtance. Wherever it was found neceſſary to explain one technical term by another, the latter is uſually printed in italics the firſt time it is mentioned; ſo that the reader may refer to it for a further explanation.

As the plates of this publication were intended to illuſtrate the various objects to which they refer, they are little ornamented; but have in general the recommenda-

tion of ſimplicity and geometrical truth. In this part I have been particularly favoured with many original drawings, which are uſually conſidered amongſt the inacceſſible *arcana* of ſhip-building. They are much more numerous, uſeful, and correct, than what has hitherto appeared in any work of the kind. In fine, I have endeavoured, to the beſt of my judgment, to retrench the ſuperfluities, and ſupply the deficiences of former writers on the ſame ſubject, as well as to digeſt and methodiſe whatever appeared looſe or inaccurate therein.

This undertaking was firſt ſuggeſted to me by my worthy and ingenious friend George Lewis Scott, Eſq; who conſidered it as a work of extenſive utility, Indeed, in a country whoſe principal ſources of ſtrength are derived from the ſuperiority of her marine, it is evidently wanted. I have the pleaſure alſo to know that Sir Edward Hawke, and ſeveral officers of reſpectable abilities in our navy, are of the ſame opinion. To this may be added, what the celebrated M. Du Hamel lately obſerved, in a letter to me, *Ce livre manquoit abſolument; celui qui a été imprimé en Hollande, et qui a eu un debit conſiderable, eſt tres imparfait: celui de M. Saverien eſt encore plus mauvais.* I mention this expreſsly, becauſe ſome ſea-officers have conſidered the work unneceſſary. It is however ſubmitted, with all poſſible deference, to ſuperior judges; to men of ſcience and letters, who know the difficulty of explaining the parts of a mechanical ſyſtem, when the readers are unacquainted with the ſubject.

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M A R I N E.

ABACK, *coeffé*, the ſituation of the ſails when their ſurfaces are flatted againſt the maſts by the force of the wind.

The ſails are ſaid to be *taken aback*, when they are brought into this ſituation, either by a ſudden change of the wind, or by an alteration in the ſhip's courſe. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the ſea-phraſe, to give the ſhip *ſtern-way*, in order to avoid ſome danger diſcovered before her in a narrow channel; or when ſhe has advanced beyond her ſtation in the line of battle, or otherwiſe.

The ſails are placed in this poſition by ſlackening their lee-braces, and hauling in the weather ones; ſo that the whole effort of the wind is exerted on the fore-part of their ſurface, which readily puſhes the ſhip aſtern, unleſs ſhe is reſtrained by ſome counter-acting force. See BACKING, and BRACING.

It is alſo uſual to ſpread ſome ſail aback near the ſtern, as the mizen-top-ſail, when a ſhip rides with a ſingle anchor in a road, in order to prevent her from approaching it ſo as to entangle the flukes of it with her ſlackened cable, and thereby looſen it from the ground. See ANCHOR.

Fig. 1. Plate III. diſcovers the plan of a ſhip, *a b*, with her main-top-ſail, *c d*, aback; in which the curved dotted line expreſſes the cavity of it, as blown back by the wind on each ſide of the maſt. The fore-top-ſail, which is full, is exhibited by the line *e f*. Fig. 3. repreſents a perſpective view of the ſhip in the ſame ſituation; and the dart ſhews the direction of the wind upon both.

Lay all flat ABACK, the order to arrange all the ſails in this ſituation.

ABAFT, *arriere*, (*abaftan*, Sax. behind) the hinder part of a ſhip, or all thoſe parts both within and without, which lie towards the ſtern, in oppoſition to afore; which ſee.

ABAFT, *arriere de*, is alſo uſed as a prepoſition, and ſignifies *further aft*, or *nearer the ſtern*; as, the barricade ſtands *abaft* the main-maſt, i. e. behind it, or nearer the ſtern.

ABOARD (*à bord*, Fr. *aberda*, Ital.) the inſide of a ſhip: hence any perſon who enters a ſhip is ſaid to go *aboard*: but when an enemy enters in the time of battle, he is ſaid to *board*. A phraſe which always implies hoſtility. See the article BOARDING.

To fall ABOARD of, *aborder*, to ſtrike or encounter another ſhip, when one or both are in motion; to be driven upon a ſhip by the force of the wind or current.

ABOARD-*main-tack! amure la grande voile!* the order to draw the main-tack, i. e. the lower corner of the main-ſail, down to the cheſs-tree. See CHESS-TREE.

ABOUT, *revirè*, (*abutan*, Sax.) the ſituation of a ſhip immediately after ſhe has *tacked* or changed her courſe by going about, and ſtanding on the other tack. See TACKING.

ABOUT-SHIP! *adieu-va!* the order to the ſhip's crew to prepare for tacking.

ABREAST, *par le travers* (of *breoſt*, Sax.), ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced.

This term more particularly regards the line of battle at ſea, where, on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons, or diviſions of a fleet, are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in *right* or *curved* lines. When the line is formed *abreaſt*, the whole ſquadron advances uniformly, the ſhips being equally diſtant from, and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line *abreaſt*. The commander in chief is always ſtationed in the center, and the ſecond and third in command in the centers of their reſpective ſquadrons. See this farther illuſtrated in the article LINE.

ABREAST, within the ſhip, implies on a line with the beam, or by the ſide of any object aboard; as, the frigate ſprung a leak abreaſt of the main hatch-way, i. e. on the ſame line with the main hatch-way, croſſing the ſhip's length at right angles, in oppoſition to *afore* or *abaft* the hatch-way. See ABAFT.

We diſcovered a fleet ABREAST *of Beachy-Head*, i. e. off, or directly oppoſite thereto.

ACORN, *pomme de girouette*, a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſt-head. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail. See plate I. fig. 1. where *a* repreſents the acorn, *b* the vane and ſtock, *c* the ſpindle, and *d* the maſt-head.

ADMIRAL, *amiral*, an officer of the firſt rank and command in the fleet, and who is diſtinguiſhed by a flag diſplayed at his main-top-maſt-head. Alſo an officer who ſuperintends the naval forces of a nation, and who is authoriſed to determine in all maritime cauſes.

The origin and denomination of this important office, which ſeems to have been eſtabliſhed in moſt countries that border on the ſea, have given

given riſe to a great variety of opinions. Some have borrowed them from the Greek, others from the Arabic, while a third ſort, with greater probability, derive both the title and dignity from the Saracens.* But ſince no certain concluſions have been deduced from theſe elaborate reſearches, and as it rather appears the province of this work to give the reader an idea of the office and duty of an admiral at ſea, than to furniſh an hiſtorical or chronological detail of the rank and power with which admirals have been inveſted in different nations, we ſhall contentedly reſign this taſk to the ingenious lexicographers who have ſo repeatedly entertained us with ſuch critical inveſtigations.

The ADMIRAL, or commander in chief of a fleet, being frequently inveſted with a great charge, on which the fate of a kingdom may depend, ought certainly to be poſſeſſed of abilities equal to ſo important a ſtation and ſo extenſive a command. His fleet is unavoidably expoſed to a variety of perplexing ſituations in a precarious element. A train of dangerous incidents neceſſarily ariſe from thoſe ſituations. The health, order, and diſcipline of his people, are not leſs the objects of his conſideration, than the condition and qualities of his ſhips. A ſudden change of climate, a rank and infectious air, a ſcarcity, or unwholſomneſs of proviſions, may be as pernicious to the former, as tempeſtuous weather or dangerous navigation to the latter. A lee-ſhore, an injudicious engagement with an enemy greatly ſuperior, may be equally fatal to both. He ought to have ſufficient experience to anticipate all the probable events that may happen to his fleet during an expedition or cruiſe, and, by conſequence, to provide againſt them. His ſkill ſhould be able to counter-act the various diſaſters which his fleet may ſuffer from different cauſes. His vigilance and preſence of mind are neceſſary to ſeize every favourable opportunity that his ſituation may offer to proſecute his principal deſign; to extricate himſelf from any difficulty or diſtreſs; to check unfortunate events in the beginning, and retard the progreſs of any great calamity. He ſhould be endued with reſolution and fortitude to animate his officers by the force of example, and promote a ſenſe of emulation in thoſe who are under his command, as well to improve any advantage, as to fruſtrate or defeat the efforts of his ill fortune.

The moſt eſſential part of his duty, however, appears to be military conduct. As ſoon as the fleet under his command puts to ſea, he is to form it into the proper order of battle, called the LINE. In this arrangement he is to make a judicious diſtribution of ſtrength from the van to the rear, throwing the principal force into the center, to reſiſt the impreſſion of the enemy's fleet; which might otherwiſe, at ſome favourable opportunity, break through his line, and throw the van and rear into confuſion.

A competent knowledge of the ſeas, weather, and reigning winds, of the coaſt or region where he is ſtationed, is alſo requiſite, as it will greatly facilitate his plans on the enemy. It will enable him to avoid being improperly embayed, where he might be ſurpriſed in a diſad-

 vantageous

* In regno Saracenorum quatuor prætores ſtatuit, qui admiralii vocabantur. SIGEBERT.

vantageous ſituation; and to judge whether it will be moſt expedient to attack his adverſary, or lie prepared to receive his aſſault. When his fleet is forced by ſtreſs of weather or otherwiſe to take ſhelter in a road or bay, it will likewiſe ſuggeſt the neceſſary conduct of keeping a ſufficient number of cruiſers at ſea, to bring him early intelligence, that they may be ready to cut or ſlip the cables when they are too much hurried to weigh their anchors.

As the forming a complete, ſtrong, and uniform line is a very material article in naval war, the admiral ought frequently to arrange the fleet under his command into this order, that the inferior officers may obſerve to bring their ſhips, with greater dexterity and alertneſs, into their ſeveral ſtations, and maintain the regularity of the line when they tack, veer, or ſail abreaſt. See LINE.

When the admiral intends a deſcent on an enemy's coaſt, or other attack which may be attended with complicated and unforeſeen incidents, his orders ſhould be delivered or drawn up with the greateſt accuracy and preciſion: they ſhould be ſimple, perſpicuous, direct, and comprehenſive; they ſhould collect a number of objects into one point of view, and, foreſeeing the effects of ſucceſs or defeat, appoint the proper meaſures to be adopted in conſequence thereof. Hiſtory and experience confirm the neceſſity of this obſervation, and preſent us with a variety of diſaſters that have happened on ſuch occaſions, merely by a deficiency in this material article. In the commanding officer, inattention, barrenneſs of expedient, or a circumſcribed view of the neceſſary effects of his enterprize, may be equally pernicious. And general orders ought to be utterly free from pedantry and perplexity, which always betray a falſe taſte and confuſed imagination, beſides the probability of producing many fatal conſequences.

When an admiral conquers in battle, he ſhould endeavour to improve his victory, by puſhing the advantages he has acquired as far as prudence directs; a conduct which merits his attention as much as any in the action! When he is defeated, he ought to embrace every opportunity of ſaving as many of his ſhips as poſſible, and endeavour principally to aſſiſt thoſe which are diſabled. In ſhort, it is his duty to avail himſelf of every practicable expedient rather than ſink under his misfortune, and ſuffer himſelf to become an eaſy prey to the enemy.

He ſhould be ſufficiently acquainted with civil law, to judge with propriety of the proceedings of courts-martial, and to correct the errors, and reſtrain the abuſes which may happen therein by miſtake, or ignorance, or inattention.

As ſecret treaties, propoſitions, or ſchemes of the enemy, may occaſionally be ſubmitted to his inſpection, or fall into his poſſeſſion by capture; and which it might be improper to diſcover to any perſon near him, he ought to have a competent knowledge of the modern languages, or at leaſt, thoſe of the countries againſt whom his military operations are directed, to be able to comprehend with facility the full ſcope and purport of ſuch papers.

He

He ought to be well verſed in geometry, to order proper and correct ſurveys of unknown coaſts, roads, or harbours to be made, and to judge of their accuracy, and detect their errors. To aſcertain the ſituation and longitude of different places, he ſhould be alſo ſufficiently ſkilled in aſtronomy, and the method of taking obſervations, which indeed is eſſentially neceſſary to the profeſſion of a ſea-officer, although too much neglected.

By his orders the admiral is likewiſe to aſſiſt at all councils of war that relate to naval affairs: to viſit, as often as convenient, the other ſhips of his ſquadron: to enquire particularly into their condition, and obſerve the men muſtered, taking care that no ſupernumeraries are borne on the books. He is directed to acquaint the ſecretary of the admiralty of all his proceedings relating to the ſervice, for the information of the lord-high-admiral, or lords commiſſioners of the admiralty; and to attend him or them, on his return home, with an account of his voyage or expedition, and to tranſmit a copy of his journal to their ſecretary.

Much more might be obſerved on this occaſion. It appears however by the general outline which we have ſketched, that the office and duty of an admiral requires greater ſkill and more comprehenſive abilities than is generally ſuppoſed neceſſary to the command of a naval armament. And that he ought to be duly qualified, at leaſt in this kingdom, to aſſiſt at the councils of his ſovereign, and enter into the enlarged ſyſtem of protecting his country from an invaſion by ſea, or of meditating a deſcent on an enemy's coaſt; as well as to improve navigation, and open new channels of commerce. For further particulars of his charge, ſee the articles ENGAGEMENT, LINE, SQUADRON.

ADMIRAL *of the fleet*, the higheſt officer under the admiralty of Great-Britain: when he embarks on any expedition, he is diſtinguiſhed by the union flag at the main-top-maſt-head.

Vice-ADMIRAL, *vice-Amiral*, the officer next in rank and command to admiral; his flag is diſplayed at the fore-top-maſt-head.

Rear-ADMIRAL, *contre-amiral, lieutenant-général des armées navales*, the officer next in rank and command to the vice-admiral, and who carries his flag at the mizen-top-maſt-head.

There are at preſent in England, beſides the admiral of the fleet, three admirals of the white ſquadron, and four of the blue. Three vice-admirals of the red, three of the white, and four of the blue. Four rear-admirals of the red, four of the white, and five of the blue ſquadron: beſides twenty-two rear-admirals that have carried no flag, who are ſuperannuated upon half-pay.

Vice-ADMIRAL is alſo a civil officer appointed by the lords-commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great-Britain, with judges and marſhals under them, for executing juriſdiction within their reſpective diſtricts. Their deciſions, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRALTY, *Amirauté*, the office of lord-high-admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners, called Lords of the Admiralty.

ADVICE-BOAT, *pacquet d'avis*, a ſmall veſſel employed to carry expreſſes or orders with all poſſible diſpatch.

ADRIFT (from *a* and *drift*, Sax.) the ſtate of a ſhip or veſſel broke looſe from her moorings, and driven without controul at the mercy of the wind, ſeas, or current, or all of them together.

AFLOAT, *à flot*, Fr.) floating on the ſurface of the water: a ſhip is ſaid to be *afloat* when there is a volume of water under her bottom of ſufficient depth to buoy her up from the ground.

AFORE, *avant*, (*fore*, Sax.) all that part of a ſhip which lies forward, or near the ſtem.

AFORE, as a prepoſition, likewiſe implies *further forward*, or nearer the prow; as, the manger ſtands *afore* the fore-maſt, i. e. further forward, or nearer the ſtem. In both theſe ſenſes *afore* is uſed in contradiſtinction to *abaft*. See the article ABAFT.

AFT, *arriere*, (from *æfter*, or *abaft*) behind, or near the ſtern of the ſhip; being oppoſed to *fore*; as, run out the guns *fore and aft!* i. e. from one end of the ſhip to the other; and whence,

AFTER, *de l'arriere*, (*æfter*, Sax.) a phraſe applied to any object ſituated in the hinder-part of the ſhip; as, the *after*-hatchway, the *after*-capſtern, the *after*-ſails, &c.

The AFTER-SAILS uſually comprehend all thoſe which are extended on the mizen-maſt, and on the ſtays between the mizen and main-maſts. They are oppoſed to the head-ſails, which include all thoſe that are ſpread on the fore-maſt and bowſprit; and both by their mutual operation on the oppoſite ends of the ſhip, duly balance her when under ſail. See the article TRIM.

AGENT-VICTUALLER, *avitalleur*, an officer ſtationed at a royal port, to regulate the victualling of the king's ſhips, under the directions of the commiſſioners for victualling the navy. He receives all the proviſions from the victualling-office in London, and diſtributes them to the ſhips in the harbour. He alſo receives into his ſtore-houſes ſuch as may be returned by ſhips after the expiration of their voyage, and renders an account thereof to the ſaid commiſſioners

AGROUND, *echoué*, (from *a* and *ground*) the ſituation of a ſhip whoſe bottom, or any part of it, hangs or reſts upon the ground, ſo as to render her immoveable till a greater quantity of water floats her off; or till ſhe is drawn out into the ſtream, by the application of mechanical powers.

AHEAD, *avant*, *au devant*, (from *a* and *head*, Sax.) further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip. See ASTERN.

To run AHEAD *of one's reckoning*, *depaſſer*, to ſail beyond the place ſhewn erroneouſly in the dead-reckoning as the ſhip's ſtation.

Line AHEAD. See the article LINE.

A-HULL, *à ſec ; à mats, & à cordes* (from *a* and *hull*) the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind. See this further explained in the article TRYING.

AIM, the direction of a cannon, or other fire-arm, to its object, or the point to which it is directed; whence,

To take AIM, *prendre ſa mire*, (from *eſmer*, Fr.) is to point a gun to its object according to the point-blank range. See CANNON and RANGE.

ALEE, *envoié*, (from *a* and *lee*) the ſituation of the helm when it is puſhed down to the lee ſide of the ſhip, in order to put the ſhip about, or lay her head to the windward.

ALL *in the wind*, the ſtate of a ſhip's ſails when they are parallel to the direction of the wind, ſo as to ſhake and ſhiver, by turning the ſhip's head to windward, either by deſign, or neglect of the helm's man.

ALL'*s well!* an acclamation of ſafety or ſecurity pronounced by a centinel, and repeated by all the others who are ſtationed in different places of a ſhip of war, at the time of ſtriking the bell each half-hour during the period of the night watch.

ALL *hands high*, or ALL *hands hoay! tout le monde haut!* the call or order by which all the ſhip's company are ſummoned upon deck by the boatſwain.

ALOFT, *en haut*, (*loffter*, to lift up, Dan.) up in the tops, at the maſt-heads, or any where about the higher yards or rigging.

ALONG-*ſide*, *bord à bord*, *flanc & flanc*, ſide by ſide, or joined to a ſhip, wharf, &c. and lying parallel thereto.

To lay ALONG-*ſide*, *alonger*, to arrange a ſhip by the ſide of another.

ALONG-*ſhore*, along the coaſt; this phraſe is commonly applied to coaſting-navigation, or to a courſe which is in ſight of, and nearly parallel to, the ſhore.

Lying ALONG, *à la bande*, (*au longe*, Fr.) the ſtate of being preſſed down ſideways by a weight of ſail in a freſh wind that croſſes the ſhip's courſe either directly or obliquely.

ALOOF, *lof*, this has frequently been mentioned as a ſea-term, but whether juſtly or not we ſhall not preſume to determine; it is known in common diſcourſe to imply, at a diſtance; and the reſemblance of the phraſes, *keep aloof*, and *keep a luff*, or *keep the luff*, in all probability gave riſe to this conjecture. If it was really a ſea-phraſe originally, it ſeems to have referred to the dangers of a lee-ſhore, in which ſituation the pilot might naturally apply it in the ſenſe commonly underſtood, *viz.* keep *all off*, or quite off: it is, however, never expreſſed in that manner by ſeamen now. See LUFF. It may not be improper to obſerve, that, beſides uſing this phraſe in the ſame ſenſe with us, the French alſo call the weather ſide of a ſhip, and the weather clue of a courſe *le lof*.

AMAIN,

AMAIN, *cale-tout*, (from *main*, or *maigne*, old French) at once, ſuddenly; as, let go *amain!* i. e. let it run at once. This phraſe is generally applied to any thing that is hoiſted or lowered by a tackle, or complication of pullies.

AMIDSHIPS, the middle of the ſhip, either with regard to her length or breadth. Example in the firſt ſenſe; The enemy boarded us *amidſhips*, i. e. in the middle, between the ſtem and ſtern. Example in the ſecond ſenſe; Put the helm *amidſhips*, i. e. in the middle, between the two ſides.

ANCHOR, *ancre* (*anchora*, Lat. from αγκυρα, Greek) a heavy, ſtrong, crooked inſtrument of iron, dropped from a ſhip into the bottom of the water, to retain her in a convenient ſtation in a harbour, road, or river.

The moſt ancient anchors are ſaid to have been of ſtone, and ſometimes of wood, to which a great quantity of lead was uſually fixed. In ſome places baſkets full of ſtones, and ſacks filled with ſand, were employed for the ſame uſe. All theſe were let down by cords into the ſea, and by their weight ſtayed the courſe of the ſhip. Afterwards they were compoſed of iron, and furniſhed with teeth, which being faſtened to the bottom of the ſea, preſerved the veſſel immoveable; whence ὀδοῦσι and *dentes* are frequently taken for anchors in the Greek and Latin poets. At firſt there was only one tooth, whence anchors were called ἑτερόστομοι; but in a ſhort time the ſecond was added by Eupalamus, or Anacharſis, the Scythian philoſopher. The anchors with two teeth were called ἀμφίστολοι, or ἀμφίστομοι, and from ancient monuments appear to have been much the ſame with thoſe uſed in our days, only the tranſverſe piece of wood upon their handles (the ſtock) is wanting in all of them. Every ſhip had ſeveral anchors, one of which, ſurpaſſing all the reſt in bigneſs and ſtrength, was peculiarly termed ἱερὰ, or *ſacra*, and was never uſed but in extreme danger; whence *ſacram anchoram ſolvere*, is proverbially applied to ſuch as are forced to their laſt refuge. *Potter's Antiquities of Greece.*

The anchors now made are contrived ſo as to ſink into the ground as ſoon as they reach it, and to hold a great ſtrain before they can be looſened or diſlodged from their ſtation. They are compoſed of a ſhank, a ſtock, a ring, and two arms with their flukes. The ſtock, which is a long piece of timber fixed acroſs the ſhank, ſerves to guide the flukes in a direction perpendicular to the ſurface of the ground; ſo that one of them ſinks into it by its own weight as ſoon as it falls, and is ſtill preſerved ſteadily in that poſition by the ſtock, which, together with the ſhank, lies flat on the bottom. In this ſituation it muſt neceſſarily ſuſtain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or of both of them, ſometimes increaſed by the turbulence of the ſea, and acting upon the ſhip ſo as to ſtretch the cable to its utmoſt tenſion, which accordingly may diſlodge the anchor from its bed, eſpecially if the ground be ſoft and oozy or rocky. When the anchor is thus diſplaced, it is ſaid, in the ſea phraſe, to *come home*.

That the figure of this uſeful inſtrument may be more clearly underſtood, let us ſuppoſe a long ſtaffy beam of iron erected perpendicularly, Plate I. fig. 2. *b a*; at the lower end of which are two arms, *d e*, of equal thickneſs with the beam (uſually called the ſhank) only that they taper towards the points, which are elevated above the horizontal plane at an angle of thirty degrees; or inclined to the ſhank at an angle of ſixty degrees: on the upper part of each arm (in this poſition) is a fluke, or thick plate of iron, *g h*, commonly ſhaped like an iſoſceles triangle, whoſe baſe reaches inwards to the middle of the arm. On the upper-end of the ſhank is fixed the ſtock tranſverſely with the flukes: the ſtock is a long beam of oak, *f*, in two parts, ſtrongly bolted, and hooped together with iron rings. See alſo fig. 3. Cloſe above the ſtock is the ring, *a*, to which the cable is faſtened, or *bent*: the ring is curiouſly covered with a number of pieces of ſhort rope, which are twiſted about it ſo as to form a very thick texture or covering, called the puddening, and uſed to preſerve the cable from being fretted or chafed by the iron.

