South Sea

APPENDIX.

SIR,

PHILADELPHIA, *June* 23d, 1794.

AS I conſider the maſting of our frigates as of the utmoſt importance to their ſailing, working, and general eaſe and management at ſea, I have herewith annexed proportions calculated from a ſyſtem I formed ſome years ago; and although I believe theſe proportions would be approved of by com- [illegible] of the ſubject in [illegible] I wiſh the moſt experienced ſea-officers of ſkill here, or other ingenious perſons, who have been at ſea, to be conſulted before they are adopted: I mention ſea-officers, &c. becauſe it is almoſt impoſſible that any other deſcription of men, who have not had an opportunity of being often at ſea, can form a proper judgment on this important ſubject; as the complete maſting of a ſhip muſt be guided by nice obſervation, experience, and judgment, accompanied with ſome degree of philoſophy.

I have the honour to be,

SIR,

Your moſt obedient

(Copy.) And very humble ſervant,

THOMAS TRUXTUN.

Secretary of War, &c. &c.

REMARKS.

As the extreme breadth of beam of a ſhip is proportioned to the length of her keel, ſo are the length of her maſts and yards calculated to that breadth; but as the formation of all veſſels' bodies differ according to the purpoſe for which they are intended, it is abſolutely neceſſary to vary in the mode of calculating the dimenſions of the ſpars, according to the conſtruction of the body.

The diameter of all ſpars here, under the denomination of maſts, are intended to be one inch in the partners to every three feet in length; and that of the yards one inch in the ſlings to four and three quarters feet of the whole length, the mizen-maſt excepted, which from its being made the ſame length of the fore-maſt, on account of carrying a large boom, mizen, or ſpanker, the ſize is reduced to one inch in the partners, to every four feet of the whole length; and the bow-ſprit in the bed is fixed of the ſame ſize as the foremaſt in the partners.

In calculating the diameter of pole-maſts, ſuch as a pole mizen-top-maſt, or pole top-gallant-maſt, the length of the pole is deducted, and the remainder being the length of the maſt from the heel to the hound, is divided by three, to give its diameter in inches in the cap.

As the breadth of beam, length of main-maſt and main-yard, is here given as the baſis of all proportions for the other ſpars, to find the length of the main-maſt I take twice the breadth of the beam, and one-ſixth of the ſum, and add them together; and to find the length of the main yard, I take twice the breadth of the beam. The ſtudding-ſail booms and yards, &c. not mentioned here, are calculated and regulated by the uſual mode. The ſame principle of maſting will anſwer for ſhips of the line, only with them a reſpect muſt be had to their additional depth.

Here

Here follows the calculation of the maſts, yards, and ſpars of a Frigate of 44 guns, of the following dimenſions, viz.

145 feet keel, ſtraight rabbet; extreme breadth of beam 43 feet 6 inches; depth of hold 14 feet 3 inches; depth between decks 6 feet 3 inches; and the waiſt 7 feet; otherwiſe in proportion.

Extreme breadth of beam -	Feet	43 6
Multiply by - - -		2
This the length of the main-yard -		87
Add one-ſixth of this ſum - -		14 6
The length of main-maſt - -		101 6

General proportions of *Masts*, *Spars*, &c. for a Frigate built for War of 44 guns.

	Feet.	Inch.		Feet.		Inch.
Main-mast the whole length (as calculated page 3)	101	6	Head out of fame	13½	Diameter	34
One-thirteenth deduct from the main-mast, and the remainder is the whole length of the fore-mast	93	8	- -	13½		31½
Mizen-mast the fame length of the fore-mast	93	8	- -	12		23½
Main-yard the whole length (as calculated page 3)	87		Arms out of fame	4½		18½
One-twentieth deduct from main-yard, and the remainder is the whole length of the fore-yard	82	8	- -	4½		17½
Crofs-jack-yard one-quarter fhorter than the fore-yard	62		- -	3½		13
Bow-fprit one-third fhorter than the fore-maft	62	6	- -	-		31½
Jibb-boom one-quarter fhorter than the bow-fprit	47		- -	-		15½
Three-fifths the length of the main-maft is the main-top-maft	60	9	Head out of fame	8		20½
One-twentieth deduct from main-top-maft, and the remainder is the fore-top-maft	57	8	- -	8		19
Two-thirds of the mizen-maft is the pole mizen-top-maft	62	4	- -	21		14
Four-fifths of the main-top-maft is the main-top-gallant-maft	48	8	- -	16		11
Four-fifths of the fore-top-maft is the fore-top-gallant-maft	46		- -	16		10
Difference between one-third and one-fourth taken from the main-yard, gives the main-top-fail-yard	61	7	Arms out of fame	5		13½
Difference between one-third and one-fourth taken from the main-top-fail-yard, gives the main-top-gallant-yard	43	8	- -	2		9
One-fourth taken from the main-top-gallant-yard, gives the main royal-yard	32	10	- -	1½		7
Difference between one-third and one-fourth taken from the fore-yard, gives the fore-top-fail-yard	58	7	- -	5		12½
Difference between one-third and one-fourth taken from the fore-top-fail-yard, gives the fore-top-gallant-yard	41	7	- -	2		8½
One fourth taken from the fore-top-gallant-yard, gives the fore-royal yard	31	3	- -	1½		6½
Difference between one-third and one-fourth taken from crofs-jack-yard, gives the mizen-top-fail-yard	43	11	- -	3½		9½
Difference between one-third and one-fourth taken from mizen-top-fail-yard, gives the mizen-top-gallant-yard	31	2	- -	1½		6½
Mizen-gaff, the length of the mizen top-fail-yard	43	11	- -	-		9½
Mizen or fpanker-boom, once and one-third the length of the mizen-gaff	58	7	- -	-		12½
Enfign-ftaff one-fourth fhorter than mizen-top-fail-yard	33					
Jack-ftaff one half the length of the enfign-ftaff	16	6				
One half and one-twentieth of the beam is the width of main-top	24					
One half the beam is the width of the fore-top	21	9				
Two-thirds the width of the main-top is the mizen top	16					