Every ſhip has, or ought to have, three principal anchors, with a cable to each, viz. the ſheet, *maitreſſe-ancre*, (which is the *anchora ſacra* of the antients) the beſt bower, *ſecond ancre*, and ſmall bower, *ancre d'affourche*, ſo called from their uſual ſituation on the ſhip's bows. There are beſides ſmaller anchors, for removing a ſhip from place to place in a harbour or river, where there may not be room or wind for ſailing; theſe are the ſtream-anchor, *ancre do touai*; the kedge and grappling, *grapin*; this laſt, however, is chiefly deſigned for boats.

To drag the ANCHORS, *chaſſer ſur ſes ancres*, implies the effort of making the anchor *come home*, when the violence of the wind, &c. ſtrains the cable ſo as to tear it up from the bed into which it had ſunk, and drag it along the ground; as already explained.

Foul-ANCHOR: it is ſo called when it either hooks ſome other anchor, wreck, or cable, under the ſurface of the water; or when, by the wind ſuddenly abating, the ſhip ſlackens her ſtrain, and ſtraying round the bed of her anchor, entangles her ſlack cable about the upper fluke of it, and eaſily draws it out of its place, as ſoon as ſhe begins to ride with a ſtrain. To prevent this, it is uſual, as ſhe approaches the anchor, in light winds, to draw the ſlack cable into the ſhip as faſt as poſſible.

To ANCHOR, *ancrer*, *mouiller*, *&c.* is to let go the anchor, and to let the ſhip ride thereby.

The ANCHOR *is a cock-bill, ancre eſt à la vielle*, implies that the ſhank-painter, or rope by which the flukes were hung to the ſhip's bow, being caſt off, the flukes drop down perpendicularly; whilſt the anchor is ſuſpended at the cat-head by its ſtopper, ready to be ſunk from the bow at a moment's warning.

At ANCHOR, *à l'ancre*, the ſituation of a ſhip which rides by her anchor in a road or haven, &c. Plate I. fig. 6. repreſents the fore-part of a ſhip, as riding in this ſituation.

The ANCHOR *is a peek.* See the article APEEK.

The

The ANCHOR *is a-trip, or a-weigh.* See thoſe articles.

To back the ANCHOR. See BACK.

To cat the ANCHOR, *caponner l'ancre*, is to hook a tackle called the *cat* to its ring, and thereby pull it up cloſe to the cat-head, which ſee.

To fiſh the ANCHOR, to draw up the flukes upon the ſhip's ſide after it is catted. See the articles DAVIT and FISH.

To ſheer the ſhip to her ANCHOR, *gouverner ſur l'ancre*, is to ſteer the ſhip's head towards the place where the anchor lies when they are heaving the cable into the ſhip; that the cable may thereby enter the hauſe with leſs reſiſtance, and the ſhip advance towards the anchor with greater facility.

To ſhoe the ANCHOR. See the article SHOE.

To weigh the ANCHOR, *lever l'ancre*, to heave the anchor out of the ground by its cable. See CAPSTERN and WINDLASS.

To weigh the ANCHOR *with the long-boat, lever l'ancre avec la chaloupe*, is to draw it up by applying mechanical powers to the buoy-rope, and thereby pull it up to the boat's ſtem or ſtern.

To weigh the ANCHOR *by the hair*, is to weigh it by the cable in a boat, when the ſhip cannot approach it, or when the buoy rope is broke. See the French term *Ancre*, and the phraſes which ſucceed in order.

ANCHOR-*ground*, *fond de bonne tenüe*, is a bottom which is neither too deep, too ſhallow, nor rocky; as in the firſt the cable bears too nearly perpendicular, and is thereby apt to jerk the anchor out of the ground: in the ſecond, the ſhip's bottom is apt to ſtrike at low water, or when the ſea runs high, by which ſhe is expoſed to the danger of ſinking: and in the third, the anchor is liable to hook the broken and pointed ends of rocks, and tear away its flukes; whilſt the cable, from the ſame cauſe, is conſtantly in danger of being cut through as it rubs on their edges.

APEEK, (*à pique*, Fr.) perpendicular to the anchor; a ſhip is ſaid to be in this ſituation, when the cable is drawn ſo tight into the bow as to bring her directly over the anchor, ſo that the cable bears right down from the ſhip's ſtem.

APRON, (from *a* and *ſpran*, Sax.) a platform, or flooring of plank, raiſed at the entrance of a dock, a little higher than the bottom, againſt which the dock gates are ſhut. See the article DOCK.

APRON, *contre etrave*, in ſhip-building, a piece of curved timber fixed behind the lower part of the ſtem, immediately above the foremoſt end of the keel. See plate I. fig. H. in the PIECES *of the* HULL.

The APRON conforms exactly to the ſhape of the ſtem, ſo that when the convexity of the former is applied to the concavity of the latter, it forms one ſolid piece, which ſerves to fortify the ſtem, and give it a firmer connexion with the keel.

As the apron is compoſed of two pieces ſcarfed together, and uſed to ſupport the ſcarf of the ſtem, it is neceſſary that the ſcarf thereof ſhould be at ſome diſtance from that of the ſtem. It is formed of the ſame thickneſs with the heel of the ſtem; but its thickneſs is equal throughout. Sometimes the piece immediately under the apron forms a curve, of which the horizontal part covers the dead-wood, whilſt the vertical

part

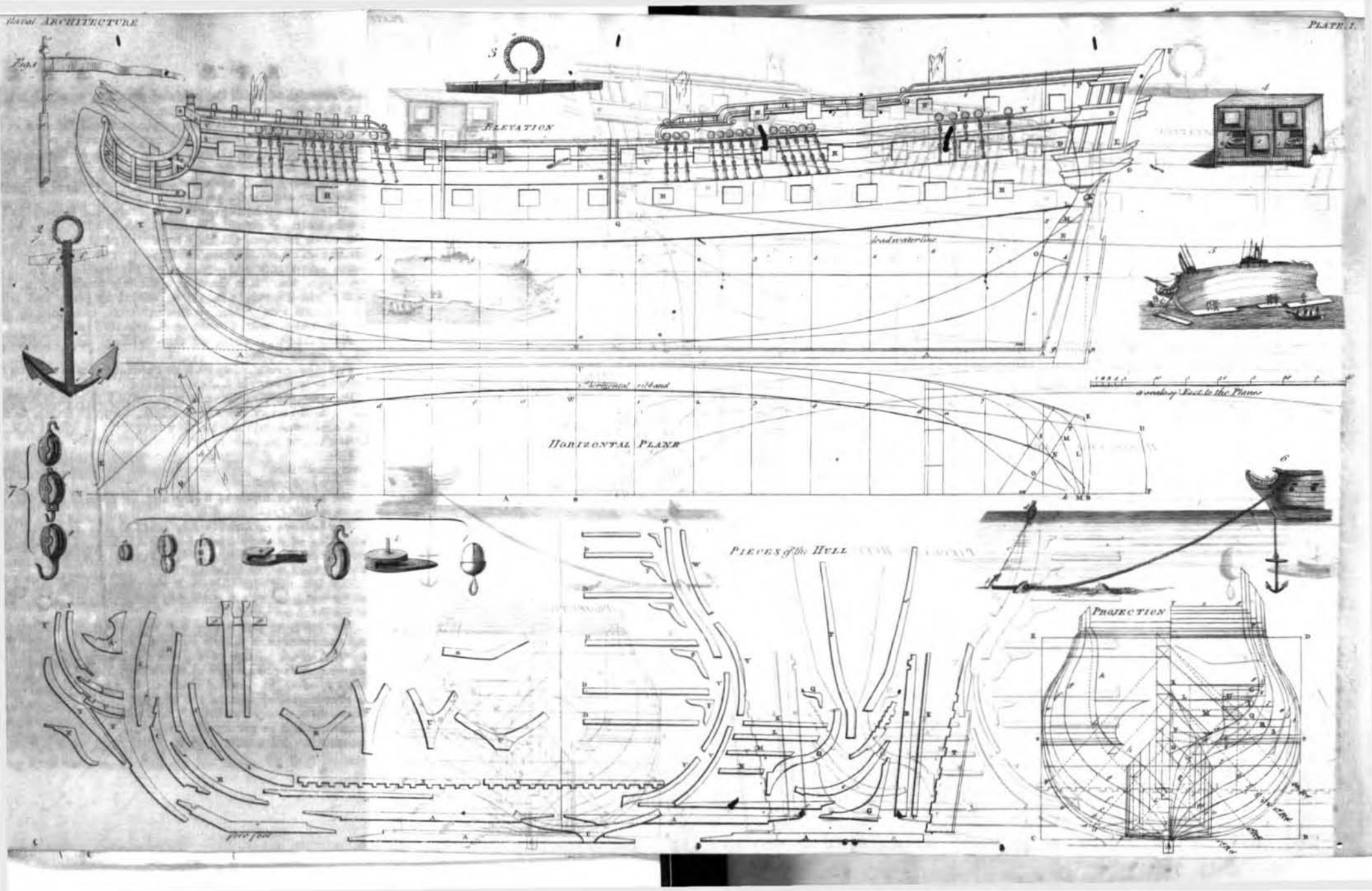
Fig. 1
ELEVATION
dead water line
HORIZONTAL PLANE
a working Boat to the Planes
PIECES of the HULL
PROJECTION

part correſponds with the inſide of the ſtem, to which it is fayed, making the commencement of the apron.

Apron, *platine*, is alſo a ſquare piece of lead faſtened over the touch-hole of the cannon, to keep the charge dry at ſea or in rainy weather.

Naval ARCHITECTURE, or the ſcience of ſhip-building, comprehends the theory of delineating marine veſſels upon a plane; and the art of framing them upon the ſtocks, according to the proportions exhibited in a regular deſign.

All edifices, whether civil or military, are known to be erected in conſequence of certain eſtabliſhed plans, which have been previouſly altered or improved till they have arrived at the deſired point of perfection. The conſtruction of ſhips appears alſo to require at leaſt as much correctneſs and preciſion as the buildings which are founded upon *terra firma:* it is therefore abſolutely neceſſary that the mechanical ſkill of the ſhipwright ſhould be aſſiſted by plans and ſections, which have been drawn with all poſſible exactneſs, examined by proper calculations, and ſubmitted to the moſt accurate ſcrutiny.

Naval Architecture, or ſhip-building, may be diſtinguiſhed into three principal parts.

Firſt, To give the ſhip ſuch an exterior form as may be moſt ſuitable to the ſervice for which ſhe is deſigned.

Secondly, to give the various pieces of a ſhip their proper figures; to aſſemble and unite them into a firm, compact frame, ſo that by their combination and diſpoſition they may form a ſolid fabric, ſufficient to anſwer all the purpoſes for which it is intended: And,

Thirdly, To provide convenient accommodations for the officers and crew, as well as ſuitable apartments for the cargo, furniture, proviſions, artillery and ammunition.

The exterior figure of a ſhip may be divided into the bottom and upper-works.

The bottom, or quick-work, contains what is termed the *hold*, and which is under water when the ſhip is laden. The upper-works, called alſo the dead-work, comprehend all that part which is uſually above the water when the ſhip is laden.

The figure of the bottom is therefore determined by the qualities which are neceſſary for the veſſel, and conformable to the ſervice for which ſhe is propoſed.

The limits of our deſign will not admit of a minute deſcription, and enumeration of all the pieces of timber which enter into the conſtruction of a ſhip, nor of a particular deſcription of their aſſemblage and union; or the manner in which they reciprocally contribute to the ſolidity of thoſe floating citadels. It nevertheleſs appears neceſſary to give a general idea of the uſe, figure, and ſtation, of the principal pieces, to thoſe who are intirely unacquainted with the ſubject. As our definitions will be greatly illuſtrated alſo by the proper figures, we have annexed to this article a plate which comprehends ſome of the moſt

 material

material draughts, as well as a repreſentation of the principal pieces employed in naval architecture.

It is uſual amongſt ſhipwrights to delineate three ſeveral draughts.

Firſt, The whole length of the ſhip is repreſented according to a ſide view, perpendicular to the keel, and is termed the plane of elevation, or ſheer-draught. Plate I.

Second, The ſhip is exhibited according to an end view, and ſtripped of her planks, ſo as to preſent the outlines of the principal timbers; and this is properly termed the plane of projection, or the vertical plane of the timbers, Plate I. becauſe it ſhews the projection of their frames relatively to each other.

Third, It is not ſufficient to have the vertical curves of the bottom in different places, for a diſtinct idea of the horizontal curves is alſo equally neceſſary and uſeful: this is obtained by means of *water-lines*, traced upon what is called the horizontal plane. In this draught, the curves of the tranſoms called the *round-aft*, is alſo marked, and ſometimes the breadth and thickneſs of the timbers.

The plane of elevation, plate I. determines the length and depth of the keel; the difference of the draughts of water; the length and projection, or *rake*, of the ſtem and ſtern-poſt; the poſition of the mid-ſhip frame upon the keel, together with that of the principal frames afore and abaft; the load-water-line; the wales, the dimenſions and ſituations of the gun-ports, the projection of the rails of the head and ſtern-gallery, with the ſtations of the maſts and channels. See the article ELEVATION.

This draught, however, conveys no idea of the vertical curve of the ribs or timbers; for as their projection will be only repreſented in a plane elevated upon the length of the keel, they will appear in this direction no otherwiſe than as ſtreight lines. To perceive theſe curves accurately, they muſt be regarded in another point of view, which will repreſent their projection upon a vertical plane, ſuppoſed to cut the keel at right angles in the place where the ſhip is broadeſt. For as all ſhips are broader near the middle of their length than towards the extremities, it is evident that the timbers are more extended in proportion. The moſt capacious of theſe repreſents what is called the *midſhip-frame*; and upon the area of this frame is delineated the projection of all the others.

Thus the plane of projection limits the different breadths of a ſhip in various points of her length, and exhibits the outline of the timbers reſpectively to each other, as they are erected upon the keel. Accordingly, this draught ought to preſent a variety of ſections of the ſhip in different places of her length, and always perpendicular to the ſurface of the water; ſo that the eye of the obſerver, when placed in what may be properly termed the *axis* of the ſhip, may perceive the ſeveral ſections at one glance, that is to ſay, when looking full on the ſtem, from before the ſhip, (See plate V. fig. 4.) he ſhall diſcover the fore-timbers; and when looking from behind, directly on the ſtern, he ſhall perceive the

the form of the after-timbers, (See plate X. fig. 2 and 3.) in both of which figures the ſections of the inferior timbers are expreſſed by curved black lines drawn upon the area of the midſhip-frame, which is already deſcribed to be a plane elevated perpendicularly upon the keel at the extreme breadth of the veſſel.

To form a juſt idea of this plane, therefore, we ought to ſuppoſe a ſhip reſting upon the ſtocks, in the ſame poſition as when afloat upon the water. Thus a variety of black vertical lines may be drawn at equal diſtances upon the bottom, which is white, to form different outlines of the ſhip correſponding to the timbers within. It is to be obſerved, that the faſhion of the inferior timbers muſt conform to the figure of the midſhip-frame, which is placed in the fulleſt part of the ſhip; and as the planes of all the other timbers diminiſh in a certain progreſſion as they approach the ſtem and ſtern, they are properly delineated on the plane of the midſhip-frame, which alſo repreſents the depth of the keel and length of the midſhip-beam.

As the two ſides of a ſhip ought to be exactly alike, it is judged ſufficient to repreſent the ſections of the fore-part of the ſhip on the left ſide, and thoſe in the after-part on the right ſide, ſo as to perceive all the ſections, as well afore as abaft, upon one plane. See plate I. PROJECTION.

However neceſſary it may be to underſtand preciſely the vertical curves of the bottom, it is no leſs requiſite to have a juſt idea of thoſe which are horizontal.

The horizontal, or floor plane, is that upon which the whole frame is erected, and will be more clearly underſtood by previouſly deſcribing the water-lines and ribbands, of which it is compoſed.

When a ſhip floats upon the ſtream, it is evident that her upper-works will be ſeparated from the bottom by the ſurface of the water, which will accordingly deſcribe an imaginary horizontal line upon the bottom from the ſtem to the ſtern-poſt.

The moſt elevated of thoſe lines is termed the load-water-line, which is ſuppoſed to be drawn by the ſurface of the water on the upper part of the bottom, when ſhe is ſufficiently laden for a ſea-voyage. For if we ſuppoſe this ſurface a rule, and thereby deſcribe a correſponding black line along the veſſel's bottom, that line will be diſtinguiſhed upon the bottom, which is white, and repreſent what is called the load-water-line.

If the ſhip is lightened of any part of her lading, and preſerves the ſame difference in her draught of water at the two ends, or, what is the ſame thing, if ſhe is lightened ſo as to preſerve the ſame equilibrium of the keel with regard to the ſurface of the water, it is evident that ſhe will riſe higher out of the water, ſo that the black line already deſcribed will be elevated above it, and another black line may be delineated upon the bottom, cloſe to the ſurface of the water, which will exhibit a ſecond water-line parallel to the firſt, but nearer the keel in proportion to the number of feet which the ſhip has riſen.

Thus

Thus by lightening a ſhip gradually, and at the ſame time preſerving the direction of her keel, or the angle which the keel makes with the ſurface of the water, a variety of water-lines may be drawn parallel to each other, and to the load-water-line. See a farther illuſtration of theſe lines in the article WATER-LINE. See alſo their figure on a ſhip's bottom, plate I. fig. 5.

The ribbands are likewiſe of great utility in ſhip-building; they are narrow and flexible planks placed on the bottom at different heights, ſo as to form a ſort of mould for ſtationing the inferior timbers between the principal ones. They differ from the water-lines, inaſmuch as the latter have only one curve, which is horizontal, whereas the ribbands, beſides their horizontal one, have a vertical curve. To convey a juſt idea of theſe curves, which cannot be repreſented on one draught at their full length, without an oblique ſection of the ſhip's length, it will be neceſſary to have recourſe to two planes; that of the elevation, which exhibits their vertical curve; and to the floor-plane, upon which the horizontal curve is expreſſed. See RIBBANDS.

Theſe different lines are extremely uſeful in exhibiting the various curves of a ſhip's bottom, that as they are gradually diminiſhed, their uniformity or irregularity may be diſcovered by the ſkilful artiſt.

We have already obſerved, that the qualities required in a ſhip ought to determine the figure of the bottom: a ſhip of war therefore ſhould be able to ſail ſwiftly, and carry her lower tier of guns ſufficiently out of the water. A merchant-ſhip ought to contain a large cargo of merchant-goods, and be navigated with few hands; and both ſhould be able to carry ſail firmly; ſteer well; drive little to leeward; and ſuſtain the ſhocks of the ſea without being violently ſtrained.

The firſt thing to be eſtabliſhed in the draught of a ſhip is her length; and as a ſhip of war, according to her rate, is furniſhed with a certain number of cannon, which are placed in battery on her decks, it is neceſſary that a ſufficient diſtance ſhould be left between their ports to work the guns with facility, and particularly to leave ſpace enough between the foremoſt gun and the ſtem, and between the aftmoſt gun and the ſtern-poſt on each ſide, on account of the arching, or inward curve of the ſhip towards her extremities.

When the length of a ſhip is determined, it is uſual to fix her breadth by the dimenſions of the midſhip-beam. On this occaſion the ſhipwrights, for the moſt part, are conducted by rules founded on their own obſervation; for having remarked, that ſome veſſels which by repeated experience have been found to anſwer all the purpoſes of navigation, have a certain breadth in proportion to their length, they have inferred that it would be improper to depart from this proportion: but as other ſhips have been conſtructed with different breadths, which were equally perfect, a variety of different general rules have been adopted by theſe artiſts, who are accordingly divided in their opinions about the breadth which ought to be aſſigned to a ſhip relatively with her length, whilſt each one produces reaſons and experience in ſupport of his own ſtandard. Thoſe who would diminiſh the breadth alledge, that

a nar-

a narrow veſſel meets with leſs reſiſtance in paſſing through the water; 2dly. That by increaſing the length ſhe will drive leſs to leeward; 3dly. That according to this principle, the water-lines will be more conveniently formed to divide the fluid; 4thly. That a long and narrow ſhip will require leſs ſail to advance ſwiftly; that her maſts will be lower, and her rigging lighter; and, by conſequence, the ſeamen leſs fatigued with managing the ſails, &c.

Thoſe, on the contrary, who would enlarge the breadth, pretend, 1ſt. That this form is better fitted to preſerve a good battery of guns. 2dly. That there will be more room to work the guns conveniently. 3dly. That by carrying more ſail the ſhip will be enabled to run faſter; or, that this quality will at leaſt overbalance the advantage which the others have of more eaſily dividing the fluid. 4thly. That, being broader at the load-water-line, or place where the ſurface of the water deſcribes a line round the bottom, they will admit of being very narrow on the floor, particularly towards the extremities: and 5thly. That a broad veſſel will more readily riſe upon the waves than a narrow one.

From ſuch oppoſite principles has reſulted that variety of ſtandards adopted by different ſhipwrights; and a ſervile imitation of theſe mechanical methods has, to the great reproach of the art, produced all theſe pretended rules of proportion: for the various models they have hitherto adopted indiſputably prove their doubt and uncertainty with regard to their proper ſtandard. Hence theſe pretended myſteries which are only to be revealed to ſuch as are initiated into the craft! Hence this diviſion of the art into claſſes, or, according to the technical term, into *families*, each of which affects, with becoming ſolemnity, to be poſſeſſed of the true ſecret, in preference to all the others! And hence violence of oppoſition, and mutual contempt amongſt the artiſts! Indeed nothing appears more effectually to have retarded the progreſs of naval architecture, than the involving it in myſteries which the profeſſors would gravely inſinuate are only intelligible to themſelves. This ridiculous affectation is nevertheleſs tenaciouſly retained, notwithſtanding the example to the contrary of ſome of the moſt able ſhipwrights in Europe, who are real maſters of the theory of their art, and do honour to their profeſſion, and who are juſtly exempted from the cenſure to which the others are often expoſed.

It is not to be expected that an art ſo complicated and various, comprehending ſuch a diverſity of ſtructures, can be treated at large in a work of this ſort. To enter into a particular detail of the theory and practice; to explain the different parts with ſufficient accuracy and perſpicuity, would of itſelf require a large volume, and, by conſequence, greatly exceed the limits of our deſign. Being thus neceſſitated to contract our deſcription into a narrow compaſs, it will be ſufficient to give a general idea of the ſubject; to deſcribe the principal pieces of which a ſhip is compoſed, and to explain the principal draughts uſed in the conſtruction thereof.

As the ſeveral lines exhibited in the planes of elevation, projection, &c. will be rendered more intelligible by a previous account of thoſe pieces, it may not be improper to begin with reciting their names, and giving a ſummary deſcription of their uſes and ſtations. They are for the moſt part repreſented according to the order of their diſpoſition in that part of plate I. which is termed PIECES *of the* HULL.

A. The pieces which compoſe the keel, to be ſecurely bolted together, and clinched.

B. The ſtern-poſt, which is tenanted into the keel, and connected to it by a knee, G. It ſupports the rudder, and unites the ſides of the ſhip abaft.

C. The ſtem, which is compoſed of two pieces ſcarfed together: it is an arching piece of timber, into which the ſhip's ſides are united forwards.

D. The beams, which are uſed to ſupport the decks, and confine the ſides to their proper diſtance.

E. The falſe poſt, which ſerves to augment the breadth of the ſtern-poſt, being alſo tenanted into the keel.

F. The knees, which connect the beams to the ſides.

G. The knee of the ſtern-poſt, which unites it to the keel.

H. The apron, in two pieces: it is fayed on the inſide of the ſtem, to ſupport the ſcarf thereof; for which reaſon, the ſcarf of the former muſt be at ſome diſtance from that of the latter.

I. The ſtemſon, in two pieces, to reinforce the ſcarf of the apron.

K. The wing tranſom: it is fayed acroſs the ſtern-poſt, and bolted to the head of it, having its two ends let into the faſhion-pieces.

L. The deck tranſom, parallel to the wing-tranſom, and ſecured in the ſame manner.

M. N. The lower tranſoms.

O. The faſhion-piece on one ſide; the heel of it is connected with the ſtern-poſt, and the head is ſecured to the wing-tranſom.

P. The top-timbers, or upper parts of the faſhion-pieces.

Q. The ſleepers, which faſten the tranſoms to the ſhip's ſide.

R. The breaſt-hooks, in the hold; they are fayed acroſs the ſtem, to ſtrengthen the fore part of the ſhip.

S. The breaſt-hooks of the deck: they are placed immediately above the former, and uſed for the ſame purpoſes.

T. The rudder, which is joined to the ſtern-poſt by hinges, and ſerves to direct the ſhip's courſe.

U. The floor-timbers; they are laid acroſs the keel, to which they are firmly bolted.

V. The lower futtocks, and

W. The top-timbers, which are all united to the floor-timbers, forming a frame that reaches from the keel to the top of the ſide.

X. The pieces which compoſe the kelſon: they are ſcarfed together like the keel pieces, and placed over the middle of the floor-timbers, upon

upon each of which they are ſcored about an inch and a half, as exhibited by the notches.

Y. The ſeveral pieces of the knee of the head; the lower part of which is fayed to the ſtem; the heel being ſcarfed to the fore foot.

Z. The cheeks of the head or knees, which connect the head to the bows on each ſide.

&. The ſtandard of the head, which faſtens it to the ſtem.

a. The catheads, one of which lies on each bow, projecting outwards like the arm of a crane. They are uſed to draw the anchors up to the top of the ſide without injuring the bow.

b. The bits, to which the cable is faſtened when the ſhip rides at anchor.

c. The falſe poſt, in two pieces, fayed to the fore part of the ſtern-poſt.

d. The ſide-counter-timbers, which terminate the ſhip abaft within the quarter gallery.

e e. Two pieces of dead wood, one afore, and another abaft, fayed on the keel.

In veſſels of war, the general dimenſions are eſtabliſhed by authority of officers appointed by the government to ſuperintend the building of ſhips. In the merchants ſervice, the extreme breadth, length of the keel, depth in the hold, height between-decks and in the waſte, are agreed on by contract; and from theſe dimenſions the ſhipwright is to form a draught ſuitable to the trade for which the ſhip is deſigned.

In projecting the draught of a veſſel of war, the firſt article to be conſidered is her length. As all ſhips are much longer above than below, it is alſo neceſſary to diſtinguiſh the preciſe part of her height from which her length is taken: this is uſually the lower gun-deck, or the load water-line. It has been already obſerved, that water-lines are deſcribed longitudinally on a ſhip's bottom by the ſurface of the water in which ſhe floats, and that the line which determines her depth under the water is uſually termed the load-water-line. In this draught it will be particularly neceſſary to leave ſufficient diſtance between the ports.

The next object is to eſtabliſh the breadth by the midſhip-beam. Although there is great difference of opinion about proportioning the breadth to the length, yet it is moſt uſual to conform to the dimenſions of ſhips of the ſame rate. After the dimenſions of the breadth and length are determined, the depth of the hold muſt be fixed, which is generally half the breadth: but the form of the body ſhould be conſidered on this occaſion; for a flat floor will require leſs depth in the hold than a ſharp one. The diſtance between the decks muſt alſo be ſettled.

We may then proceed to fix the length of the keel, by which we ſhall be enabled to judge of the rake of the ſtem and ſtern-poſt. The rake is known to be the projection of the ſhip at the height of the ſtem and ſtern-poſt, beyond the ends of the keel afore and abaft; or the angle by

which the length is increaſed as the fabric riſes. To theſe we may alſo add the height of the ſtem and wing tranſom.

After theſe dimenſions are ſettled, the timbers may be conſidered which form the ſides of the ſhip. A frame of timbers, which appears to be one continued piece, is compoſed of one floor-timber, U, whoſe arms branch outward to both ſides of the ſhip; (See plate I. PIECES *of the* HULL) two or three futtocks V V, and a top-timber, W. The futtocks are connected to the upper arms of the floor-timbers on each ſide of the ſhip, and ſerve to prolong the timber in a vertical direction: and the top-timbers are placed at the upper part of the futtocks for the ſame purpoſe. All theſe being united, and ſecured by croſs-bars, form a circular encloſure, which is called a frame of timbers, *couple d'un vaiſſeau*. And as a ſhip is much broader at the middle than at the extremities, the arms of the floor-timber will form a very obtuſe angle at the extreme breadth; but this angle decreaſes in proportion to the diſtance of the timbers from the midſhip-frame, ſo that the foremoſt and aftmoſt ones will form a very acute angle. Floor-timbers of the latter ſort are uſually called crutches.

Shipwrights differ extremely in determining the ſtation of the midſhip-frame; ſome placing it at the middle of the ſhip's length, and others further forward. They who place it before the middle, alledge, that if a ſhip is full forward, ſhe will meet with no reſiſtance after ſhe has opened a column of water; and that the water ſo diſplaced will eaſily unite abaft, and by that means force the ſhip forward; beſides having more power on the rudder, in proportion to its diſtance from the center of gravity: this alſo comes nearer the form of fiſhes, which ſhould ſeem the moſt advantageous for dividing the fluid.

When the riſing of the midſhip-floor-timber is decided, we may then proceed to deſcribe the riſing-line of the floor, on the ſtern-poſt abaft, and on the ſtem afore.

The height of the lower-deck is the next thing to be conſidered: it is determined in the middle by the depth of the hold; and ſome builders make it no higher than the ſtem; but they raiſe it abaft as much above its height in the middle, as the load-water-mark, or draught of water abaft, exceeds that afore. With regard to the height between decks, it is altogether arbitrary, and muſt be determined by the rate of the ſhip, and the ſervice ſhe is deſigned for.

It is alſo neceſſary to remember the ſheer of the wales, and to give them a proper *hanging*; becauſe the beauty and ſtateline ſs of a ſhip greatly depend upon their figure and curve, which, if properly drawn, will make her appear airy and graceful on the water.

We come now to conſider the upper-works, and all that is above water, called the dead-work: and here the ſhip muſt be narrower, ſo that all the weight lying above the load-water-line will thereby be brought nearer the middle of the breadth, and of courſe the ſhip will be leſs ſtrained by the working of her guns, &c. But although ſome advantages are acquired by diminiſhing the breadth above water, we muſt be careful not to narrow her too much; as there muſt be ſufficient

room

room left on the upper-deck for the guns to recoil. The ſecurity of the maſts ſhould likewiſe be remembered, which requires ſufficient breadth to ſpread the ſhrouds. A deficiency of this ſort may indeed be in ſome meaſure ſupplied by enlarging the breadth of the channels.

With regard to the qualities required in the conſtruction of a ſhip, to fit her for the various purpoſes of navigation, the reader is referred to the article BOTTOM.

We ſhall now proceed to explain the ſheer draught, or plane of *elevation*, of a ſixty gun ſhip; wherein we have been attentive to make the ſame letters refer to the ſame objects, as in the explanation of the PIECES, as above; at leaſt when the ſame objects are in both figures; a conduct we ſhall invariably purſue throughout this work, although it ſeems to have been forgot by our predeceſſors. Thus in all the plates of ſhip-building, the keel, whether ſeparate or joined, is repreſented by A, the ſtern-poſt by B, the ſtem by C, the beams by D; unleſs where thoſe objects do not *all* appear, and then ſomething elſe is placed inſtead thereof. Thus in plate III. of the deck, where the keel cannot be ſeen, the main hatchway is repreſented by A, as not being inſerted in any figure wherein the keel appears.

A A. The keel, whoſe upper edge is prolonged by the dotted line p q, upon the extremities of which are erected perpendiculars which determine the height of the wing tranſom, K, and length of the gun-deck, K C.

A B. The ſtern-poſt.

A C. The ſtem.

D D. The quarter-gallery, with its windows.

E F. The quarter-pieces, which limit the ſtern on each ſide.

F. The taffarel, or upper piece of the ſtern.

F G. Profile of the ſtern, with its galleries.

H. The gun ports.

I. The channels, with their dead-eyes and chain-plates.

K. The wing-tranſom.

K G. The counter.

L B. The deck-tranſom.

M N O. The firſt, ſecond, and third tranſoms, of which O K is the third or loweſt.

m O L P. The direction of the faſhion-piece, having its breadth canted aft towards the ſtern.

Q R. The main ſkeeds, for hoiſting in the boats clear of the ſhip's ſide.

L Q Z. The main wale, with its ſheer afore and abaft.

D R X. The channel wales, parallel to the main wale.

S U S. The ſheer rail, parallel to the wales.

T *t*. The rudder.

A t F. The rake of the ſtern.

V W V. The waiſt-rail.

P *i i*. The drift-rails abaft; and *i* a, the drift-rails forward.

T U C. The water-line.

X X. The rails of the head.

Y. The knee of the head, or cutwater.

Z Z. The cheeks of the head.

a a. The cat-head.

M ⊕ C. The riſing line of the floor.

k u C. The cutting-down line, which limits the thickneſs of all the floor-timbers, and likewiſe the height of the dead-wood afore and abaft.

⊕ *u* U W. The midſhip-frame.

a, *b*, *c*, *d*, *e*, *f*, *g*, *h*. The frames or timbers in the fore-body of the ſhip, i. e. before the midſhip frame.

1, 2, 3, 4, 5, 6, 7, 8, 9. The timbers in the after-body, or which are erected abaft the midſhip-frame.

As the eye of a ſpectator is ſuppoſed in this projection to view the ſhip's ſide in a line perpendicular to the plane of elevation, it is evident that the convexity will vaniſh, like that of a cylinder or globe, when viewed at a conſiderable diſtance; and that the frames will conſequently be repreſented by ſtrait lines, except the faſhion-piece abaft and the knuckle-timber forward.

It has been already obſerved, that the plane of projection may be defined a vertical delineation of the curves of the timbers upon the plane of the midſhip frame, which is perpendicular to that of the elevation. It is neceſſary to obſerve here, that the various methods by which theſe curves are deſcribed, are equally mechanical and arbitrary. In the latter ſenſe, they are calculated to make a ſhip fuller or narrower according to the ſervice for which ſhe is deſigned, and in the former they are drawn according to thoſe rules which the artiſt has been implicitly taught to follow, or which his fancy or judgment has eſteemed the moſt accurate and convenient. They are generally compoſed of ſeveral arches of a circle, reconciled together by moulds framed for that purpoſe. The radii of thoſe arches therefore are of different lengths, according to the breadth of the ſhip in the place where ſuch arches are ſwept; and they are expreſſed on the plane of projection either by horizontal or perpendicular lines; the radii of the breadth ſweeps being always in the former, and the radii of the floor ſweeps in the latter direction. Theſe two arches are joined by a third, which coincides with both, without interſecting either. The curve of the top-timber is either formed by a mould which correſponds to the arch of the breadth-ſweep, or by another ſweep, whoſe center and radius are without the plane of projection. The breadth of the ſhip at every top-timber is limited by an horizontal line drawn on the floor-plane, called the half-breadth of the top-timbers. The extreme breadth is alſo determined by another horizontal line on the floor-plane; and the lines of half-breadth are thus mutually transferable, from the projection and floor-planes, to each other.

The neceſſary data by which the curves of the timbers are delineated then are, the perpendicular height from the keel, the main or principal breadth, and the top-timber breadth: for as a ſhip is much broader near the middle of her length than towards the ends, ſo ſhe is broader

in

in the middle of her height than above and below; and this latter difference of breadth is continued throughout every point of her length. The main breadth of each frame of timbers is therefore the ſhip's breadth nearly in the middle of her height in that part: and the top-timber breadth is the line of her breadth near the upper ends of each timber. It has been already obſerved, that as both ſides of a ſhip are alike, the artificers only draw one ſide, from which both ſides of the ſhip are built: therefore the timbers abaft the midſhip frame are exhibited on one ſide of the plane of projection, and the timbers before it on the other.

Plane of PROJECTION, Plate I.

A. The keel.

B C. The line which expreſſes the upper-edge of the keel, from which the height of each timber, and height of its different breadths are meaſured.

B D and C E, perpendiculars raiſed on the line B C, to limit the ſhip's extreme breadth and height amid-ſhips; or, in other words, to limit the breadth and height of the midſhip-frame.

A F. A perpendicular erected from the middle of the keel to biſect the line of the ſhip's breadth in two equal parts.

F * 9. The half-breadth line of the aftmoſt top-timber; being the uppermoſt horizontal line in this figure.

Note. The ſeven lines parallel to, and immediately under this, on the right ſide of the line A F, are all top-timber half-breadths, abaft the midſhip-frame; the loweſt of which coincides with the horizontal line D E.

The parallel horizontal lines nearly oppoſite to theſe, on the left ſide of the line A F, repreſent the top-timber half-breadths in the fore-body, or the half-breadths of the top-timbers before the midſhip-frame.

G, H, I, Q, R, S, T. The radii of the breadth-ſweeps abaft the midſhip-frame; thoſe of the breadth-ſweeps in the fore-body, or before the midſhip-frame, are directly oppoſite on the right ſide.

⊕ A ⊕. The midſhip-frame, from the extreme breadth downwards.

1, 2, 3, 4, 5, 6, 7, 8, 9. The out-lines of timbers abaft the midſhip-frame, in different parts of their height.

a, *b*, *c*, *d*, *e*, *f*, *g*, *h*. The outlines of the timbers before the midſhip-frame, in different parts of their height, h being the foremoſt, or knucke timber.

K *i*. The wing-tranſom, whoſe ends reſt upon the faſhion-piece.

L. The deck-tranſom, parallel to, and under the wing-tranſom.

M N O. The lower-tranſoms, of which O *k* is the third and loweſt.

m k P. The dotted line, which expreſſes the figure of the faſhion-piece, without being canted aft.

P. The upper-part, or top-timber of the faſhion-piece.

n, *o*, *p*, *q*, *r*, *ſ*. The radii of the floor-ſweeps, abaft the midſhip-frame: thoſe before the midſhip-frame are on the oppoſite ſide of the line A F, to which they are all parallel.

1ſt R^{d}. 2d R^{d}. 3d R^{d}. 4th R^{d}. The diagonal ribbands abaft the midſhips.

t, *u*, *x*, *y*. The ſame ribbands expreſſed in the fore-body.

It has been remarked above, that the horizontal plane is compoſed of water-lines and ribbands; it alſo contains the main and top-timber breadth-lines, or the longitudinal lines by which the main breadth and top-timber-breadth are limited in every point of the ſhip's length. The horizontal curve of the tranſoms and harpins are alſo repreſented therein, together with the planes of the principal timbers; the cant of the faſhion-piece, the length of the rake afore and abaft, the projection of the cat-heads, and the curve of the upper-rail of the head, to which curves of the lower ones are uſually parallel.

HORIZONTAL PLANE. Plate I.

B A C. The line of the ſhip's length, paſſing through the middle of the ſtem and ſtern-poſt.

B. The upper-end of the ſtern-poſt.

C. The upper-end of the ſtem.

B F. The length of the rake abaft.

D W X. The top-timber-breadth-line, or the line which limits the breadth of each top-timber.

D F. The breadth of the aftmoſt timber at the taffarel.

B K. The wing-tranſom.

B L P. The horizontal curve of the deck-tranſom.

M M. The horizontal curve, or *round-aft*, of the firſt tranſom.

M N. The horizontal curve of the ſecond tranſom: it is prolonged into a water-line, N 8 7.

i O. The horizontal curve of the third tranſom, which is alſo prolonged into another water-line, O, *n*, U, *p*, Q.

m O P. The plane of the faſhion-piece, as canted aft.

⊕ W U. The plane of the midſhip-frame.

a, *b*, *c*, *d*, *e*, *f*, *h*. The planes of the timbers before the midſhip-frame.

1, 2, 3, 4, 5, 6, 7, 8, 9. The planes of the timbers abaft the midſhip-frame.

X X. The figure of the upper-rail of the head.

C Y. The projection of the knee of the head.

The Third horizontal ribband, is marked on the plate.

a a. The projection of the cat-head.

Thus we have endeavoured briefly to explain the nature and uſes of the principal draughts uſed in the conſtruction of a ſhip, which reciprocally correſpond with each other in the dimenſions of length, breadth, and depth. Thus the plane of elevation is exactly of the ſame length with the horizontal or floor-plane. The ſeveral breadths of the timbers in the floor-plane and that of the projection are mutually transferable; and the real height of the timbers in the projection, exactly conforms to their height in the elevation. Thus let it be required to tranſfer the height of the wing-tranſom from the elevation to the projection:

Extend

Extend the compaſſes from the point K, in the elevation, down to the dotted line prolonged from the upper-edge of the keel, and ſetting the other foot in the point *p*, then ſhall the line K *p* be the perpendicular height of the wing tranſom: tranſfer this from the middle of the line B A C, in the projection, to the point K in the perpendicular A F, then will A K be the height of the wing-tranſom in the plane of projection: and thus the height of all the tranſoms may be laid from the former upon the latter.

Again, let it be required to tranſfer the main-breadth of the midſhip-frame from the projection to the horizontal plane: Set one foot of the compaſſes in the point ⊕ on the perpendicular C E, and extend the other along the main-breadth-ſweep ⊕ G, till it touches the perpendicular A F parallel to C E: lay this diſtance upon the horizontal plane from the point u in the line of the ſhip's length, B A C, along the plane of the midſhip-frame to the point ⊕; ſo ſhall the line ⊕ W U be the breadth of the midſhip-frame on the horizontal plane.

Thus alſo the top-timber-breadth, or the diſtance of each top-timber from the middle of the ſhip's breadth, may be in the ſame manner tranſferred, by extending the compaſſes from the line B A C, in the horizontal plane, to the top-timber breadth-line, upon any particular timber, as 1, 2, 3, &c. which will give its proper dimenſions thereon.

In the ſame manner the breadths of all the timbers may be laid from the projection to the horizontal plane, and *vice verſa*, from that to the projection. Thus the height of each timber may alſo be tranſferred from the elevation to the projection, &c.

The principal utility of theſe draughts therefore is to exhibit the various curves of the ſhip's body, and of the pieces of which it is framed, in different points of view, which are either tranſverſe or longitudinal, and will accordingly preſent them in very different directions. Thus the horizontal curves of the tranſoms and water-lines are repreſented on the floor-plane, all of which are nearly ſtreight lines in the elevation and projection; and thus the vertical curves of the timbers are all exhibited on the projection, although they appear as ſtreight lines in the elevation and floor plane.

Before this article is cloſed, it may be neceſſary to remark, that the various pieces repreſented in plate I. as well as the lines in the draughts which have not been already defined, are copiouſly explained in their proper places; as it would have been contrary to the plan of this work to have given a more enlarged deſcription of them here.

That the reader, however, might be better enabled to comprehend the ſcope of this article, it was judged neceſſary to give a general ſketch of naval architecture itſelf; to collect into one point of view the moſt material draughts by which a ſhip is conſtructed, and to deſcribe, as conciſely as poſſible, the ſeveral parts of which they are compoſed.

The principal parts of a ſhip alſo, which are here reduced into a narrow compaſs, will be repreſented at large in different places of this work, to illuſtrate thoſe explanations whither it may be neceſſary to refer,

refer, in order to underſtand the ſubject more clearly. Thus the ſtern, the quarter, the midſhip-frame, the bow and head, of a ſhip of 74 guns, are exhibited on a ſcale of $\frac{1}{2}$ of an inch to a foot; by which all the ſubordinate parts may be diſtinctly viewed, and their combination and arrangement ſufficiently underſtood.

ARMED-SHIP, *vaiſſeau armé en guerre*, a veſſel occaſionally taken into the ſervice of the government in time of war, and employed to guard ſome particular coaſt, or attend on a fleet. She is therefore armed and equipped in all reſpects like a ſhip of war, and commanded by an officer of the navy, who has the rank of maſter and commander. All ſhips of this ſort are upon the eſtabliſhment of the king's ſloops, having a lieutenant, maſter, purſer, ſurgeon, &c.

ASHORE, (from *a* and *ſhore*) on the ſhore, or land, as oppoſed to aboard.

A ſhip is ſaid to be ASHORE, *echoué*, when ſhe has run upon the ground, or on the ſea-coaſt, either by deſign or accident.

ASTERN, *au derriere*, (from *a* and *ſteorn*, Sax.) any diſtance behind a ſhip, as oppoſed to *a-head*, which is before her. Thus, when ſouth is *a-head*, or on the line to which the ſtem is directed, north will be *aſtern*.

ATHWART, *par le travers*, (from *a* and *twert*, Dan. tranſverſe) when uſed in navigation, implies acroſs the line of the courſe; as, we diſcovered a fleet at day-break ſtanding *athwart* us, i. e. ſteering acroſs our way.

ATHWART-HAUSE, the ſituation of a ſhip when ſhe is driven by the wind, tide, or other accident, acroſs the fore-part of another. This phraſe is equally applied when the ſhips bear againſt each other, or when they are at a ſmall diſtance; the tranſverſe poſition of the former to the latter being principally underſtood.

ATHWART *the fore-foot*, a phraſe employed to denote the flight of a cannon-ball, as fired from one ſhip acroſs the line of another's courſe, to intercept the latter, and compel her to ſhorten ſail till the former approaches near enough to examine her. The *fore-foot* is the lower part of the ſtem; ſo that the ſhot flying acroſs it is ſaid to be fired *athwart the fore-foot*.

ATHWART-SHIPS, reaching acroſs the ſhip, from one ſide to the other.

ATRIP (*trepor*, Fr. *trippen*, Dutch) is applied differently to the anchor and the ſails. The anchor is *atrip*, *derangée*, when it is drawn out of the ground in a perpendicular direction, either by the cable or buoy-rope. The top-ſails are ſaid to be *atrip*, when they are hoiſted up to the maſt-head, or to their utmoſt extent.

AVERAGE, in commerce *avarie*, (*averagium*, Lat.) the accidents and misfortunes which happen to ſhips and their cargoes, from the time of their loading and ſailing, till their return and unlading. It is divided into three kinds. 1. The ſimple or particular *average*, which conſiſts in the extraordinary expences incurred for the ſhip alone, or for the merchandiſe

chandiſe alone; ſuch is the loſs of anchors, maſts, and rigging, occaſioned by the common accidents at ſea; the damages which happen to merchandiſes by ſtorms, capture, ſhipwreck, wet, or rotting; all which muſt be borne and paid by the thing that ſuffered the damage. 2. The large and common average, being thoſe expences incurred, and damages ſuſtained, for the common good and ſecurity, both of the merchandiſe and veſſels, conſequently to be borne by the ſhip and cargo, and to be regulated upon the whole Of this number are the goods or money given for the ranſom of the ſhip and cargo; things thrown overboard for the ſafety of the ſhip; the expences of unlading, or entering into a river or harbour, and the proviſions and hire of the ſailors when the ſhip is put under embargo. 3. The ſmall averages, which are expences for towing and piloting the ſhip out of, or into harbours, creeks, or rivers; one third of which muſt be charged to the ſhip, and two thirds to the cargo.

AVERAGE is more particularly uſed for a certain contribution that merchants make proportionably towards their loſſes. It alſo ſignifies a ſmall duty which the merchants, who ſend goods in another man's ſhip, pay to the maſter, for his care of them, over and above the freight. Hence it is expreſſed in the bills of lading, paying ſo much freight for the ſaid goods, with damage and average accuſtomed.

AWEIGH, *a quitté* (of *a* and *weigh*) the ſtate of the anchor when it is drawn out of the ground in a perpendicular direction, by the application of mechanical powers, as a capſtern or windlaſs, to the cable within the ſhip; ſo that aweigh is ſynonimous to *atrip*.

AWNING, *tendelet*, (from *aulne*, Fr.) a canopy of canvaſs extending over the decks of a ſhip in hot weather, for the convenience of the officers and crew, and to preſerve the decks from being cracked or ſplit, *ebaroui*, by the heat of the ſun: The awning is ſupported by a range of light poſts, called ſtanchions, which are erected along the ſhip's ſide on the right and left; it is alſo ſuſpended in the middle by a complication of ſmall cords, called a crowfoot. See the article CROWFOOT.

AZIMUTH-COMPASS, an inſtrument employed to diſcover the magnetical azimuth or amplitude of any heavenly object. This operation is performed at ſea, to find the exact variation of the magnetical needle. The compaſs will be deſcribed in its proper place: it is, however, neceſſary here to explain the additional contrivance by which it is fitted to take the magnetical azimuth, or amplitude of the ſun or ſtars, or the bearings of head-lands, ſhips, and other objects at a diſtance.

The braſs edge, originally deſigned to ſupport the card, and throw the weight thereof as near the circumference as poſſible, is itſelf divided into degrees and halves; which may be eaſily eſtimated into ſmaller parts if neceſſary. The diviſions are determined by means of a cat-gut line ſtretched perpendicularly with the box, as near the braſs edge as may be, that the parallax ariſing from a different poſition of the obſerver may be as little as poſſible.

There is alſo added an index at the top of the inner-box, which may be fixed on or taken off at pleaſure, and ſerves for all altitudes of the object. It conſiſts of a bar, equal in length to the diameter of the inner-box, each end being furniſhed with a perpendicular ſtile, with a ſlit parallel to the ſides thereof; one of the ſlits is narrow, to which the eye is applied, and the other is wider, with a ſmall cat-gut ſtretched up the middle of it, and from thence continued horizontally from the top of one ſtile to the top of the other. There is alſo a line drawn along the upper ſurface of the bar. Theſe four, viz. the narrow ſlit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the ſame plane, which diſpoſes itſelf perpendicularly to the horizon when the inner-box is at reſt and hangs free. This index does not move round, but is always placed on, ſo as to anſwer the ſame ſide of the box.

The ſun's azimuth is known to be an angle contained between the meridian and the center of the ſun. When this is required, and his rays are ſtrong enough to caſt a ſhadow, the box is turned about till the ſhadow of the horizontal thread, or if the ſun be too low, till that of the perpendicular thread, in one ſtile, or the ſlit through the other, falls upon the line in the index bar, or vibrates to an equal diſtance on each ſide of it, the box being gently touched if it vibrates too far: at the ſame time they obſerve the degree marked upon the braſs edge of the cat-gut line. In counting the degree for the azimuth, or any other angle that is reckoned from the meridian, the outward circle of figures upon the braſs edge is uſed; and the ſituation of the index, with reſpect to the card and needle, will always direct upon what quarter of the compaſs the object is placed.

But if the ſun does not ſhine out ſufficiently ſtrong, the eye is placed behind the narrow ſlit in one of the ſtiles, and the wooden box turned about till ſome part of the horizontal, or perpendicular thread appears to interſect the center of the ſun, or vibrate to an equal diſtance on each ſide of it; ſmoked glaſs being uſed next the eye, if the ſun's light is too ſtrong. In this method another obſerver is neceſſary, to note the degree cut by the nonius, at the ſame time the firſt gives notice that the thread appears to ſplit the object.

Plate II. fig. 20. is a perſpective view of the compaſs, when in order for obſervation; the point of view being the center of the card, and the diſtance of the eye two feet.

A B. is the wooden box in which it is uſually contained.

K. is a cat-gut line drawn from the inſide of the box for determining the degree upon the braſs edge.

L, M, N, O. is the index bar with its two ſtiles, and cat-gut threads, which being taken off from the top of the box, is placed in two pieces P Q, notched properly to receive it.

The other parts of the figure, with their references, are explained in the article Compass.

B.

B.

BACK *of the poſt.* See the article STERN-POST.

To BACK *an anchor, empeneller,* to carry out a ſmall anchor, as the ſtream or kedge, ahead of the large one, by which the ſhip uſually rides, in order to ſupport it, and prevent it from looſening, or *coming home,* in bad ground. In this ſituation, the latter is confined by the former, in the ſame manner that the ſhip is reſtrained by the latter.

To BACK *aſtern,* in rowing, *ſcier à culer,* is to manage the oars in a direction contrary to the uſual method, ſo as that the boat or veſſel impreſſed by their force, ſhall retreat, or move with her ſtern foremoſt, inſtead of advancing.

To BACK *the ſails,* is to arrange them in a ſituation that will occaſion the ſhip to retreat or move aſtern. This operation is particularly neceſſary in narrow channels, when a ſhip is carried along ſideways by the ſtrength of the tide or current, and it becomes requiſite to avoid any object that may intercept her courſe, as ſhoals, or veſſels under ſail, or at anchor: it is alſo neceſſary in a naval engagement, to bring a ſhip back, ſo as to lie oppoſite to her adverſary, when ſhe is too far advanced in the line. See ABACK.

BACK-BOARD, a piece of board of a ſemicircular figure, placed tranſverſely in the after-part of a boat, like the back of a chair, and ſerving the paſſengers to recline againſt whilſt ſitting in the ſtern-ſheets. See BOAT.

BACK-STAYS, *cale haubans,* (from *back* and *ſtay*) long ropes reaching from the topmaſt-heads to the ſtarboard and larboard ſides of the ſhip, where they are extended to the channels: they are uſed to ſupport the top-maſts, and ſecond the efforts of the ſhrouds, when the maſt is ſtrained by a weight of ſail in a freſh wind.

They are uſually diſtinguiſhed into breaſt-back-ſtays and after-back-ſtays; the intent of the former being to ſuſtain the top-maſt when the force of the wind acts upon the ſhip ſideways, or, according to the ſea-phraſe, when the ſhip ſails upon a wind; and the purpoſe of the latter is to enable it to carry ſail when the wind is further aft.

There are alſo back-ſtays for the top-gallant-maſts, in large ſhips, which are fixed in the ſame manner with thoſe of the top-maſts.

A pair of back-ſtays is uſually formed of one rope, which is doubled in the middle, and faſtened there ſo as to form an eye, which paſſes over the maſt-head, from whence the two ends hang down, and are ſtretched to the channels by dead-eyes and laniards. See DEAD-EYES, &c.

The figure of the back-ſtays, and their poſition, is exhibited in the article RIGGING, to which the reader is further referred.

BADGE, *boutzille*, *fauſſe galerie*, in ſhip-building, a ſort of ornament, placed on the outſide of ſmall ſhips, very near the ſtern, containing either a window, for the convenience of the cabin, or the repreſentation of it: it is commonly decorated with marine figures, martial inſtruments, or ſuch like emblems. See QUARTER.

To BALANCE, (*balancer*, Fr.) to contract a ſail into a narrower compaſs, in a ſtorm, by retrenching or folding up a part of it at one corner; this method is uſed in contradiſtinction to *reefing*, which is common to all the principal ſails; whereas balancing is peculiar to few, ſuch as the mizen of a ſhip, and the main-ſail of thoſe veſſels, wherein it is extended by a boom. See BOOM and REEF.

The BALANCE of the mizen, *fanon*, is thus performed: the mizen-yard is lowered a little, then a ſmall portion of the ſail is rolled up at the *peek*, or upper corner, and faſtened to the yard about one fifth inward from the outer end, or yard-arm, toward the maſt. See MIZEN.

A boom-main-ſail is balanced, after all its reefs are taken in, by rolling up a ſimilar portion of the hindmoſt, or aftmoſt lower-corner, called the *clue*, and faſtening it ſtrongly to the boom, having previouſly wrapped a piece of old canvas round the part (which is done in both caſes) to prevent the ſail from being fretted by the cord which faſtens it.

BALLAST, *leſt*, (*ballaſte*, Dut. *ballaſtro*, Span.) a certain portion of ſtone, iron, gravel, or ſuch like materials, depoſited in a ſhip's hold, when ſhe has either no cargo, or too little to bring her ſufficiently low in the water. It is uſed to counter-ballance the effort of the wind upon the maſts, and give the ſhip a proper ſtability, that ſhe may be enabled to carry ſail without danger of over-turning.

There is often great difference in the proportion of ballaſt required to prepare ſhips of equal burthen for a voyage; the quantity being always more or leſs, according to the ſharpneſs or flatneſs of the ſhip's bottom, which ſeamen call the *floor*.

The knowledge of ballaſting a ſhip with propriety, is certainly an article that deſerves the attention of the ſkilful mariner; for although it is known that ſhips in general will not carry a ſufficient quantity of ſail, till they are laden ſo deep that the ſurface of the water will nearly glance on the extreme breadth amidſhips; yet there is more than this general knowledge required; ſince, if ſhe has a great weight of heavy ballaſt, as lead, iron, &c. in the bottom, it will place the center of gravity too low in the hold; and although this will enable her to carry a great ſail, ſhe will nevertheleſs ſail very heavily, and run the riſk of being diſmaſted by her violent rolling.

To ballaſt a ſhip, therefore, is the art of diſpoſing thoſe materials ſo that ſhe may be duly poiſed, and maintain a proper equilibrium on the water, ſo as neither to be too *ſtiff*, nor too *crank*, qualities equally pernicious; as in the firſt, although the ſhip may be fitted to carry a great ſail, yet her velocity will not be proportionably increaſed; whilſt her maſts are more endangered by her ſudden jerks and exceſſive labouring: and

and in the laſt, ſhe will be incapable of carrying ſail, without the riſk of overſetting.

Stiffneſs in ballaſting, is occaſioned by diſpoſing a great quantity of heavy ballaſt, as lead, iron, &c. in the bottom, which naturally places the center of gravity very near the keel; and that being the center about which the vibrations are made, the lower it is placed, the more violent will be the motion of rolling.

Crankneſs, on the other hand, is occaſioned by having too little ballaſt, or by diſpoſing the ſhip's lading ſo as to raiſe the center of gravity too high, which alſo endangers the maſt in carrying ſail when it blows hard: for when the maſts loſe their perpendicular height, they ſtrain on the ſhrouds in the nature of a lever, which encreaſes as the ſine of their obliquity; and a ſhip that loſes her maſts is in great danger of being loſt.

The whole art of ballaſting, therefore, conſiſts in placing the center of gravity to correſpond with the trim and ſhape of the veſſel, ſo as neither to be too high nor too low; neither too far forward, nor too far aft; and to lade the ſhip ſo deep, that the ſurface of the water may nearly riſe to the extreme breadth amidſhips; and thus ſhe will be enabled to carry a good ſail, incline but little, and ply well to the windward. See the article TRIM.

BANIAN-DAYS, a cant term among common ſailors, denoting thoſe days on which they have no fleſh-meat: it ſeems to be derived from the practice of a nation amongſt the eaſtern Indians, who never eat fleſh.

BANK, *banc, atterriſſement, (banc,* Sax.) an elevation of the ground, or bottom of the ſea, which is often ſo high as to appear above the ſurface of the water, or at leaſt ſo little beneath it, as to prevent a ſhip from floating over it: in this ſenſe, bank amounts nearly to the ſame as ſhallows, flats, &c. The ſhelves that abound with rocks under water, are diſtinguiſhed by other names, as reefs, ridges, keys, &c.

An exact knowledge of the banks, their extent, and the different depths of water in which they lie, conſtitutes a very eſſential portion of the ſcience of a pilot, or maſter of a ſhip. If the veſſel be large, and draws much water, great attention will be neceſſary to avoid them. If, on the contrary, ſhe is ſmall, the ſame banks afford a ſure aſylum, where ſhe may brave the largeſt ſhips, which dare not follow her to ſo dangerous a retreat. Many ſmall veſſels have eluded the purſuit of a ſuperior enemy by means of this hoſpitable barrier.

BANKS on the ſea-coaſt are uſually marked by beacons or buoys. In charts they are diſtinguiſhed by little dots, as ridges of rocks are characteriſed by croſſes. The principal banks in the Weſtern Ocean, are thoſe of Newfoundland, and the Bahama-Bank: the moſt remarkable one in Newfoundland is called the Grand Bank, which is of a vaſt extent, being nearly two hundred miles in length, and ſtretching north and ſouth: its uſual depth is from twenty to eighty fathoms: and this is the great ſcene of the cod-fiſhery, which is ſo material an article in European commerce.

BANK *of oars*, a ſeat or bench of rowers in a galley.

BANKER,

BANKER, a veſſel employed in the cod-fiſhery on the Banks of Newfoundland.

BAR *of a port or haven*, a ſhoal or bank of ſand, gravel, &c. thrown up by the ſurge of the ſea, to the mouth of a river or harbour, ſo as to endanger, and ſometimes totally prevent the navigation.

BARCA-LONGA, a large Spaniſh fiſhing-boat, navigated with lug-ſails, and having two or three maſts: theſe are very common in the Mediterranean See VESSEL.

BARGE (*bargie*, Dutch) a veſſel or boat of ſtate, furniſhed with elegant apartments, canopies, and cuſhions; equipped with a band of rowers, and decorated with flags and ſtreamers: they are generally uſed for proceſſions on the water, by noblemen, officers of ſtate, or magiſtrates of great cities. Of this ſort we may naturally ſuppoſe the famous barge or galley of Cleopatra, which, according to Shakeſpeare,

——— "Like a burniſh'd throne
Burnt on the water; the poop was beaten gold;
Purple her ſails, and ſo perfumed, that
The winds were love-ſick with them: the oars were ſilver,
Which to the tune of flutes kept ſtroke, and made
The water which they beat to follow faſter,
As amorous of their ſtrokes——
——— ——— At the helm
A ſeeming mermaid ſteer'd: the ſilken tackles
Swell'd with the touches of thoſe flower-ſoft-hands
That yarely form'd their office.'——

There are likewiſe other barges of a ſmaller kind, for the uſe of admirals and captains of ſhips of war. Theſe are of a lighter frame, and may be eaſily hoiſted into, and out of the ſhips to which they occaſionally belong. See BOAT.

BARGE, *cabotiere*, is alſo the name of a flat-bottomed veſſel of burthen, for lading and diſcharging ſhips, and removing their cargoes from place to place in a harbour.

BARK (*barca*, low Lat.) a general name given to ſmall ſhips: it is however peculiarly appropriated by ſeamen to thoſe which carry three maſts without a mizen top-ſail. Our northern mariners, who are trained in the coal trade, apply this diſtinction to a broad-ſterned ſhip, which carries no ornamental figure on the ſtem or prow.

BARNICLE, *cravan*, a ſpecies of ſhell-fiſh, often found ſticking to the bottoms of ſhips, rocks, &c.

BARRICADE (*barricada*, Span.) a ſtrong wooden rail, ſupported by ſeveral little pillars or ſtanchions, and extending, as a fence, acroſs the foremoſt part of the quarter-deck. In a veſſel of war, the intervals between the pillars are commonly filled with cork, junks of old cable, or matts of platted cordage. In the upper part, there is a double rope-netting, ſupported by double cranes of iron, extending about a foot above the rail; and between the two parts of the netting are ſtuffed a number

number of hammocks, filled with the ſeamens bedding, to intercept and prevent the execution of ſmall-ſhot fired by ſwivel guns, carabines, or muſkets, in the time of battle.

BARS *of the Capſtern and Windlaſs.* See thoſe articles.

BASIN *of a dock*, (*baſſin*, Fr.) a place where the water is confined by double flood-gates, and thereby prevented from running out at the tide of ebb. The uſe of it is to contain ſhips whilſt repairing, either before they enter, or after they come out of the dock.

BASIN, *paradis*, alſo implies ſome part of a haven, which opens from a narrow channel into a wide and ſpacious reſervoir for ſhipping.

BATTENS *of the hatches*, a ſort of long narrow laths, ſcantlings of wooden ſtuff, or ſtreight hoops of caſks. They are nailed along the edges of tarpaulings, which are pieces of tarred canvas, of ſufficient breadth and length to cover the hatches at ſea; the battens ſerve to confine the edges of the tarpaulings cloſe down to the ſides of the hatches, to prevent the water, which may ruſh over the decks in a ſtorm, from penetrating into the lower apartments of the ſhip.

BAY, *baye*, a gulf or inlet of the ſea-coaſt, comprehended between two promontories, or capes of land, where ſhipping frequently ride at anchor, ſheltered from the wind and ſea.

BEACON, *baliſe*, (*beacon*, Sax.) a poſt or ſtake erected over a ſhoal or ſand-bank, as a warning to ſeamen to keep their ſhips at a diſtance.

BEAK-HEAD, *coltis*, a name given to a ſhip's head whoſe forecaſtle is ſquare or oblong, a circumſtance common to all veſſels of war which have two or more decks of guns. In ſmaller ſhips, the forecaſtle is nearly ſhaped like a parabola, whoſe vertex, or angular point, lies immediately over the ſtem.

The ſtrong, projecting, pointed beaks uſed by the antients in time of battle, have been intirely rejected ſince the uſe of gun-powder.

BEAMS, *baux*, (*beam*, Sax. a tree) ſtrong thick pieces of timber, ſtretching acroſs the ſhip from ſide to ſide, to ſupport the decks, and retain the ſides at their proper diſtance.

The BEAMS of ſhips of war are uſually formed of three pieces ſcarfed together; as appears in plate III. They are ſuſtained at each end by thick planks in the ſhip's ſide, called clamps, upon which they reſt. They are alſo firmly connected to the timbers of the ſhip by means of ſtrong knees, and ſometimes by ſtandards. See MIDSHIP-FRAME.

It is neceſſary that the beams, as repreſented in the midſhip-frame, ſhould have a greater height in the middle than at the two ends, to carry the water more readily off from the decks, and to diminiſh the recoil of the guns, which will thereby more eaſily return into their places.

The longeſt of theſe is called the *midſhip-beam*; it is lodged in the midſhip-frame, or between the wideſt frame of timbers. At about two thirds of the height from the keel to the lower-deck, are laid a range of beams, to fortify the hold, and ſupport a platform called the orlop, which contains the cables and ſtores of the ſhip.

There are uſually twenty-four beams on the lower-deck of a ſhip of ſeventy-four guns, and to the other decks additional ones in proportion, as the ſhip lengthens above.

On the BEAM, implies any diſtance from the ſhip on a line with the beams, or at right angles with the keel: thus, if the ſhip ſteers or points northward, any object lying eaſt or weſt, is ſaid to be on the ſtarboard or larboard *beam*. Thus alſo,

Before the BEAM, is an arch of the horizon comprehended between the line that croſſes her length at right angles, and ſome object at a diſtance before it, or between the line of the beam, and that point of the compaſs which ſhe ſtems. Thus if a ſhip, ſteering weſt, diſcovers an iſland on the right, three points *before the beam*, the iſland muſt bear N W b N from the ſhip. See the article BEARING.

BEAN-COD, a ſmall fiſhing-veſſel, or pilot-boat, common on the ſea-coaſts and in the rivers of Portugal. It is extremely ſharp forward, having its ſtem bent inward above into a great curve: the ſtem is alſo plated on the fore-ſide with iron, into which a number of bolts are driven, to fortify it, and reſiſt the ſtroke of another veſſel, which may fall athwart-hauſe. It is commonly navigated with a large lateen ſail, which extends over the whole length of the deck, and is accordingly well fitted to ply to windward.

BEAR-A-HAND! a phraſe of the ſame import with make haſte, diſpatch, quick, &c.

BEARING, in navigation, *giſſement*, an arch of the horizon intercepted between the neareſt meridian and any diſtant object, either diſcovered by the eye, or reſulting from the ſinical proportion; as in the firſt caſe, at 4 P. M. Cape Spado, in the iſle of Candia, bore S by W. by the compaſs.

In the ſecond, the longitudes and latitudes of any two places being given, and conſequently the difference of latitude and longitude between them, the bearing from one to the other is diſcovered by the following analogy:

As the meridional difference of latitude
Is to the difference of longitude:
So is radius
To the tangent bearing.

BEARING is alſo the ſituation of any diſtant object, eſtimated from ſome part of the ſhip according to her poſition. In this ſenſe, an object ſo diſcovered, muſt be either ahead, aſtern, abreaſt, on the bow, or on the quarter.

Theſe BEARINGS, therefore, which may be called mechanical, are on the beam, before the beam, abaft the beam, on the bow, on the quarter, ahead, or aſtern. If the ſhip ſails with a ſide-wind, it alters the names of ſuch bearings in ſome meaſure, ſince a diſtant object on the beam is then ſaid to be to leeward, or to windward; on the lee quarter, or bow; and on the weather quarter or bow.

BEARING-UP, or BEARING-away, *arriver*, in navigation, the act of changing the courſe of a ſhip, in order to make her run before the wind, after ſhe had ſailed ſome time with a ſide-wind, or cloſe-hauled: it is generally performed to arrive at ſome port under the lee, or to avoid ſome imminent danger occaſioned by a violent ſtorm, leak, or enemy in ſight.

This phraſe, which is abſurd enough, ſeems to have been derived from the motion of the helm, by which this effect is partly produced; as the helm is then borne *up* to the windward, or weather ſide of the ſhip. Otherwiſe, it is a direct contradiction in terms, to ſay that a ſhip *bears up*, when ſhe goes before the wind; ſince the current of the wind, as well as that of a river, is always underſtood to determine the ſituation of objects or places within its limits. In the firſt ſenſe we ſay, up to windward and down to leeward; as in the latter we ſay, up or down the river. This expreſſion, however, although extremely improper, is commonly adopted in the general inſtructions of our navy, printed by authority, inſtead of bearing down, or bearing away.

BEATING, in navigation, the operation of making a progreſs at ſea againſt the direction of the wind, in a zig-zag line, or traverſe, like that in which we aſcend a ſteep hill. As this method of ſailing will be particularly explained under the term TACKING, the reader is referred to that article.

To BECALM, *derober*, (from *calme*, Dut.) to intercept the current of the wind, in its paſſage to a ſhip, with any contiguous object, as a ſhore above her ſails, a high ſea behind, or ſome other ſhip. At this time the ſails remain in a ſtate of reſt, and are conſequently deprived of their power to govern the motion of the ſhip.

BECKETS, *bille*, imply in general any thing uſed to confine looſe ropes, tackles, oars, or ſpars, in a convenient place, where they may be diſpoſed out of the way till they are wanted. Hence, beckets are either large hooks, or ſhort pieces of rope, with a knot in one end and an eye in the other, or formed like a circular wreath; or they are wooden brackets; and, probably, from a corruption and miſapplication of this laſt term, aroſe the word becket, which ſeems often to be confounded with bracket.

Put the tacks and ſheets in the BECKETS! the order to hang up the weather main and fore-ſheet, and the lee main and fore-tack, to a little knot and eye-becket on the foremoſt main and fore-ſhrouds, when the ſhip is cloſe-hauled, to prevent them from hanging in the water.

BED, a flat thick piece of timber, uſually formed of the rough ſtaves of caſks, or ſuch like materials, to be lodged under the quarters of caſks containing any liquid, and ſtowed in a ſhip's hold. The uſe of the beds is to ſupport the caſk, and keep the bilge, or middle-part of it, from bearing againſt the ſhip's floor, or againſt the body upon which it reſts, leſt the ſtaves ſhould give way and break in the place where they are weakeſt: or lie in a wet place, ſo as to rot in the courſe of the voyage. See the article STOWING.

BED *of a river, lit*, the bottom of the channel in which the ſtream or current uſually flows.

BED *of a cannon.* See CARRIAGE.

To BELAY, *amarrer*, (from *beleygen*, Belg.) to faſten a rope, by winding it ſeveral times round a cleat, belaying-pin, or kevel: this term is peculiar to ſmall ropes, and chiefly the running-rigging, there being ſeveral other expreſſions uſed for large ropes, as bitting, bending, making faſt, ſtoppering, &c. See thoſe articles.

BEND, *avuſte*, (probably from *bindan*, Sax. to bind) the knot by which one rope is faſtened to another, hence

To BEND, is to faſten one rope to another, of which there are ſeveral methods.

BENDING *the cable*, the operation of clinching, or tying the cable to the ring of its anchor.

BENDING *a ſail*, faſtening it to its yard or ſtay. See the articles SAIL, STAY, and YARD.

BENDS, the thickeſt and ſtrongeſt planks in a ſhip's ſide. See WALES, by which name they are more properly called.

BETWEEN-DECKS, *entre-pont*, the ſpace contained between any two decks of a ſhip.

BEVELLING, in ſhip-building, the art of hewing a timber with a proper and regular curve, according to a mould which is laid on one ſide of its ſurface.

'In order to hew any piece of timber to its proper bevel, it will be neceſſary, firſt, to make one ſide fair, and out of winding; a term uſed to ſignify that the ſide of a timber ſhould be a plane. If this ſide be uppermoſt, and placed horizontally, or upon a level, it is plain, if the timber is to be hewed ſquare, it may be done by a plummet and line; but if the timber is not hewed ſquare, the line will not touch both the upper and lower edge of the piece; or if a ſquare be applied to it, there will be wood wanting either at the upper or lower ſide. This is called within or without a ſquare. When the wood is deficient at the under-ſide, it is called under-bevelling; and when it is deficient in the upper-ſide, it is called ſtanding-bevelling: and this deficiency will be more or leſs according to the depth of the piece; ſo that before the proper bevellings of the timbers are found, it will be ſometimes very convenient to aſſign the breadth of the timbers; nay, in moſt caſes it will be abſolutely neceſſary, eſpecially afore and abaft: though the breadth of two timbers, or the timber and room, which includes the two timbers and the ſpace between them, may be taken without any ſenſible error, as far as the ſquare body goes. For as one line repreſents the moulding-ſide of two timbers, the fore-ſide of the one being ſuppoſed to unite with the aft-ſide of the other; the two may be conſidered as one intire piece of timber.' *Murray's Ship-building.*

BIGHT, *balant*, (*bygan*, Sax. to bend) the double part of a rope when it is folded, in contradiſtinction to the end: as, her anchor hooked the *bight* of our cable, i. e. caught any part of it between the ends. The *bight* of his cable has ſwept our anchor; that is, the double part of the cable of another

other ſhip, as ſhe ranged about, has entangled itſelf under the ſtock or fluke of our anchor.

BIGHT, *anſe*, is alſo a ſmall bay between two points of land.

BILANDER, *bilandre*, Fr. a ſmall merchant-ſhip with two maſts.

The BILANDER is particularly diſtinguiſhed from other veſſels of two maſts by the form of her main-ſail, which is a ſort of trapezia, the yard thereof being hung obliquely on the maſt in the plane of the ſhip's length, and the aftmoſt or hinder end peeked or raiſed up to an angle of about 45 degrees, and hanging immediately over the ſtern; while the fore end ſlopes downward, and comes as far forward as the middle of the ſhip. To this the ſail is bent or faſtened; and the two lower corners, the foremoſt of which is called the tack, and the aftmoſt the ſheet, are afterwards ſecured, the former to a ring-bolt in the middle of the ſhip's length, and the latter to another in the taffarel. The main-ſails of larger ſhips are hung acroſs the deck inſtead of along it, being faſtened to a yard which hangs at right angles with the maſt and the keel.

Few veſſels, however, are now rigged in this method, which has probably been found more inconvenient than ſeveral others. See SHIP. It may not be improper to remark, that this name, as well as brigantine, has been variouſly applied in different parts of Europe to veſſels of different ſorts.

BILGE, (ſuppoſed from *bilik*, Sax. a ſtorm) that part of the floor of a ſhip, on either ſide of the keel, which approaches nearer to an horizontal than to a perpendicular direction, and on which the ſhip would reſt if laid on the ground: or more particularly, thoſe parts of the bottom which are oppoſite to the heads of the floor-timbers amidſhips on each ſide of the keel. Hence, when a ſhip receives a fracture in this place, ſhe is ſaid to be *bilged*.

BILL *of lading*, *connoiſſement*, an acknowledgment ſigned by the maſter of a ſhip, and given to a merchant, containing an account of the goods which the former has received from the latter, &c. with a promiſe to deliver them at the intended place for a certain ſum of money. Each bill of lading muſt be treble; one for the merchant who ſhips the goods, another to be ſent to the perſon to whom they are conſigned, and the third to remain in the hands of the maſter of the ſaid ſhip. It muſt, however, be obſerved, that a bill of lading is only uſed when the goods ſent on board a ſhip are but part of the cargo; for when a merchant loads a veſſel entirely on his own account, the deed paſſed between him and the maſter of the ſhip is called charter-party. See CHARTER-PARTY.

BINACLE, a wooden caſe or box, which contains the compaſſes, log-glaſſes, watch-glaſſes, and lights to ſhew the compaſs at night.

As this is called *bittacle* in all the old ſea-books, even by mariners, it appears evidently to be derived from the French term *habitacle*, (a ſmall habitation) which is now uſed for the ſame purpoſe by the ſeamen of that nation.

The BINACLE (plate I. fig. 4.) is furniſhed with three apartments, with ſliding ſhutters: the two ſide ones, a b, have always a compaſs in each, d, to direct the ſhip's way, while the middle diviſion, c, has a lamp or can-

dle, with a pane of glaſs on either ſide to throw a light upon the compaſs in the night, whereby the man who ſteers may obſerve it in the darkeſt weather, as it ſtands immediately before the helm on the quarter-deck.

There are always two binacles on the deck of a ſhip of war, one being deſigned for the man who ſteers, and the other for the perſon who ſuperintends the ſteerage, whoſe office is called *conning*, or *cunning*.

BIRTH, or BERTH, *evitei*, the ſtation in which a ſhip rides at anchor, either alone or in a fleet; or the diſtance between the ſhip and any adjacent object; comprehending the extent of the ſpace in which ſhe ranges at the length of her cables; as, *ſhe lies in a good birth*, i. e. in a convenient ſituation, or at a proper diſtance from the ſhore and other veſſels; and where there is good anchoring-ground, and ſhelter from the violence of the wind and ſea.

BIRTH, *appartement*, alſo ſignifies the room or apartment where any particular number of the officers or ſhip's company uſually meſs and reſide. In a ſhip of war there is commonly one of theſe between every two guns.

To BITE, *mordre*, to hold faſt in the ground; expreſſed of the anchor.

BITS, *bittes*, (*bitol*, Sax.) a frame compoſed of two ſtrong pieces of timber, fixed perpendicularly in the fore-part of a ſhip, whereon to faſten her cables as ſhe rides at anchor. See b b, PIECES *of the* HULL.

Theſe pieces being let down through ſquare mortiſes cut in the decks above and below, are bolted and fore-locked to the ſhip's beams. There are ſeveral bits in a ſhip, the principal of which are thoſe for the cables: their upper ends commonly reach about four or five feet above the lower deck, over which the cable paſſes. They are ſupported on the fore part by ſtrong ſtandards; one arm of which is bolted to the deck, and the other to the bits: and on the after part is fixed a ſtrong beam of timber, g, (plate I. PIECES *of the* HULL) parallel to the deck, and at right angles with the bits, to which it is bolted and forelocked. The ends of this beam, which is called the croſs-piece, reach about two or three feet beyond the bits, whoſe upper-ends are nearly two feet above the croſs-piece. The cable being paſſed once round about theſe bits, may be gradually ſlackened at pleaſure; without which it would be impoſſible to prevent it from running out with the utmoſt rapidity, when the ſhip rides a great ſtrain, which is always the caſe in a ſtorm, or an impetuous tide. In ſhips of war there are uſually two pair of cable bits, and when they are both uſed at once, the cable is ſaid to be double-bitted. The plan of the bits, with their croſs-pieces and ſtandards, are repreſented in Plate III. where b b are the bits, e their ſtandards, and g the croſs-piece.

To BIT *the cable*, is to put it round the bits, in order to faſten it, or ſlacken it gradually, which laſt is called *veering away*.

The other bits are of a ſmaller kind, but conſtructed nearly in the ſame manner. They are uſed to faſten the top-ſail-ſheets, or the ropes by which the lower corners of the top-ſails are extended.

BLACK-STRAKES, a range of planks immediately above the wales in a ſhip's ſide: they are always covered with a mixture of tar and lamp-black, forming an agreeable variety with the white bottom beneath,

neath, and the ſcraped planks of the ſide, covered with melted turpentine or varniſh of pine, above. All the yards are likewiſe daubed with this mixture, which not only preſerves them from the heat of the ſun and the weather, but gives them a fine gloſs, which makes a good appearance contraſted with the white varniſh on the maſts.

BLADE. See the article OAR.

BLOCK, *poulie*, a machine known in mechanics by the name of pully, and uſed for various purpoſes in a ſhip, particularly to increaſe the mechanical power of the ropes employed in contracting, dilating, or traverſing the ſails. The ends of theſe ropes, being arranged in certain places upon the deck, may thus be readily found whenever they are wanted. The blocks, which are for theſe purpoſes diſpoſed in various places upon the maſts, yards, and ſails, and amongſt the rigging, are alſo of various ſizes, ſhapes, and powers, according to the effect they are calculated to produce. They are ſingle, double, or treble, being ſo denominated from the number of wheels they contain. There are even ſome of five, ſix, and ſeven fold, but theſe are only employed to raiſe or move ſome very weighty bodies, and are not uſed about the yards or ſails. We ſhall begin by deſcribing the moſt ſimple, and afterwards proceed to thoſe which are more complicated.

A common ſingle block is compoſed of three parts; the ſhell, the ſheave, and the pins. The ſhell, *arcaſſe*, approaches neareſt to the figure of a long ſpheroid, ſomewhat flatted in the middle. Between the two flat ſides it is hollowed ſo as to receive a narrow cylindrical wheel called the ſheave, *rouet*, formed of lignum vitæ, or other hard wood; and thro' the centre of this ſheave is bored a round hole, to admit of a pin, which is driven through two correſponding holes in the middle of the ſhell, perpendicular to the hollow ſpace within. The pin thus becomes the axis of the wheel or ſheave, which completes the wooden work of the machine. Thus formed, it is bound with a ſort of rope-ring, which is cloſely fitted to a notch paſſing round the ſurface of the ſhell, and over both ends of the pin: and by this ring, or wreath, which is called a block-ſtrop, they are ſuſpended upon the maſts, ſhrouds, &c.

The complicated blocks, or thoſe which contain a number of wheels, either have all the wheels to run upon one axis, (ſee plate I.) or have their ſhells ſo formed that the wheels are one above another. In the former ſhape they approach neareſt the figure of a cylinder, and in the latter appear like two or more ſingle blocks joined together endways.

In plate I. fig. 7. a, repreſents a ſingle block, and b, c, two double ones, of different kinds, without ſtrops. Fig. e, f, two double tackle-blocks iron bound, the lower one, f, being fitted with a ſwivel. g, a double iron-bound block with a large hook, h, a ſnatch-block, i, a top-block, k, a voyal-block, and l, a clue-garnet-block. See SNATCH-BLOCK, TACKLE, and VOYAL.

The Cat-block (plate II. fig. 15.) is employed to draw the anchor up the cat-head. See the article CAT.

The ſwivel in the iron-bound block is to turn it, that the ſeveral parts of the rope of which the tackle is compoſed may not be twiſted round each other, which would greatly diminiſh the mechanical power.

The top-block is uſed to hoiſt up or lower down the top-maſts, and is for this purpoſe hooked in an eye-bolt driven into the cap. See CAP.

The clue-garnet blocks are uſed to draw the clues, or lower-corners of the *courſes*, up to the yard, and are conſequently faſtened to the clues of thoſe ſails. See CLUE-GARNET. The uſe of the ſhoulder on the lower-end, is to prevent the ſtrop from being fretted or chafed by the motion of the ſail, as the ſhip rolls or pitches.

BOARD, in navigation, (*bordée*, Fr.) the ſpace comprehended between any two places where the ſhip changes her courſe by tacking; or the line over which ſhe runs between tack and tack, when ſhe is turning to windward, or ſailing againſt the direction of the wind. See the articles BEATING and TACKING.

She makes a good BOARD, i. e. ſails nearly upon a ſtreight line, without deviating to leeward when ſhe is cloſe-hauled. See CLOSE-HAULED.

BOARDING, *abordage*, an aſſault made by one ſhip upon another, by entering her in battle with a detachment of armed men; either becauſe the efforts of the artillery and muſquetry have proved ineffectual, or becauſe ſhe may have a greater number of men, and be better equipped for this attack than the enemy who defends herſelf againſt it.

This ſtratagem, however, is chiefly practiſed by privateers upon merchant-ſhips, who are not ſo well provided with men, and rarely attempted in the royal navy; the battle being generally decided in men of war by the vigorous execution of a cloſe cannonade.

An officer ſhould maturely conſider the danger of boarding a ſhip of war before he attempts it; and be well aſſured that his adverſary is weakly manned: for perhaps he wiſhes to be boarded, and if ſo, a great ſlaughter will neceſſarily follow.

The ſwell of the ſea ought alſo to be conſidered, becauſe it may run ſo high as to expoſe both the ſhips to the danger of ſinking.

There is perhaps very little prudence in boarding a ſhip of equal force; and when it is attempted, it may be either to windward or to leeward, according to the comparative force or ſituation of the ſhips. If there be any ſwell, or ſea, it may be more adviſeable to lay the enemy aboard on the lee-ſide, as the water is there the ſmootheſt; beſides, if the boarder is repulſed in that ſituation, he may more eaſily withdraw his men, and ſtand off from his adverſary. But as the weather-ſhip can generally fall to leeward at any time, it is perhaps more eligible to keep to windward, by which ſhe will be enabled to rake her antagoniſt, or fire the broadſide into her ſtern as ſhe croſſes it, in paſſing to leeward, which will do great execution amongſt her men, by ſcouring the whole length of the deck.

Boarding may be performed in different places of the ſhip, according to the circumſtances, preparation and poſition of both: the aſſailant having previouſly ſelected a number of men armed with piſtols and cutlaſſes. A number of powder-flaſks, or flaſks charged with gun-powder and fitted with a fuſe, are alſo provided, to be thrown upon the enemy's deck immediately before the aſſault. Beſides this, the boarder is generally

generally furniſhed with an earthen ſhell, called a ſtink-pot, which on that occaſion is ſuſpended from his yard-arms or bow-ſprit-end. This machine is alſo charged with powder, mixed with other inflammable and ſuffocating materials, with a lighted fuſe at the aperture. Thus prepared for the action, and having grappled his adverſary, the boarder diſplays his ſignal to begin the aſſault. The fuſes of the ſtink-pot and powder-flaſks being lighted, they are immediately thrown upon the deck of the enemy, where they burſt and catch fire, producing an intolerable ſtench and ſmoke, and filling the deck with tumult and diſtraction. Amidſt the confuſion occaſioned by this infernal apparatus, the detachment provided ruſh aboard ſword in hand, under cover of the ſmoke, on their antagoniſt, who is in the ſame predicament with a citadel ſtormed by the beſiegers, and generally overpowered, unleſs he is furniſhed with extraordinary means of defence, or equipped with cloſe-quarters, to which he can retreat with ſome probability of ſafety. See the article CLOSE-QUARTERS.

BOAT (*bæt*, Sax. *boot*, Belg.) a ſmall open veſſel, conducted on the water by rowing or ſailing. The conſtruction, machinery, and even the names of boats, are very different, according to the various purpoſes for which they are calculated, and the ſervices on which they are to be employed.

Thus they are occaſionally ſlight or ſtrong; ſharp or flat-bottomed; open or decked; plain or ornamented; as they may be deſigned for ſwiftneſs or burthen; for deep or ſhallow water; for ſailing in a harbour or at ſea; and for convenience, or pleaſure.

The largeſt boat that uſually accompanies a ſhip is the long-boat, *chaloupe*, which is generally furniſhed with a maſt and ſails: thoſe which are fitted for men of war, may be occaſionally decked, armed, and equipped, for cruiſing ſhort diſtances againſt merchant-ſhips of the enemy, or ſmugglers, or for impreſſing ſeamen, &c.

The barges are next in order, which are longer, ſlighter, and narrower: they are employed to carry the principal ſea-officers, as admirals, and captains of ſhips of war, and are very unfit for ſea. See the article BARGE.

Pinnaces exactly reſemble barges, only that they are ſomewhat ſmaller, and never row more than eight oars; whereas a barge properly never rows leſs than ten. Theſe are for the accommodation of the lieutenants, &c.

Cutters of a ſhip, *bateaux*, are broader, deeper, and ſhorter than the barges and pinnaces; they are fitter for ſailing, and are commonly employed in carrying ſtores, proviſions, paſſengers, &c. to and from the ſhip. In the ſtructure of this ſort of boats, the lower-edge of every plank in the ſide over-lays the upper-edge of the plank below, which is called by ſhipwrights clinch-work.

Yawls, *canots*, are ſomething leſs than cutters, nearly of the ſame form, and uſed for ſimilar ſervices; they are generally rowed with ſix oars.

The above boats more particularly belong to men of war; as merchant-ſhips ſeldom have more than two, viz. a long-boat and yawl: when

when they have a third, it is generally calculated for the countries to which they trade, and varies in its conſtruction accordingly.

Merchant-ſhips employed in the Mediterranean find it more convenient to uſe a lanch, which is longer, more flat-bottomed, and better adapted every way to the harbours of that ſea than a long-boat. See LANCH.

A wherry, *diligence*, is a light ſharp boat, uſed in a river or harbour for carrying paſſengers from place to place.

Punts, *flette*, are a ſort of oblong flat-bottomed boats, nearly reſembling floating ſtages; they are uſed by ſhipwrights and caulkers, for breaming, caulking, or repairing a ſhip's bottom.

A moſes is a very flat broad boat, uſed by merchant-ſhips amongſt the Caribbee-iſlands, to bring hogſheads of ſugar off from the ſea-beach to the ſhipping which are anchored in the roads.

A felucca is a ſtrong paſſage-boat uſed in the Mediterranean, from ten to ſixteen banks of oars. The natives of Barbary often employ boats of this ſort as cruiſers.

For the larger ſort of boats, ſee the articles CRAFT, CUTTER, PERIAGUA, and SHALLOP.

Of all the ſmall boats, a Norway yawl ſeems to be the beſt calculated for a high ſea, as it will often venture out to a great diſtance from the coaſt of that country, when a ſtout ſhip can hardly carry any ſail.

Trim the BOAT! *barque-droit!* the order to ſit in the boat in ſuch a manner as that ſhe ſhall float upright in the water, without leaning to either ſide.

To bale the BOAT, is to throw out the water which remains in her bottom or the well-room.

Moor the BOAT! the order to faſten a boat with two ropes, ſo as that the one ſhall counter-act the other.

For a repreſentation of ſome of the principal boats of a ſhip of war, ſee plate III. where fig. 1. exhibits the elevation, or ſide view, of a ten-oared barge; a a, its keel; b, the ſtern-poſt; c, the ſtem; b c, the water-line, which ſeparates what is under the ſurface of the water from what is above it; e, the row-locks, which contain the oars between them; f, the top of the ſtern; g, the back-board; f g, the place where the cockſwain ſtands or ſits while ſteering the boat; l, the rudder, and m, the tiller, which is of framed iron.

Fig. 2. repreſents the plan of the ſame barge, where d is the 'thwarts, or ſeats where the rowers ſit to manage their oars; f, i, h, the ſtern-ſheets; i k, the benches whereon the paſſengers ſit in the ſtern-ſheets: the reſt is explained in fig. 1.

Fig 3. is a ſtern view of the ſame barge, with the projection of all the timbers in the after-body; and fig. 4, a head view, with the curves of all the timbers in the fore-body.

Having thus explained the different views of the barge, the reader will eaſily comprehend the ſeveral correſponding parts in the other boats; where fig. 5 is the plan, and fig. 6 the elevation of a twelve-oared cutter that rows double banked: which, although ſeldom employed unleſs in capital ſhips, becauſe requiring twelve rowers, is nevertheleſs a very excellent

excellent boat, both for rowing and ſailing. Fig. 7 and 8 are the head and ſtern of this boat.

Fig. 9 is the plan of a long-boat, of which fig. 10 is the elevation, 11 the ſtern-view, and 12 the head-view.

BOAT-HOOK, an iron hook with a ſharp point on the hinder part thereof, to ſtick into a piece of wood, a ſhip's-ſide, &c. It is ſtuck upon a long pole or ſhaft, (pl. III. fig. 1 n.) by the help of which a perſon in the boat may either hook any thing to confine the boat in a particular place, or puſh her off by the ſharp point attached to the back of the hook.

BOATSWAIN, *Contre-maitre*, the officer who has the boats, ſails, rigging, colours, anchors, and cables committed to his charge.

It is the duty of the boatſwain particularly to direct whatever re lates to the rigging of a ſhip, after ſhe is equipped from a royal dock-yard. Thus he is to obſerve that the maſts are properly ſupported by their ſhrouds, ſtays, and back-ſtays, ſo that each of thoſe ropes may ſuſtain a proportional effort when the maſt is ſtrained by the violence of the wind, or the agitation of the ſhip. He ought alſo to take care that the blocks and running-ropes are regularly placed, ſo as to anſwer the purpoſes for which they are intended; and that the ſails are properly fitted to their yards and ſtays, and well furled or reefed when occaſion requires.

It is likewiſe his office to ſummon the crew to their duty; to aſſiſt with his mates in the neceſſary buſineſs of the ſhip; and to relieve the watch when it expires. He ought frequently to examine the condition of the maſts, ſails, and rigging, and remove whatever may be judged unfit for ſervice, or ſupply what is deficient: and he is ordered by his inſtructions to perform this duty *with as little noiſe as poſſible.*

BOB-STAY, *ſous-barbe*, a rope uſed to confine the bowſprit of a ſhip downward to the ſtem, or cut-water. It is fixed by thruſting one of its ends through a hole bored in the fore-part of the cut-water for this purpoſe, and then ſplicing both ends together ſo as to make it two-fold, or like the link of a chain: a *dead-eye* is then ſeized into it, and a *laniard* paſſing through this and communicating with another dead-eye upon the bowſprit, is drawn extremely tight by the help of mechanical powers. See BOWSPRIT.

The uſe of the bob-ſtay, is to draw down the bowſprit, and keep it ſteddy; and to counter-act the force of the ſtays of the fore-maſt, which draw it upwards. The bowſprit is alſo fortified by ſhrouds from the bows on each ſide; which are all very neceſſary, as the foremaſt and the upper-part of the main-maſt are ſtayed and greatly ſupported by the bowſprit. For this reaſon, the bob-ſtay is the firſt part of a ſhip's rigging which is drawn tight to ſupport the maſts. To perform this taſk more effectually, it is uſual to ſuſpend a boat, anchor, or other weighty body, at the bowſprit-end, to preſs it downwards during this operation.

BOLSTERS, a ſort of ſmall cuſhions or bags, filled with tarred canvas, laid between the collars of the ſtays and the edge of ſome piece of wood on which they lie: they are uſed to preſerve the ſtays from being

chafed or galled by the motion of the maſts, as the ſhip rocks or pitches at ſea.

BOLT-ROPE, *ralingue*, a rope to which the edges or ſkirts of the ſails are ſewed, to ſtrengthen, and prevent them from rending. Thoſe parts of the bolt-rope which are on the perpendicular or ſloping edges, are called leech-ropes; that at the bottom, the foot-rope; and that on the top or upper-edge, the head-rope. Stay-ſails, whoſe heads are formed like an acute angle, have no head-rope. To different parts of the bolt-rope are faſtened all the ropes employed to contract or dilate the ſails. The figure and poſition of the bolt-rope is exhibited in the plate referred to from the article SAIL.

BOMB. See the articles MORTAR and SHELL.

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BOOMS, *boute dehors*, certain long poles run out from different places in the ſhip to extend the bottoms of particular ſails. Of theſe there are ſeveral ſorts; as the jib-boom, ſtudding-ſail-booms, ring-tail-boom, driver-boom, main-boom, and ſquare-ſail-boom; the two laſt, however, are only appropriated to ſmall ſhips of one or two maſts. See JIB, &c.

BOOT-TOPPING, the act of cleaning the upper-part of a ſhip's bottom, or that part which lies immediately under the ſurface of the water, and daubing it over with tallow, or with a *coat* or mixture of tallow, ſulphur, reſin, &c.

BOOT-TOPPING is chiefly performed where there is no dock, or other commodious ſituation for breaming or careening; or when the hurry of a voyage renders it inconvenient to have the whole bottom properly trimmed and cleanſed of the filth which gathers to it in the courſe of a ſea-voyage. It is executed by making the ſhip lean to one ſide, as much as they can with ſafety, and then ſcraping off the graſs, ſlime, ſhells, or other material, that adheres to the bottom, on the other ſide, which is elevated above the ſurface of the water for this purpoſe, and accordingly daubed with the coat of tallow and ſulphur. Having thus finiſhed one ſide, they make the ſhip lean to the other ſide, and perform the ſame operation, which not only preſerves the bottom from the worm, but makes the ſhip ſlide ſmoothly through the water. See CAREEN and DOCK.

BORE. See the article CANNON.

BOTH SHEETS AFT, *entre deux écoutes*, the ſituation of a ſhip that ſails right afore the wind, or with the wind right aftern.

BOTTOM,

BOTTOM, *carene*, (*botm*, Sax. *bodem*, Belg.) as a ſea-term, is either uſed to denote the bottom of a ſhip, or that of the water: thus in the former ſenſe we ſay, a clean or a foul bottom; a Britiſh, French, or Dutch bottom: and in the latter ſenſe, a rocky, ſandy, or oozy bottom.

The bottom of a ſhip, as we have deſcribed in the article *Naval* ARCHITECTURE, comprehends all that part which is under water when the ſhip is laden; the figure of it muſt therefore be determined by the qualities required in the ſhip, and the purpoſes for which ſhe is deſigned.

It has been remarked, that a ſhip of war ſhould carry her loweſt tier of cannon ſufficiently above the ſurface of the water to be uſed when neceſſary. If this quality is neglected, a ſmall ſhip will have the advantage of a large one, inaſmuch as the latter cannot open her lower battery in a freſh ſide-wind, without being expoſed to extreme danger, by receiving a great quantity of water in at her ports between-decks.

A ſhip ſhould be duly poiſed, ſo as not to dive or pitch heavily, but go ſmoothly and eaſily through the water, riſing to the waves when they run high, or when the veſſel has reduced her ſail to the ſtorm. If ſhe is deficient in this article, the ſeas will frequently burſt aboard, and ſtrain the decks or carry away the boats. The maſts are alſo greatly endangered from the ſame cauſe.

A ſhip ſhould ſail well when large, or before the wind; but particularly when *cloſe-hauled*, or ſailing with a ſide-wind. She ſhould alſo be enabled in the latter ſituation to keep her wind, without deviating much to leeward; to work and tack eaſily, and lie in a turbulent ſea without ſtraining violently.

Many of our ſhipwrights have conſidered it extremely difficult, if not impracticable, to make a ſhip carry her cannon well, bear a competent ſail, and advance ſwiftly through the water; becauſe a very full bottom is neceſſary to acquire the two firſt qualities; whereas a ſharp floor is better fitted to procure the latter. But when it is remembered, that a full ſhip will carry a much greater force of ſail than a ſharp one, a good artiſt may form the body ſo as to unite all theſe three qualities with the additional one of ſteering eaſily, by paying a proper attention to the following general rules.

To make a ſhip carry a good ſail. A flat floor-timber ſomewhat long, or the lower-futtocks pretty round, a ſtreight upper-futtock, the top-timber to throw out the breadth aloft; at any rate to carry the main-breadth as high as the lower-deck. Now if the rigging be well adapted to ſuch a body, and the upper-works lightened as much as poſſible, ſo that the whole contributes to lower the center of gravity, there will be no reaſon to doubt of the ſhip's carrying a good ſail.

To make a ſhip ſteer well, and anſwer the helm readily. If the faſhion-pieces be well formed, the tuck, or ſpreading-parts under the ſtern, carried pretty high; the midſhip-frame well forward; a conſiderable additional depth in the draught of water abaft more than forward; a great rake forward and none abaft; a ſnug quarter-deck and forecaſtle:

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BOTTOM,

BOTTOM, *carene*, (*bolm*, Sax. *bodem*, Belg.) as a ſea-term, is either uſed to denote the bottom of a ſhip, or that of the water: thus in the former ſenſe we ſay, a clean or a foul bottom; a Britiſh, French, or Dutch bottom: and in the latter ſenſe, a rocky, ſandy, or oozy bottom.

The bottom of a ſhip, as we have deſcribed in the article *Naval* ARCHITECTURE, comprehends all that part which is under water when the ſhip is laden; the figure of it muſt therefore be determined by the qualities required in the ſhip, and the purpoſes for which ſhe is deſigned.

It has been remarked, that a ſhip of war ſhould carry her loweſt tier of cannon ſufficiently above the ſurface of the water to be uſed when neceſſary. If this quality is neglected, a ſmall ſhip will have the advantage of a large one, inaſmuch as the latter cannot open her lower battery in a freſh ſide-wind, without being expoſed to extreme danger, by receiving a great quantity of water in at her ports between-decks.

A ſhip ſhould be duly poiſed, ſo as not to dive or pitch heavily, but go ſmoothly and eaſily through the water, riſing to the waves when they run high, or when the veſſel has reduced her ſail to the ſtorm. If ſhe is deficient in this article, the ſeas will frequently burſt aboard, and ſtrain the decks or carry away the boats. The maſts are alſo greatly endangered from the ſame cauſe.

A ſhip ſhould ſail well when large, or before the wind; but particularly when *cloſe-hauled*, or ſailing with a ſide-wind. She ſhould alſo be enabled in the latter ſituation to keep her wind, without deviating much to leeward; to work and tack eaſily, and lie in a turbulent ſea without ſtraining violently.

Many of our ſhipwrights have conſidered it extremely difficult, if not impracticable, to make a ſhip carry her cannon well, bear a competent ſail, and advance ſwiftly through the water; becauſe a very full bottom is neceſſary to acquire the two firſt qualities; whereas a ſharp floor is better fitted to procure the latter. But when it is remembered, that a full ſhip will carry a much greater force of ſail than a ſharp one, a good artiſt may form the body ſo as to unite all theſe three qualities with the additional one of ſteering eaſily, by paying a proper attention to the following general rules.

To make a ſhip carry a good ſail. A flat floor-timber ſomewhat long, or the lower-futtocks pretty round, a ſtreight upper-futtock, the top-timber to throw out the breadth aloft; at any rate to carry the main-breadth as high as the lower-deck. Now if the rigging be well adapted to ſuch a body, and the upper-works lightened as much as poſſible, ſo that the whole contributes to lower the center of gravity, there will be no reaſon to doubt of the ſhip's carrying a good ſail.

To make a ſhip ſteer well, and anſwer the helm readily. If the faſhion-pieces be well formed, the tuck, or ſpreading-parts under the ſtern, carried pretty high; the midſhip-frame well forward; a conſiderable additional depth in the draught of water abaft more than forward; a great rake forward and none abaft; a ſnug quarter-deck and forecaſtle:

all theſe will greatly facilitate the ſteerage; and a ſhip that ſails well will always ſteer eaſily.

To make a ſhip carry her guns well out of the water. A long floor-timber, and not of great riſing; a very full midſhip-frame, and low tuck, with light upper-works.

To make a ſhip go ſmoothly through the water, and prevent her from pitching heavily. A long keel, a long floor, not to riſe too high afore and abaft; but the area, or ſpace contained in the fore-body, according to the reſpective weight it is deſtined to carry: all theſe are neceſſary to make a ſhip paſs eaſily through the ſea.

To make a ſhip keep a good wind and drive little to leeward. A good length by the keel; not too broad, but pretty deep in the hold, which will occaſion her to have a ſhort floor-timber and a very great riſing. As ſuch a ſhip will meet with great reſiſtance in driving ſideways, and feel very little, in advancing or going ahead, ſhe will fall very little to leeward.

Being thus furniſhed with the methods to qualify a ſhip for the different purpoſes of navigation, the only difficulty remains to apply them properly in the conſtruction, which muſt, in a great meaſure, be left to the judgment of the artiſt. The whole art then is evidently to form the body in ſuch a manner, as that none of theſe qualities ſhall be entirely deſtroyed; and in giving the preference to that which is principally required in the ſervice for which the ſhip is deſtined. As it therefore appears poſſible to unite them all in one veſſel ſo that each of them may be eaſily diſcerned, a neglect of this circumſtance ought to be attributed to the incapacity of the ſhipwright, who has not ſtudied the principles of his art with proper application. See *Naval* Architecture, Building, and Ship.

BOTTOMRY, *bomerie*, (from *bottom*) a contract for borrowing money on the keel or bottom of a ſhip; ſo that the commander binds the ſhip herſelf, that if the money be not paid at the time appointed, the creditors ſhall have the ſhip.

Bottomry is alſo where a perſon lends money to a merchant or adventurer who wants it in traffic, and the lender is to be paid a much greater ſum at the return of the ſhip, ſtanding to the hazard of the voyage. Although the intereſt on this account be greater than the law commonly allows, it is yet not eſteemed uſury; becauſe the money being ſupplied at the lenders riſk, if the ſhip periſhes, he ſhares in the loſs thereof.

BOW, *epaule*, in ſhip-building, the rounding part of a ſhip's ſide forward, beginning at the place where the planks arch inwards, and terminated where they cloſe at the ſtem or prow. See the article Head, where the bow of a ſhip is repreſented at large. It is proved by a variety of experiments, that a ſhip with a narrow bow is much better calculated for ſailing ſwiftly, than one with a broad bow; but is not ſo well fitted for a high ſea, into which ſhe always *pitches*, or plunges, her fore-part very deep, for want of ſufficient breadth to repel the volume of water, which

which ſhe ſo eaſily divides in her fall. The former of theſe is called by ſeamen a *lean*, and the latter a *bluff* bow.

"The bow which meets with the leaſt reſiſtance in a direct courſe, not only meets with the leaſt reſiſtance in oblique courſes, but alſo has the additional property of driving the leaſt to leeward; which is a double advantage gained by forming the bow ſo as to give it that figure which will be the leaſt oppoſed in moving through any medium." *Bouguer's Traité du Navire.*

On the BOW, in navigation, an arch of the horizon, comprehended between ſome diſtant object, and that point of the compaſs which is right-ahead, or to which the ſhip's ſtem is directed. This phraſe is equally applicable, when the object is beheld from the ſhip, or diſcovered by trigonometrical calculation: as, we ſaw a fleet at day-break bearing three points *on the ſtarboard bow*; that is, three points, from that part of the horizon which is right ahead, towards the right hand. See alſo the article BEARING.

BOWER. See the article ANCHOR.

BOWLINE, *bouline*, a rope faſtened near the middle of the leech, or perpendicular edge of the ſquare ſails, by three or four ſubordinate parts, called bridles. It is only uſed when the wind is ſo unfavourable that the ſails muſt be all braced ſideways, or *cloſe-hauled* to the wind: in this ſituation the bowlines are employed to keep the weather, or windward, edges of the principal ſails tight forward and ſteddy, without which they would be always ſhivering, and rendered incapable of ſervice. See the articles BRIDLE, CLOSE-HAULING, and SAIL.

To check the BOWLINE, is to ſlacken it, when the wind becomes large.

To BOWSE, *palanquer*, to draw on any body with a tackle, or complication of pullies, in order to remove it, or otherwiſe alter its ſtate or ſituation: this is chiefly practiſed when ſuch alteration or removal cannot be conveniently effected without the application of mechanical powers. This term is pronounced *bowze*.

BOWSPRIT, *beaupré*, (from *bow* and *ſprit*) a large boom or maſt, which projects over the ſtem, to carry ſail forward, in order to govern the fore part of a ſhip, and counter-act the force of the ſails extended behind, or, in the *after* part. It is otherways of great uſe, as being the principal ſupport of the fore-maſt, by confining the *ſtays* whereby it is ſecured, and enabled to carry ſail: theſe are great ropes ſtretching from the maſt-head to the middle of the bowſprit, where they are drawn tight. See the articles STAY and DEAD-EYE.

BOXES *of the pump*. See the article PUMP.

BOX-HAULING, in navigation, a particular method of veering a ſhip, when the ſwell of the ſea renders tacking impracticable. It is performed by putting the helm *a-lee*, to throw the head up to windward, where meeting with great reſiſtance from the repeated ſhocks of the waves on the weather bow, it *falls off*, or turns to leeward, with a quicker effort, and without advancing. The aftermoſt ſails are at this time diminiſhed, or perhaps altogether deprived of their force of action, for a ſhort

ſhort time, becauſe they would otherwiſe counteract the ſails forward, and prevent the ſhip from turning. They are, however, extended as ſoon as the ſhip, in veering, brings the wind on the oppoſite quarter, as their effort then contributes to aſſiſt her motion of wheeling.

BOX-HAULING is generally performed when the ſhip is too near the ſhore to have room for veering in the uſual way. See VEERING.

BOXING, an operation in ſailing ſomewhat ſimilar to box-hauling. It is performed by laying the head ſails, or the ſails in the fore-part of the ſhip, aback, to receive the greateſt force of the wind in a line perpendicular to their ſurfaces, in order to throw the ſhip's head back into the line of her courſe, after ſhe had inclined to windward of it by neglect of the helmſman, or otherwiſe.

BRACE, *bras*, a rope employed to wheel, or traverſe the ſails upon the maſt, in a direction parallel to the horizon, when it is neceſſary to ſhift the ſails that they may correſpond with the direction of the wind and the courſe of the ſhip. Braces are, for this purpoſe, faſtened to the extremities of the yards, which are called the *yard-arms*.

All the braces of the yards are double, except thoſe of the top-gallant, and ſpritſail-topſail-yards. The mizen-yard is furniſhed with *fangs*, or vangs, in the room of braces. See the article MIZEN.

BRACKETS, *conſoles*, ſhort crooked timbers reſembling knees. They are fixed under the galleries and frame of a ſhip's head, to ſupport the gratings.

BRAILS, *cargues*, (*breuils*, Fr.) certain ropes paſſing through pullies on the mizen-maſt, and afterwards faſtened, in different places, on the hinder, or aftmoſt ridge of the ſail, in order to truſs it up to the maſt, as occaſion requires. See MIZEN.

BRAILS, is likewiſe a general name given to all the ropes which are employed to *haul up*, or collect to their yards, the bottoms, lower corners, and ſkirts of the other great ſails, for the more ready *furling* them whenever it is neceſſary. The operation of thus drawing them together, is called brailing them up, or hauling them up in the brails. See the article SAIL.

BRAKE, *brimbale*, the handle, or lever, by which a common ſhip-pump is uſually managed. It operates by means of two iron bolts thruſt through the inner end of it; one of which reſting acroſs two cheeks or ears, in the upper-end of the pump, ſerves as a fulcrum for the brake, ſupporting it between the cheeks. The other bolt connects the extremity of the brake to the pump-ſpear, which draws up the *box* or piſton, charged with the water in the tube. See the article PUMP.

BREADTH, *largeur*, the meaſure of a ſhip from ſide to ſide in any particular place: it is uſually diſtinguiſhed into extreme-breadth, *ligne du fort*, main-breadth, and top-timber-breadth. See the explanation of the plane of projection, in the article *Naval* ARCHITECTURE.

As the ſides of the ſhip are formed by a variety of ribs, called timbers, and the areas of thoſe timbers being of different breadths above and below, it is neceſſary to diſtinguiſh them in the conſtruction, in order to form their ſeveral curves, and fix the correſponding pieces with more accu-

racy

racy and preciſion. The part of every timber which encloſes the greateſt ſpace from the middle-line of the ſhip's length, is therefore called the *main*-breadth; and the diſtance between the upper-part of the ſame timber and the middle-line of the ſhip's length, is called the top-timber-breadth.

As the ſhip is alſo broader at the midſhip-frame than in any other point of her length, the diſtance between her ſides in the main-breadth of that timber, is called the extreme-breadth of the ſhip.

BREADTH-SWEEP, the radius of the arch which forms part of the curve of a ſhip's timber; as explained in the horizontal plane. See *Naval* ARCHITECTURE.

BREAKERS, *briſans*, a name given by ſailors to thoſe billows that break violently over rocks lying under the ſurface of the ſea. They are diſtinguiſhed both by their appearance and ſound, as they cover that part of the ſea with a perpetual foam, and produce a hoarſe and terrible roaring, very different from what the waves uſually have in a deeper bottom.

When a ſhip is unhappily driven amongſt breakers, it is hardly poſſible to ſave her, as every billow that heaves her upwards, ſerves to daſh her down with additional force, when it breaks over the rocks or ſands beneath it.

BREAKING-BULK, the act of beginning to unlade a ſhip; or of diſcharging the firſt part of the cargo.

To BREAK-UP, *déchirer*, to rip off the planks of a ſhip, and take her to pieces, when ſhe becomes old and unſerviceable.

BREAK-WATER, the hulk, or hull, of ſome old ſhip or veſſel, ſunk at the entrance of a ſmall harbour, to break off, and diminiſh the force of the waves, as they advance towards the veſſels moored within.

BREAK-WATER is alſo a ſort of ſmall buoy, faſtened to a large one in the water, when the buoy-rope of the latter is not long enough to reach from the anchor, lying on the bottom, to the ſurface of the water. The uſe of this break-water is therefore to ſhew where the buoy ſwims. See BUOY.

To BREAM, *chauffer* (from *broom*) to burn off the filth, ſuch as graſs, ooze, ſhells, or ſea-weed, from a ſhip's bottom, that has gathered to it in a voyage, or by lying long in a harbour. This operation is performed by holding kindled furze, faggots, or ſuch materials, to the bottom, ſo that the flame incorporating with the pitch, ſulphur, &c. that had formerly covered it, immediately looſens and throws off whatever filth may have adhered to the planks. After this, the bottom is covered anew with a compoſition of ſulphur, tallow, &c. which not only makes it ſmooth and ſlippery, ſo as to divide the fluid more readily, but alſo poiſons and deſtroys thoſe worms which eat through the planks in the courſe of a voyage. Breaming may be performed either when the ſhip lies aground after the tide has ebbed from her, by *docking*, or by *careening*, which ſee; as alſo COAT and STUFF.

BREAST-

BREAST-FAST, a ſort of hawſer, or large rope, employed to confine a ſhip ſideways to a wharf or key, or to ſome other ſhip; as the head-faſt confines her forward, and the ſtern-faſt, abaft.

BREAST-HOOKS, *guirlandes*, (from *breaſt* and *hook*) are thick pieces of timber, incurvated into the form of knees, and uſed to ſtrengthen the fore-part of the ſhip, where they are placed at different heights directly acroſs the ſtem, ſo as to unite it with the bows on each ſide.

The breaſt-hooks are ſtrongly connected to the ſtem and hawſe-pieces by tree-nails, and by bolts, driven from without, through the planks and hawſe-pieces, and the whole thickneſs of the breaſt-hooks, upon whoſe inſide thoſe bolts are forelocked, or clinched, upon rings. They are uſually about one third thicker, and twice as long, as the knees of the decks which they ſupport.

There are generally four or five of theſe pieces in the hold between the kelſon and the lower-deck, in the form of R, (plate I. PIECES *of the* HULL), upon the uppermoſt of which the planks of that deck are rabitted. There are two placed between the lower and the ſecond decks, in the form of S, (plate I.), one of which is immediately beneath the hawſe-holes, and the other under the ſecond deck, whoſe planks are inlaid thereon, and upon which the inner-end of the bowſprit frequently reſts.

The fore-ſide of the breaſt-hook, which is convex, is formed ſo as to correſpond with the place in which it is ſtationed, that is to ſay, it conforms exactly to the interior figure of that part of the bow where it ought to be fayed: accordingly the branches, or arms, of the breaſt-hooks, make a greater angle as they are more elevated above the keel, whilſt the lower ones are more incurvated, and are almoſt figured like the crotches.

As it is not neceſſary that the inner, or concave ſide of theſe pieces, ſhould retain a regular form, the artificers frequently let them remain as thick as poſſible, to give additional ſupport to the ſhip's fore-part, where ſhe ſuſtains the whole ſhock of reſiſtance in dividing the fluid, or in plunging down into it.

It is evident that the connexion and ſolidity of the ſhip in this place will be reinforced in proportion to the ſtrength and extent of the breaſt-hooks, ſo that they may cover a greater number of the head-timbers.

BREAST-WORK, *fronteau*, a ſort of baluſtrade or fence, compoſed of rails or mouldings, and frequently decorated with ſculpture. It is uſed to terminate the quarter-deck and poop at the fore-ends, and to incloſe the forecaſtle both before and behind.

BREECHING, *brague*, (from *breech*) a rope uſed to ſecure the cannon of a ſhip of war, and prevent them from recoiling too much in the time of battle.

It is fixed by faſtening the middle of it to the hindmoſt knob or caſcabel of the gun, which ſailors call the pomiglion, or pummelion; the two ends of it are afterwards inſerted through two ſtrong rings on the ſides of the carriage, and faſtened to other bolts in the ſhip's ſides.

The

The breeching is of ſufficient length to let the muzzle of the cannon come within the ſhip's ſide to be charged.

The uſe of the breeching, as it checks the recoil of the cannon, is ſhewn in plate III. DECK, where it is expreſſed by e e, paſſing through the ring-bolts, f, on the ſide of the carriage, g, being faſtened to the caſcabel, h. It is alſo exhibited in the MIDSHIP-FRAME, where it is employed to laſh the cannon when it is *houſed* during the courſe of a voyage. See the article CANNON.

BREWING, the appearance of a collection of black and tempeſtuous clouds ariſing gradually from a particular part of the hemiſphere, as the fore-runner of a ſtorm.

BRIDLES, the upper-part of the moorings laid in the king's harbours to ride ſhips or veſſels of war. See the article MOORINGS.

BRIDLES *of the bowline*, *pattes*, the legs by which the bowline is faſtened to different places on the edge or ſkirt of a large ſail.

We have already explained the uſe of the *bowline*; that it is employed to confine or keep ſteddy the windward or weather edges of the principal ſails when they are braced for a ſide-wind. For as the current of air enters the cavity of the ſail in a direction nearly parallel to its ſurface, it follows that the ridge of the ſail muſt neceſſarily be ſhaken by the wind, unleſs it is kept tight forward; but as a ſingle rope has not been found ſufficient to confine the whole ſkirt of the ſail, inaſmuch as it only draws upon one part thereof, it became neceſſary to apply bridles or legs ſpreading out from the bowline. They are repreſented in the figures annexed to the article SAIL.

BRIG, or BRIGANTINE, a merchant-ſhip with two maſts. This term is not univerſally confined to veſſels of a particular conſtruction, or which are maſted and rigged in a method different from all others. It is variouſly applied, by the mariners of different European nations, to a peculiar ſort of veſſel of their own marine.

Amongſt Engliſh ſeamen, this veſſel is diſtinguiſhed by having her main-ſail ſet nearly in the plane of her keel; whereas the main-ſails of larger ſhips are hung athwart, or at right angles with the ſhip's length, and faſtened to a yard which hangs parallel to the deck: but in a brig, the foremoſt edge of the main-ſail is faſtened in different places to hoops which encircle the main-maſt, and ſlide up and down it as the ſail is hoiſted or lowered: it is extended by a *gaff* above, and by a boom below.

To BRING *by the lee*. See *To* BROACH-TO.

To BRING-TO, in navigation, *capoſer*, to check the courſe of a ſhip when ſhe is advancing, by arranging the ſails in ſuch a manner as that they ſhall counter-act each other, and prevent her either from retreating or moving forward. In this ſituation the ſhip is ſaid to lie-by, or lie-to, having, according to the ſea-phraſe, ſome of her ſails *aback*, to oppoſe the force of thoſe which are *full*; or having them otherwiſe ſhortened by being *furled*, or *hauled up in the brails*.

BRINGING-TO, is generally uſed to detain a ſhip in any particular ſtation, in order to wait the approach of ſome other that may be advancing

vancing towards her: or to retard her courſe occaſionally near any port in the courſe of a voyage.

To BRING-UP, a provincial phraſe peculiar to the ſeamen in the coal-trade, ſignifying to anchor, &c.

To BROACH-TO, in navigation, to incline ſuddenly to windward of the ſhip's courſe when ſhe ſails with a large wind; or, when ſhe ſails directly before the wind, to deviate from the line of her courſe, either to the right or left, with ſuch rapidity as to bring the ſhip's ſide unexpectedly to windward, and expoſe her to the danger of overſetting.

It is eaſy to conceive that a ſhip will carry much more ſail before the wind than when ſhe makes a progreſs with her ſide to its direction, becauſe when the current of wind acts nearly endways on her hull, the preſſure of it on the maſts muſt be conſiderably diminiſhed as ſhe yields to its impulſe and flies before it; and that if ſhe carries a great ſail at this time, it can only preſs her fore-part lower down in the water. But if, when ſhe carries a great extenſion of ſail, her ſide is ſuddenly brought to the wind, it may be attended with the moſt fatal conſequences, as the whole force of it then pours like a torrent into the cavities of the ſails. The maſts therefore unavoidably yield to this ſtrong impreſſion, acting like levers on the ſhip ſideways, ſo as nearly to overturn her, unleſs ſhe is relieved by ſome other event, which may be alſo extremely pernicious, ſuch as the ſails rending to pieces, or the maſts being carried away.

It is generally occaſioned by the difficulty of ſteering the ſhip; by the negligence or incapacity of the helmſman; or by ſome diſaſter happening to the helm or its machinery, which renders it incapable of governing the ſhip's courſe.

The difference between broaching-to and bringing *by the lee*, may be thus defined. Suppoſe a ſhip with a great ſail ſet is ſteering ſouth, having the wind N.N.W. then is weſt the *weather*, and eaſt the *lee-ſide*.

If by ſome deficiency in the ſteerage her head turns round to the weſtward, ſo as that her ſails are all taken aback on the weather-ſide before ſhe can be made to return to the courſe from which ſhe has deviated, ſhe is ſaid to *broach-to*.

If otherwiſe her head, from the ſame cauſe, has declined ſo far eaſtward as to lay her ſails aback on that ſide which was the lee-ſide, it is called bringing her by the lee.

BROADSIDE, *bordee*, in a naval engagement, the whole diſcharge of the artillery on one ſide of a ſhip of war above and below; as,

We poured a broadſide into the enemy's ſhip, i. e. diſcharged all the ſhip's cannon on one ſide upon her.

She brought her broadſide to bear on the caſtle; that is, diſpoſed the ſhip ſo as to point all her cannon to it within point-blank range.

A ſquall of wind laid the ſhip on her broadſide; that is, preſſed her down in the water, ſo as nearly to overturn her.

BROKEN-

BROKEN-BACKED, *adj.* the ſtate or quality of a ſhip, which is ſo looſened in her frame, either by age, weakneſs, or ſome great ſtrain, as to droop at each end.

This circumſtance is more common amongſt French than the Engliſh or Dutch ſhips, owing partly to their great length, and to the ſharpneſs of the floor, whoſe breadth is not ſufficiently carried from the middle towards each end; and partly from being frequently obliged to have a great weight in both ends, when they are empty in the middle, at the time of diſcharging one cargo and taking in another. See CAMBERING.

BUCCANEER, a name given to certain piratical rovers of various European nations, who formerly infeſted the Spaniſh coaſts in America, and, under pretence of traffic with the inhabitants, frequently ſeized their treaſure, plundered their houſes, and committed many other depredations.

Ship-BUILDING may be defined the manner of conſtructing ſhips, or the work itſelf, as diſtinguiſhed from naval architecture, which we have rather conſidered as the theory or art of delineating ſhips on a plane, and to which this article may properly be underſtood as a ſupplement.

The pieces by which this complicated machine is framed, are joined together in various places, by ſcarfing, rabitting, tenanting, and ſcoring. See thoſe articles.

During the conſtruction of a ſhip, ſhe is ſupported in the dock, or upon a wharf, by a number of ſolid blocks of timber placed at equal diſtances from, and parallel to, each other, as may be ſeen in the article LANCHING; ſhe is then ſaid to be on the ſtocks.

The firſt piece of timber laid upon the blocks is generally the keel; I ſay *generally*, becauſe, of late, a different method has been adopted in ſome of the royal dock-yards, by beginning with the floor-timbers; the artiſts having found that the keel is often apt to rot during the long period of building a large ſhip of war. The pieces of the keel, as exhibited in plate I. are ſcarfed together, and bolted, forming one entire piece, A A. which conſtitutes the length of the veſſel below. At one extremity of the keel is erected the *ſtem*. It is a ſtrong piece of timber incurvated nearly into a circular arch, or, according to the technical term, *compaſſing*, ſo as to project outwards at the upper-end, forming what is called the *rake* forward. In ſmall veſſels this is framed of one piece, but in large ſhips it is compoſed of ſeveral pieces ſcarfed and bolted together, as expreſſed in the explanation of plate I. PIECES *of the* HULL, and in thoſe terms ſeparately. At the other extremity of the keel, is elevated the ſtern-poſt, which is always of one entire ſtrait piece. The heel of it is let into a mortiſe in the keel, and having its upper-end to hang outwards, making an obtuſe angle with the keel, like that of the ſtem: this projection is called the *rake* abaft. The ſtern poſt, which ought to ſupport the ſtern, contains the iron-work or hinges of the rud-

der, which are called *goggings*, and unites the lower-part of the ſhip's ſides abaft. See the connexion of thoſe pieces in the ELEVATION, pl. I.

Towards the upper-end of the ſtern-poſt, and at right angles with its length, is fixed the middle of the *wing-tranſom*, where it is firmly bolted. Under this is placed another piece parallel thereto, and called the deck-tranſom, upon which the after-end of the lower-deck is ſupported. Parallel to the deck-tranſom, and at a proper diſtance under it, another piece is fixed to the ſtern-poſt, called the firſt tranſom, all of which ſerve to connect the ſtern-poſt to the *faſhion pieces*. Two more tranſoms, called the ſecond and third, are alſo placed under theſe, being likewiſe attached to the faſhion pieces, into which the extremities of all the tranſoms are let, as exhibited in plate X. fig. 1. The faſhion-pieces are formed like the other timbers of the ſhip, and have their heels reſting on the upper-part of the kelſon, at the after extremity of the floor-ribbands.

All theſe pieces, viz. the tranſoms, the faſhion-pieces, and their top-timbers, being ſtrongly united into one frame, are elevated upon the ſtern-poſt, and the whole forms the ſtructure of the ſtern, upon which the galleries and windows, with their ornaments, are afterwards built.

The ſtem and ſtern-poſt being thus elevated upon the keel, to which they are ſecurely connected by knees and arched pieces of timber bolted to both; and the keel being raiſed at its two extremities by pieces of dead-wood, the midſhip *floor-timber* is placed acroſs the keel, whereto it is bolted through the middle. The floor-timbers before and abaft the midſhip-frame are then ſtationed in their proper places upon the keel; after which the *kelſon*, which, like the keel, is compoſed of ſeveral pieces ſcarfed together, is fixed acroſs the middle of the floor-timbers, to which it is attached by bolts driven through the keel, and clinched on the upper-part of the kelſon. The futtocks are then raiſed upon the floor-timbers, and the *hawſe-pieces* erected upon the cant-timbers in the fore-part of the ſhip. The top-timbers on each ſide are next attached to the head of the futtocks, as already explained in the article *naval* ARCHITECTURE. The frames of the principal timbers being thus completed, are ſupported by ribbands, as exhibited in the plate referred to from the article RIBBANDS.

The ribs of the ſhip being now ſtationed, they proceed to fix on the planks, of which the wales are the principal, being much thicker and ſtronger than the reſt; as is repreſented in the MIDSHIP-FRAME. The harpins, which may be conſidered as a continuation of the wales at their fore-ends, are fixed acroſs the hawſe-pieces, and ſurround the fore-part of the ſhip. The planks that incloſe the ſhip's ſides are then brought about the timbers, and the *clamps*, which are of equal thickneſs with the wales, fixed oppoſite to the wales within the ſhip; theſe are uſed to ſupport the ends of the beams, and accordingly ſtretch from one end of the ſhip to the other. The *thick ſtuff*, or ſtrong planks of the bottom within-board, are then placed oppoſite to the ſeveral ſcarfs of the timbers, to reinforce them throughout the ſhip's length. The planks employed

ployed to line the ſhip, called the *ceiling*, or *foot-waling*, is next fixed in the intervals between the thick-ſtuff of the hold. The *beams* are afterwards laid acroſs the ſhip to ſupport the decks, and are connected to the ſide by lodging and hanging knees; the former of which are exhibited in their proper ſtations in plate III. F. and the hanging ones, together with the breadth, thickneſs, and poſition of the keel, floor-timbers, futtocks, top timbers, wales, clamps, thick-ſtuff, planks within and without, beams, decks, &c. are ſeen in the MIDSHIP-FRAME.

The cable-bits being next erected, the *carlings* and *ledges*, which are repreſented in plate III. and deſcribed in their proper places, are diſpoſed between the beams to ſtrengthen the deck. The *water-ways* are then laid on the ends of the beams throughout the ſhip's length, and the ſpirketting fixed cloſe above them. The upper-deck is then planked, and the *ſtring* placed under the *gunnel* or *planſheer* in the waiſt. The diſpoſition of thoſe latter pieces on the timbers, viz. the water-ways, ſpirketting, upper-deck, ſtring, and gunnel, are alſo repreſented in the MIDSHIP-FRAME.

They proceed next to plank the quarter-deck and forecaſtle, and to fix the *partners* of the maſts and capſterns with the *coamings* of the hatches. The *breaſt-hooks* are then bolted acroſs the ſtem and bow within-board, the *ſtep* of the fore-maſt placed on the kelſon; and the *riders*, exhibited in the MIDSHIP-FRAME, fayed on the inſide of the timbers to reinforce the ſides in different places of the ſhip's length. The *pointers*, if any, are afterwards fixed acroſs the hold diagonally to ſupport the beams; and the *crotches* ſtationed in the after-hold to unite the half-timbers. The *ſteps* of the main-maſt and capſterns are next placed; the planks of the lower-decks and orlop laid; the *navel-hoods* fayed on the hawſe-holes; and the *knee of the head*, or cutwater, connected to the ſtem. The figure of the head is then erected, and the *trail-board* and cheeks fixed on the ſides of the knee.

The *taffarel* and *quarter pieces*, which terminate the ſhip abaft, the former above, and the latter on each ſide, are then diſpoſed; and the ſtern and quarter galleries framed and ſupported by their brackets. The *pumps*, with their well, are next fixed in the hold; the *limber-boards* laid on each ſide of the kelſon, and the *garboard* ſtrake fixed on the ſhip's bottom next to the keel without.

The hull being thus fabricated, they proceed to ſeparate the apartments by *bulk-heads*, or partitions; to frame the *port-lids*; to fix the *cat-heads* and *cheſs-trees*; to form the *hatchways* and *ſcuttles*, and fit them with proper covers or *gratings*. They next fix the ladders whereby to mount or deſcend the different hatchways, and build the *manger* on the lower deck, to carry off the water that runs in at the hawſe-holes when the ſhip rides at anchor in a ſea. The bread-room and magazines are then lined, and the *gunnel*, *rails*, and *gangways*, fixed on the upper part of the ſhip. The *cleats*, *kevels*, and *ranges*, by which the ropes are faſtened, are afterwards bolted or nailed to the ſides in different places.

The

The *rudder*, being fitted with its irons, is next hung to the ſtern-poſt; and the *tiller*, or bar, by which it is managed, let into a mortiſe at its upper-end. The *ſcuppers*, or leaden tubes, that carry the water off from the decks, are then placed in holes cut through the ſhip's ſides; and the *ſtandards*, repreſented in the MIDSHIP-FRAME, bolted to the beams and ſides above the decks to which they belong. The poop-lanthorns are laſt fixed upon their cranes over the ſtern, and the bilge-ways, or cradles, placed under the bottom, to conduct the ſhip ſteadily into the water whilſt lanching.

As the various pieces, which have been mentioned above, are explained at large in their proper places, with references to their figures according to the plan of this work, it would have been ſuperfluous to have entered into a more particular deſcription of them here. It is perhaps neceſſary to obſerve, that as the theory ought always to precede the practice, this article would probably be much better underſtood by previouſly reading that of *Naval* ARCHITECTURE, which may be conſidered as a proper introduction to it.

BUILT, *fabrique*, the particular form or ſtructure of a ſhip, by which ſhe is diſtinguiſhed from others of a different claſs or nation. Thus a ſhip is ſaid to be frigate-built, galley-built, a hag-boat, a pink, a cat, &c. or to be Engliſh-built, French-built, American-built, &c.

BULK-HEADS, certain partitions, or walls, built up in ſeveral places of a ſhip between two decks, either lengthwiſe or acroſs, to form and ſeparate the various apartments. Some of thoſe which are built acroſs the ſhip are remarkably ſtrong. See the article CLOSE-QUARTERS.

BULL'S-EYE, *coſſe*, a ſort of ſmall pulley in the form of a ring, having a rope ſpliced round the outer edge of it, (which is hollowed to admit of the rope) and a large hole in the middle for another rope to ſlide in. It is ſeldom uſed but for the main and fore bowline-bridles of ſome ſhips, particularly the colliers of Northumberland, &c. It is ſpliced in the outer-end of the bowline, and ſliding along the bridle, to reſt in the moſt appoſite place, draws it tight above and below. This implement is more frequently uſed by Dutch than Engliſh ſeamen.

BUMKIN, or BOOMKIN, *boute-lof*, a ſhort boom or bar of timber, projecting from each *bow* of a ſhip, to extend the lower-edge of the fore-ſail to windward; for which purpoſe there is a large block fixed on its outer end, through which the rope is paſſed that is faſtened to the lower-corner of the ſail to windward, called the *tack*; and this being drawn tight down, brings the corner of the ſail cloſe to the block, which being performed, the *tack* is ſaid to be *aboard*.

The bumkin is ſecured by a ſtrong rope which confines it downward to the ſhip's bow, to counter-act the ſtrain it bears from the fore-ſail above, dragging it upwards.

BUNT, the middle part, or cavity of the principal ſquare ſails, as the main-ſail, fore-ſail, top-ſails, and top-gallant-ſails. If one of thoſe ſails is ſuppoſed to be divided into four equal parts, from one ſide to the other,

other, then may the two middle diviſions, which comprehend half of the ſail, be properly called the limits of the bunt.

BUNTINE, *etamine*, a thin woollen ſtuff, of which the colours and ſignals of a ſhip are uſually formed.

BUNTLINES, *cargues fond*, are ropes faſtened to the bottoms of the ſquare ſails, to draw them up to the yards: they are inſerted through certain blocks above, or on the upper-part of the yard, whence paſſing down-wards on the fore-part of the ſail, they are faſtened below to the lower-edge in ſeveral places of the *bolt-rope*.

BUOY, (*bouée*, Fr.) a ſort of cloſe caſk, or block of wood, faſtened by a rope to the anchor, to determine the place where the anchor is ſituated, that the ſhip may not come too near it, to entangle her cable about the ſtock, or the flukes of it.

Buoys are of various kinds; as,

Can-Buoys; theſe are in the form of a cone, (ſee plate II. fig. 8.) and of this conſtruction are all the buoys which are floated over dangerous banks and ſhallows, as a warning to paſſing ſhips, that they may avoid them. They are extremely large, that they may be ſeen at a diſtance, and are faſtened by ſtrong chains to the anchors which are ſunk for this purpoſe at ſuch places.

Nun-Buoys, are ſhaped like the middle fruſtum of two cones, abutting upon one common baſe, (plate II. fig 9.) being caſks, which are large in the middle, and tapering, nearly to a point, at each end.

Wooden Buoys, are ſolid pieces of timber, ſometimes in the ſhape of a cylinder, and ſometimes of a nun-buoy; they are furniſhed with one or two holes, in which to fix a ſhort piece of rope, whoſe two ends being ſpliced together make a ſort of circle or ring called the ſtrop.

Cable-Buoys, common caſks employed to buoy up the cable in different places from any rocky ground. In the harbour of Alexandria, in Egypt, every ſhip is moored with at leaſt three cables, and has three or four of theſe buoys on each cable for this purpoſe.

BUOY-ROPE, the rope which faſtens the buoy to the anchor: it ſhould be little more than equal in length to the depth of the water where the anchor lies, as it is intended to float near, or immediately above the bed of it, that the pilot may at all times know the ſituation thereof. See plate I. fig. 6. b is the anchor, c the buoy-rope, and d the buoy floating on the ſurface of the water.

The Buoy-Rope is often extremely uſeful otherways, in drawing up the anchor when the cable is broke. It ſhould therefore be always of ſufficient ſtrength for this purpoſe, or elſe the anchor may be loſt through negligence.

Slings of the Buoy, the ropes which are faſtened about it, and by which it is hung: they are curiouſly ſpliced round it, ſomething reſembling the braces of a drum.

To ſtream the Buoy, is to let it fall from the ſhip's ſide into the water, which is always done before they let go the anchor, that it may not be retarded by the buoy-rope as it ſinks to the bottom.

BURTHEN,

BURTHEN, or BURDEN, *port*, (*byrthen*, Sax.) the weight or meaſure of any ſpecies of merchandize that a ſhip will carry when fit for ſea.

To determine the burthen, or, in other words, the tonnage, of a ſhip, it is uſual to multiply the length of the keel into the extreme breadth of the ſhip within-board, taken along the midſhip-beam, and multiply the product by the depth in the *hold* from the plank joining to the *kelſon* upwards, to the main-deck, and divide the laſt product by 94, then will the quotient be the burden required, in tons.

BURTON, *bredindin*, a ſort of ſmall tackle, formed by two blocks or pullies, till the rope becomes three or four fold, and acquires an additional power in proportion.

It is generally employed to tighten the ſhrouds of the top-maſts, but may be otherways uſed to move or draw along any weighty body in the *hold*, or on the *deck*, as anchors, bales of goods, large caſks, &c.

BUSS, *buche*, (*buſſe*, Germ.) a ſhip of two maſts, uſed by the Engliſh and Dutch in their herring fiſheries. It is generally from fifty to ſeventy tons burthen; being furniſhed with two ſmall ſheds or cabins, one at the prow and the other at the ſtern; the former of which is employed as a kitchen.

BUTT, *about*, the end of any plank in a ſhip's ſide which unites with the end of another, continuing its length: when a plank is looſened at the end by the ſhip's weakneſs or labouring, ſhe is ſaid to have ſtarted or ſprung a butt.

BUTTOCK, the convexity of a ſhip behind, under the ſtern; it is terminated by the counter above, and by the after part of the bilge below, by the rudder in the middle, and by the quarter on the ſide.

BUTTONS. See the article BONNET.

C.

CABIN, *cabane*, a room or apartment in a ſhip where any of the officers uſually reſide.

There are many of theſe in a large ſhip; the principal of which is deſigned for the captain, or commander. In ſhips of the line, this chamber is furniſhed with an open gallery in the ſhip's ſtern, as alſo a little gallery on each quarter. The apartments where the inferior officers or common ſailors ſleep and meſs, are uſually called births; which ſee.

The bed-places built up for the ſailors at the ſhip's ſide in merchantmen, are alſo called cabins.

CABLE, (*cable*, Fr.) a large, ſtrong rope of a conſiderable length, uſed to retain a ſhip at anchor in a road, bay, or haven.

Cables are of various ſorts and ſizes. In Europe they are uſually manufactured of hemp; in Africa they are more frequently compoſed of baſs, which is a ſort of long ſtraw or ruſhes; and in Aſia of a peculiar ſort of Indian graſs.

Cables, of what thickneſs ſoever, are generally formed of three ropes twiſted together, which are then called *ſtrands*: each of theſe is compoſed of three ſmaller ſtrands; and thoſe laſt of a certain number of rope-yarns. This number is therefore greater or ſmaller in proportion to the ſize of the cable required.

There are ſome cables, however, manufactured of four ſtrands; which are chiefly the production of Italy and Provence.

All ſhips ought to be furniſhed with at leaſt three good cables; the *ſheet* cable, and the two *bowers*; beſt and ſmall.

All cables ought to be one hundred and twenty fathoms in length; for which purpoſe the threads or yarns muſt be one hundred and eighty fathoms; inaſmuch as they are diminiſhed one third in length by twiſting. Beſides this length, it is neceſſary to ſplice at leaſt two cables together, in order to double the length when a ſhip is obliged to anchor in deep water. For although it is not common to anchor in a greater depth than forty fathoms, yet if there is only one cable, and the ſhip rides in a ſtorm and tempeſtuous ſea, the anchor will of neceſſity ſuſtain the whole weight and violent jerking of the ſhip, in a direction too nearly perpendicular. By this effort it will unavoidably be looſened from its hold, and dragged by the ſhip, which thus driven from her ſtation, is in immediate danger of being wrecked on the neareſt rocks or ſhallows; whereas it is evident, that if the cable, by its great length, were to draw more horizontally on the anchor, it would bear a much greater force. See ANCHOR.

The long cable is not ſo apt to break as the ſhort one; becauſe it will bear a great deal more ſtretching before it comes to the greateſt ſtrain:

it therefore reſembles a ſort of ſpring, which may be very eaſily extended, and afterwards recovers its firſt ſtate, as ſoon as the force which extended it is removed. Beſides all this, a ſhip will ride much ſmoother with a long cable, and be leſs apt to *pitch*, or plunge deep in the water with her fore-part.

On the contrary, the ſhort cable, being too nearly vertical to the anchor, cannot bear ſuch a ſtrain, becauſe it is charged with a greater effort; and, as it will not bear ſtretching, may break at the firſt violent tug. The ſhip alſo rides with much greater difficulty, labours extremely, and often plunges all her fore-part under water.

By what has been ſaid on this ſubject, we may ſee how very neceſſary it is to furniſh a ſhip with ſufficiency of cables, or what is called ground-tackle; and what an inconſiderate policy it is in merchants to expoſe their veſſels to ſuch evident dangers from the want of them. For we may venture to aſſert, without violation of truth, that many good ſhips have been loſt only on account of a deficiency in this important article.

A cable ought neither to be twiſted too much or too little; as in the former ſtate it will be extremely ſtiff, and difficult to manage; and in the latter, it will be conſiderably diminiſhed in its ſtrength.

All cables are to each other as the cubes of their diameters.

The number of threads alſo, of which each cable is compoſed, being always proportioned to its length and thickneſs, the weight and value of it are determined by this number. Thus a cable of ten inches in circumference, ought to conſiſt of four hundred and eighty-five threads; and weigh one thouſand nine hundred and forty pounds: and on this foundation is calculated the following table, very uſeful for all perſons engaged in marine commerce, who equip merchant-ſhips on their own account, or freight them for the account of others.

A table of the number of threads and weight of cables of different circumference.

Circumference in inches.	Threads or rope-yarns.	Weight in pounds.
9	393	1572
10	485	1940
11	598	2392
12	699	2796
13	821	3284
14	952	3808
15	1093	4372
16	1244	4976
17	1404	5616
18	1574	6296
19	1754	7016
20	1943	7772

Stream-

Stream-CABLE, a hauſer, or rope, ſomething ſmaller than the bowers, and uſed to moor the ſhip in a river or haven, ſheltered from the wind and ſea, &c.

To bit the CABLE. See the article BITS.

To ſerve the CABLE, is to bind it round with ropes, leather, or other materials, to prevent it from being galled, or fretted in the hawſe by friction.

Heave in the CABLE! the order to draw it into the ſhip by winding about the capſtern or windlaſs.

Pay away the CABLE! ſlacken it, that it may run out of the ſhip. This phraſe is the ſame with *veer away* the cable. See the French term *cable*, and the phraſes following it.

CABLE'*s length*, a meaſure of 120 fathoms, or of the uſual length of the cable.

To CALK, or CAULK, *calfuter*, (probably from *calage*, Fr. hemp) to drive a quantity of oakum, or old ropes untwiſted and drawn aſunder, into the ſeams of the planks, or into the intervals where the planks are joined to each other in the ſhip's decks or ſides, in order to prevent the entrance of water. After the oakum is driven very hard into theſe ſeams, it is covered with hot melted pitch or reſin, to keep the water from rotting it.

Amongſt the ancients, the firſt who made uſe of pitch in calking, were the inhabitants of Phæacia, afterwards called Corſica. Wax and reſin appear to have been commonly uſed previous to that period; and the Poles at this time uſe a ſort of unctuous clay for the ſame purpoſe, on their navigable rivers.

CALL, *fifflet*, a ſort of whiſtle, or pipe, of ſilver or braſs, uſed by the boatſwain and his mates to ſummon the ſailors to their duty, and direct them in the different employments of the ſhip.

As the call can be ſounded to various ſtrains, each of them is appropriated to ſome particular exerciſe; ſuch as hoiſting, heaving, lowering, veering away, belaying, letting go a tackle, &c. The act of winding this inſtrument is called *piping*, which is as attentively obſerved by ſailors, as the beat of the drum to march, retreat, rally, charge, &c. is obeyed by ſoldiers.

CALM, the ſtate of reſt which appears in the air and ſea when there is no wind ſtirring.

That tract of the Atlantic ocean, ſituated between the tropic of Cancer and the latitude of 29° north; or the ſpace that lies between the *trade* and the variable winds, is frequently ſubject to calms of very long duration: and hence it has acquired, amongſt ſeamen, the name of the Calm Latitudes.

A long calm is often more fatal to a ſhip than the ſevereſt tempeſt, becauſe if the ſhip is tight and in good condition, ſhe may ſuſtain the latter without much injury; whereas in a long calm, the proviſion and water may be entirely conſumed, without any opportunity of obtaining a freſh

ſupply. The ſurface of the ſea in a continued calm is ſmooth and bright as a looking-glaſs.

CAMBERED-DECK, the deck or flooring of a ſhip is ſaid to be cambered, or to lie cambering, when it is higher in the middle of the ſhip's length, and droops towards the ſtem and ſtern, or the two ends. Alſo when it lies irregular; a circumſtance which renders the ſhip very unfit for war. See the article BROKEN-BACKED.

CAN-BUOY. See BUOY.

CAN-HOOKS, an inſtrument uſed to fling a caſk by the ends of the ſtaves: it is formed by fixing a broad and flat hook at each end of a ſhort rope, and the tackle by which the caſk ſo flung may be hoiſted or lowered, is hooked to the middle of the rope. See plate II. fig. 8 and 9. The canhooks commonly uſed aſhore by brewers, &c. are all iron, the middle part being fitted with a chain in the place of a rope.

CANNON, a well known piece of artillery, mounted in battery on the decks of a ſhip, and uſed in all naval engagements.

This engine has already been ſo accurately deſcribed by a variety of authors, that it may ſeem unneceſſary to give a particular deſcription of it here. As it forms, however, ſo important an article in all the military operations of the marine, it cannot, conſiſtently with our plan, be omitted in this place.

CANNON then may be defined a long, conical fire-arm of braſs or iron, concave within, and ſmaller at the muzzle, or face, than at the oppoſite end.

The principal parts of a ſea-cannon, as repreſented in plate VII. fig. 3. are, 1ſt. The breech, A C, and its button, or caſcabel, A h, called by ſeamen the pomiglion. The breech is generally underſtood to be the ſolid metal from the bottom of the concave cylinder to the caſcabel, which is the extremity of the cannon oppoſite to its muzzle.

2d. The trunnions, T, which project on each ſide like arms, and ſerve to ſupport the cannon near the middle of its length: on theſe it may be poiſed, and held almoſt in *equilibrio*. As the metal is thicker at the breech than towards the mouth, the trunnions are placed nearer to that end than the other.

3d. The bore, or caliber, which is comprehended between the dotted lines, and particularly expreſſed in the longitudinal ſection of a thirty-two-pounder, fig. 15. This repreſents the interior or concave cylinder, wherein the powder and ſhot are lodged with which the cannon is charged: the entrance of the bore is called the mouth.

Names of the other parts, including the above plate VII. fig. 3.

A B, the length of the cannon.	H B, the muzzle.
A E, the firſt reinforce.	A o, the caſcabel, or pomiglion.
E F, the ſecond reinforce.	A C, the breech.
F B, the chace.	C D, the vent-field.

F I, the chace-girdle.
r s, the baſe-ring and ogee.
t, the vent-aſtragal and fillets.
p q, the firſt reinforce-ring and ogee.
v w, the ſecond reinforce-ring and ogee.
x, the chace-aſtragal and fillets.
z, the muzzle-aſtragal and fillets.
n, the muzzle-mouldings.
m, the ſwelling of the muzzle.
A i, the breech-mouldings.

The uſe of theſe machines is to diſcharge upon the enemy globes or balls of iron, called *ſhot*, which are therefore of various ſizes, in proportion to the caliber of the cannon. The diameter of the ball is always ſomewhat leſs than the bore of the piece, that it may be diſcharged with the greater eaſe, and not damage the piece by rubbing it too forcibly in its paſſage; and the difference between theſe diameters is called the windage of the cannon.

The length of any cannon is always reckoned from the hind part of the baſe ring, or beginning of the caſcabel, to the extremity of the muzzle. The ſecond reinforce begins at the ſame circle where the firſt terminates; and the chace at the ſame circle where the ſecond reinforce ends.

The firſt reinforce therefore includes the baſe ring; the ogee neareſt thereto; the vent-field; the vent-aſtragal, and firſt reinforce-ring. The ſecond reinforce contains the ogee next to the firſt reinforce-ring and the ſecond reinforce-ring. The chace comprehends the ogee neareſt to the ſecond reinforce-ring; the chace-girdle and aſtragal; and the muzzle and aſtragal. The trunnions are always placed on the ſecond reinforce, ſo as that the breech part of the cannon may weigh ſomething more than the muzzle-part, to prevent the piece from ſtarting up behind when it is fired.

A variety of experiments, made with great care and accuracy, prove that powder when on fire poſſeſſes at leaſt 4000 * times more ſpace than when in grains. Therefore if we ſuppoſe that the quantity of powder with which a cannon is charged poſſeſſes one fourth of a cubical foot in grains, it will, when on fire, occupy the ſpace of about 1000 cubical feet. The ſame experiments evince alſo that the powder when inflamed, is dilated equally round its center. One grain of powder fired in the center of different concentric circles, round which grains of powder are placed, ſhall therefore ſet fire to all thoſe grains at once.

From this principle it neceſſarily follows, that powder, when fired in a cannon, makes at the ſame inſtant an equal effort on every part of the inſide of the piece, in order to expand itſelf about its center every way. But as the reſiſtance from the ſides of the piece turns the action of the powder, ſo as to follow the direction of the bore of the cannon; when it preſſes upon the ball, ſo as to force it outwards, it preſſes alſo on the breech of the cannon; and this gives the piece a motion backwards, that is called its *recoil*, which, as we have already obſerved, is reſtrained by the *breeching* and the convexity of the decks. The recoil in ſome

* Mr. Bigot de Morogues ſays from 4000 to 4500, and Mr. Hauksbee 5000.

ſome degree diminiſhes the action of the powder upon the ſhot. But this cannot be avoided; for, if the carriages were fixed ſo as not to give way to this motion, the action of the powder, or the effort that cauſes the recoil, would tear them to pieces in a very ſhort time.

All pieces of artillery were formerly diſtinguiſhed into the names of ſakers, culverins, cannon, and demi-cannon; but at preſent their names are derived from the weight of the ball which they diſcharge: thus a piece that diſcharges a ball of twenty-four pounds, is called a twenty-four-pounder; and one that carries a ſhot of thirty-two pounds, a thirty-two-pounder; and ſo of the reſt.

The metal of cannon is not equally thick in all parts, but is in ſome meaſure proportioned to the force of the powder which it is to reſiſt. At the breech, where the effort is ſtrongeſt, the thickneſs of the metal is equal to the diameter of the correſponding ſhot. At the firſt reinforce, where this begins to ſlacken, the thickneſs is ſomewhat leſs than at the breech: at the ſecond, where the force is ſtill further diminiſhed, the thickneſs is more reduced than at the firſt: and, by the ſame rule, the chace has leſs thickneſs than the ſecond reinforce. The thickneſs of the chace gradually diminiſhes from the trunnions to the mouth of the piece; ſo that if a cannon was without caſcabel, trunnion, and mouldings, it would exactly reſemble the fruſtum of a cone, or a cone deprived of the ſmall end.

In a veſſel of war, cannon are placed on a ſort of wheeled ſledge, called the *carriage*, of which fig. 16. plate VII. is the plan, and fig. 17. the elevation. This carriage is compoſed of two large pieces of plank, called ſides or cheeks, connected together by means of croſs-pieces, which are either bolts, axle-trees, or tranſoms. The two axle-trees are fixed acroſs under the fore and hinder parts of the carriage, being ſupported at their extremities by ſolid wooden wheels called trucks. The tranſom is placed directly over the fore axle-tree, and exactly in the middle of the height of the cheeks or ſide-pieces. The height of the tranſom is equal to two diameters of the ſhot, and the breadth to one diameter.

Explanation of the iron-work, and different parts of a ſea-carriage, as exhibited in the plan and elevation of a thirty-two pounder, pl. VII. fig. 16. and 17.

a. The cap-ſquares, commonly called clamps in the ſea-ſervice.

b. Eye-bolts, by which one end of the clamp is fixed to the carriage.

c. Joint-bolts, upon which the other end of the clamp is fixed over the trunnions; after which it is fore-locked, to prevent the cannon from ſtarting out of its carriage when fired.

b g. The cheeks or ſides of the carriage.

d. The tranſom-bolt.

e. The bed-bolt, upon which the bed reſts to ſupport the breech of the cannon. The bed is expreſſed by fig. 4.

f. Hind axle-tree bolts.

g. Breech-

g. Breeching-bolts, with rings, through which the breechings paſs.
h. Loops, or eye-bolts, to which the gun-tackles are hooked.
i. The fore axle-tree, with its trucks, k.
l. The hind axle-tree, with its trucks, k.

The wheels are firmly retained upon their axle-trees by means of iron bolts paſſing through the latter without the wheels: theſe bolts are called linch-pins.

The breadth of the wheels is always equal to that of the cheeks; but the height of the cheeks and diameter of the trucks muſt conform to the height of the gun-ports above the deck. The carriages of the lower tiers ſhould therefore be ſo formed, that when the breech of the cannon lies upon the hind axle-tree, the muzzle of the piece ſhould touch above the port, as expreſſed in fig. 19. which repreſents a cannon ſecured by its tackles and breechings, to prevent it from ſtraining the ſhip as ſhe rolls in a ſtormy ſea.

Cannon are charged by putting down into the bottom firſt a quantity of powder, one third or one half the weight of the ball. This is done with an inſtrument, fig. 7. termed a *ladle*, which is a kind of cylindrical ſpoon, generally made of copper, and fixed to the end of a ſtaff, called its handle. Upon the powder is put in a wad of rope-yarn, formed like a ball, which is preſſed down upon the powder with the inſtrument expreſſed by fig. 17. called a *rammer*. Upon this wad is put the ball or ſhot; and to ſecure it in its place, another wad is firmly preſſed down upon it, which operation is called *ramming-home* the wad and ſhot. The touch-hole of the piece is then filled with powder, from the upper-part of which a little train is laid that communicates with it. The uſe of this train is to prevent the exploſion of the powder from operating directly upon the inſtrument employed to fire the piece, which in that caſe might be forced out of the hand of the gunner.

In the modern pieces, a little gutter or channel is framed on the upper part of the breech, to prevent the train from being diſperſed by the wind. This channel reaches from the touch-hole to the baſe-ring.

The cannon being pointed to its *object*, or the place which it is intended to ſtrike, the train is fired, and the flame immediately conveyed to the powder in the touch-hole, by which it is further communicated to that in the piece. The powder being kindled, immediately expands ſo as to occupy a much greater ſpace than when in grains, and thus dilated it makes an effort on every ſide to force itſelf out. The ball making leſs reſiſtance than the ſides of the piece, upon which the powder preſſes at the ſame time, is driven out by its whole effort, and acquires that violent motion which is well known to the world.

In plate VII. all the inſtruments neceſſary for charging cannon are exhibited. Beſides theſe already deſcribed, there is the ſponge, fig. 10. which is uſed to clean the piece after firing, and to extinguiſh any ſparks that may remain behind. In the land-ſervice, the handle of the ſponge

is nothing elſe than a long wooden ſtaff; but in ſhips of war this handle, that uſually contains the rammer at its other end, is a piece of rope well ſtiffened by *ſpun-yarn*, which is for this purpoſe firmly wound about it. By this convenience the rammer becomes flexible, ſo that the piece is charged within the ſhip, as the perſon who loads it may bend and accommodate the length of the rammer to the diſtance between the muzzle and the ſhip's ſide; being at the ſame time ſheltered from the enemy's muſquetry, to which he would be expoſed when uſing a wooden rammer without the ſhip. To ſpunge a piece therefore is to introduce this inſtrument into the bore, and thruſting it home to the fartheſt end thereof, to clean the whole cavity. The figures 8 and 9 repreſent ſpunges of a different kind; one of which is formed of ſheep-ſkin, and the other of the ſtrongeſt briſtles of a hog. See the article EXERCISE.

The *worm*, of which there are alſo different kinds, fig. 6. and 9. is uſed to draw the charge when neceſſary.

The bit, or priming-iron, is a kind of large needle, whoſe lower end is formed into a gimblet, ſerving to clear the inſide of the touch-hole, and render it fit to receive the prime.

The lint-ſtock is a kind of ſtaff about three feet long, to the end of which a match is occaſionally faſtened to fire the piece.

The fluctuating motion of the ſea renders it neceſſary to ſecure and confine the artillery in veſſels of war, by ſeveral ropes and pullies, which are called the *gun-tackles* and *breechings*, without which they could never be managed in a naval engagement. The breeching has been already explained, as employed to reſtrain the recoil. The tackles * fig. 18, are hooked to ring-bolts in the ſides of the carriage, and to other ring-bolts in the ſide of the ſhip, near the edges of the gun-ports, and are uſed to draw the piece out into its place after it is loaded. Beſides theſe, there is another tackle hooked to the rear or *train* of the carriage, to prevent the cannon from rolling into its place till it is charged: this is called the train-tackle, and is exhibited in fig. 17.

In ſhips of war, the cannon of the lower-decks are uſually drawn into the ſhip during the courſe of an expedition at ſea, unleſs when they are uſed in battle. They are ſecured by lowering the breech ſo as that the muzzle ſhall bear againſt the upper-edge of the port, after which the two parts of the breeching are firmly braced together by a rope which croſſes them between the front of the carriage and the port; which operation is called *frapping* the breeching. The tackles are then ſecurely faſtened about it with ſeveral turns of the rope extended from the tackle and breeching, over the chace of the cannon, as repreſented in fig. 19.

The ſervice of the artillery, or the method of employing it in a naval action, is explained in the articles ENGAGEMENT and EXERCISE. The manner of pointing, or directing them to different objects; the effects of different quantities of powder upon the cannon ball; and the different lines deſcribed by its flight, are alſo treated at large in the article RANGE.

We

We ſhall here ſubjoin a table of the length and weight of different cannon, for the information of thoſe who may be entirely unacquainted therewith; and particularly our ſea-gunners.

Length and weight of braſs cannon according to the menſuration in 1753.

Pounders.	Length.		Weight.		
	Feet.	Inches.	100lb.	Quarters.	lb.
42	9	6	61	2	10
32	9	5	55	2	7
24	9	5	51	1	12
18	9	0	48	1	0
12	9	0	29	0	0
9	8	5			
6	8	0	19	0	0
3	6	5	11	0	0

Length and weight of iron guns uſed in the ſea-ſervice, according to the menſuration in 1753.

Pounders.	Length.		Weight.		
	Feet.	Inches.	100lb.	Quarters.	lb.
42	10	0	55	1	12
32	9	6	53	3	23
24	9	5	48	0	0
18	9	0	41	1	8
12	9	0	32	3	3
9	8	5	23	2	2
6	7	0	17	1	14
4	6	0	12	2	13
3	4	6	7	1	7

For an account of the particular number of men appointed to manage the different degrees of cannon, and the arrangement or diſtribution of the cannon according to the ſeveral claſſes of ſhips, ſee QUARTERS and RATE.

The following judicious remarks for increaſing the ſtrength of the Britiſh navy, by changing the cannon uſed in ſhips of war into others of equal weight but of greater bore, have been ſelected from the propoſal of the late ingenious Mr. Robins.

The advantage of large cannon over thoſe of a ſmaller bore is ſo generally acknowledged, that a particular diſcuſſion of it might perhaps be ſpared. * * *

"The moſt important advantage of heavy bullets is this, that with the ſame velocity they break holes out in all ſolid bodies in a greater proportion than their weight; that is, for inſtance, a twenty-four pound ſhot will, with the ſame velocity, break out a hole in any wall, ram-

part, or ſolid beam, in which it lodges, above eight times larger than will be made by a three pound ſhot; for its diameter being double, it will make a ſuperficial fracture above four times as great as the three-pounder, (more of a ſmaller hole being cloſed up by the ſpringing of the ſolid body than of a great one) and it will penetrate to more than twice the depth; by this means the firmeſt walls of maſonry are eaſily cut through their whole ſubſtance by heavy ſhot, which could never be affected by thoſe of a ſmaller caliber; and in ſhips the ſtrongeſt beams and maſts are hereby fractured, which a very great number of ſmall bullets would ſcarcely injure.

"To this laſt advantage of large cannon, which is indeed a capital one, there muſt be that of carrying the weight of their bullet in grape or lead ſhot, and thereby annoying the enemy more effectually than could be done by ten times the number of ſmall pieces.

"Theſe are the principal advantages of large cannon, and hence it is no wonder that thoſe entruſted with the care of the Britiſh navy have always endeavoured to arm all ſhips with the largeſt cannon they could with ſafety bear; and indeed, within theſe laſt hundred years, great improvements have been made on this head, by reducing the weight of many of the ſpecies of cannon, and thereby enabling the ſame ſhips to carry guns of a larger bore: and, very lately, the ſix pounders in ſome of the ſmaller ſhips have been changed for nine pounders of a larger fabric than uſual, which hath been juſtly eſteemed a very great addition to the ſtrength of thoſe ſhips.

"The importance then of allotting to all ſhips the largeſt cannon they can with ſafety bear being granted, it remains to ſhew on what foundation a change is propoſed to be made in the fabric of all pieces from the preſent eighteen pounders downwards, ſo that they may be changed for others of the ſame, or leſs weight, but of a larger bore. This propoſition turns on the following conſiderations.—The ſpecies of cannon proper for each ſhip is limited by the weight of the pieces; and when the charge and effort of the bullet are aſſigned, this weight in each ſpecies is, or ought to be determined by the following circumſtances;

That they ſhall not be in danger of burſting;
That they ſhall not recoil too boiſterouſly;
And that they ſhall not heat too much in frequent firing.

"All this is to be done by a proper quantity of metal properly diſpoſed; and when the pieces are ſecured from theſe accidents, all additional weight of metal, is not only uſeleſs but prejudicial.

"Now what dimenſions and weight of metal are more than ſufficient for theſe purpoſes, we may learn from the preſent practice of the navy, in the fabric of the thirty-two pounders, the heavieſt guns in common uſe; theſe are made to weigh (if the author's information be right) from fifty-two to fifty-three hundred weight; that is ſomewhat leſs than an hundred and two-thirds for each pound of bullet.

"From

"From this then the author concludes, that any ſmaller piece, made upon the model of theſe thirty-two pounders, and having their weight proportioned in the ſame manner to the weight of their bullet, will fully anſwer all the purpoſes recited above, and will be of unexceptionable ſervice.

"And he founds his opinions on theſe two principles: firſt, that the ſtrength of iron, or of any other metal, is in proportion to its ſubſtance; ſo that, for inſtance, where it has one half the ſubſtance, it has one half the ſtrength; and this ſuppoſition, he preſumes, will be ſcarcely conteſted. Secondly, that the force of different quantities of powder fired in ſpaces which they reſpectively fill, is not exactly in the proportion of thoſe quantities; but the leſſer quantity has in proportion the leaſt force: that is, for inſtance, the force of one pound of powder, in like circumſtances, is leſs than one half the force of two pounds. And this principle the author has deduced from many repeated and diverſified trials of his own; and he believes it will be found agreeable to all the obſervations which have been made, or ſhall be made, on this ſubject.

"From theſe two conſiderations, he hopes, it will be granted him, that, if two pieces, a large one and a ſmall one, are made with all their dimenſions in proportion to the diameter of their reſpective bullets, and conſequently their weights in the ſame proportion with the weights of their bullets, then the larger piece, with the ſame proportion of powder, will be more ſtrained, will heat more, and recoil more than the ſmaller.

"Hence then, as we are aſſured, that the preſent thirty-two pounders are of a ſufficient ſtrength and weight for all marine purpoſes, we have the greateſt reaſon to ſuppoſe, that, if all the pieces of an inferior caliber were formed upon the ſame model, meaſuring by the diameter of the bullet, theſe ſmaller pieces would not be defective, either in ſtrength or weight, but would be to the full as ſerviceable on ſhip-board, as the preſent pieces, which are ſo much overloaded with metal.

"The author's ſcheme then for augmenting the force of the preſent ſea-batteries, is no more than this plain principle, that all ſhip-guns ſhould be caſt upon the model of the thirty-two pounders, meaſuring by the diameter of the reſpective bullet; ſo that for each pound of bullet, there ſhould be allowed one hundred and two thirds of metal only.

"The advantages of this ſcheme will appear, by the following compariſon of the weight of the preſent pieces with their weight propoſed by this new fabric.

Pieces.	Weight now in hundreds.	Ditto by new fabric.
24	48 to 46	40
18	41 to 39	30
12	34 to 31	20
9	29 to 26	15
6	24 to 18	10