The fprit-fail-yard the fame as the fore-top-fail-yard, and the fprit-fail-top-fail-yard the fame as the fore-top-gallant-yard.

APPENDIX.

DIMENSIONS of the *Masts*, *Yards*, and *Spars* of a Frigate of 36 guns; whose length of keel is 136 feet—extreme breadth of beam 40 feet—depth of hold 13 feet—depth between decks 6 feet—and waist 6 feet 9 inches, and otherwise in proportion: calculated from the principles laid down in the foregoing sheets.

	Feet.	Inch		Feet.		Inch.
Main-mast the whole length	93	4	Head	12½	Diameter	31½
Fore-mast do.	86	2	-	12½		28½
Mizen-mast do.	86	2	-	9½		21½
Main yard do.	80	-	Arms	4½		17
Fore yard do.	76	-	-	4½		16
Crofs-jack yard do.	57	-	-	3½		12
Bow-ſprit do.	57	6	-	-		28½
Jibb boom do.	43	2	-	-		14½
Main top-maſt do.	56	-	Head	7½		18½
Fore top-maſt do.	53	-	-	7½		17½
Mizen top-maſt do.	57	4	-	19		13
Main-top-gallant-maſt do.	44	8	-	15		10
Fore-top-gallant-maſt do.	42	7	-	15		9½
Main-top-ſail yard do.	56	8	-	4½		12
Main-top-gallant yard do.	40	2	-	2		8½
Main-royal yard do.	30	2	-	1½		6½
Fore-top-ſail yard do.	53	10	-	4½		11½
Fore-top-gallant yard do.	38	2	-	2		7
Fore-royal yard do.	23	8	-	1½		6
Mizen-top-ſail yard do.	40	4	-	3		8½
Mizen top-gallant yard do.	28	7	-	1½		6
Mizen-gaff do.	40	4	-	-		8½
Spanker-boom do.	53	9	-	-		11½
Enſign-ſtaff do.	30	3				
Jack-ſtaff do.	15	1				
Widdy-ſtair-top do.	22	-				
Do. fore-top. do.	20	-				
Do. mizen-top. do.	14	8				

N. B. I have obſerved before, that it is neceſſary to vary the ſize and dimenſions of maſts, according to the formation of the body, or the purpoſe the ſhip is intended for. And I may add alſo, that in merchant-ſhips, according to the number of hands to be employed on board them, in any particular ſervice. The foregoing calculation being intended only for ſhips conſtructed and built for war, the maſter may eaſily make the neceſſary variations for other veſſels.

In forming this ſyſtem of maſting, I have made the extreme breadth of beam the great baſis of calculation, as it is by the breadth of beam that we are to meaſure, or to judge what quantity of weight and preſſure a ſhip will bear, from her ſails, and rigging aloft, without reclining, ſo as to drag a part of her upper ſides through the water; for if a ſhip from this, or any other cauſe, does not carry her bottom which the artiſt has taken ſo much pains to conſtruct, ſhe is loſt, and his intention deſtroyed.

One

One proportion (the breadth of beam) of the hull being taken to find the length of the main-maſt and main-yard, as I have ſhown, another part may as properly be taken to proportion the maſt-heads, &c. I have therefore brought forward the depth of waiſt, and the depth between decks for this purpoſe; which I think will anſwer as a better proportion than one-fourth of the length of the top-maſt: for it muſt be obſerved, that there are inconveniences attending maſt-heads, being too long as well as their being too ſhort. However, if one-fourth of the whole length of the top-maſt, as I have before mentioned, is taken for the lower maſts heads, it will make but little difference from the firſt method; as per example. By the firſt method, the 44 gun ſhips' main and fore-maſt heads are 13 feet 4 inches, (as the agitation of the fore-maſt is greater than the main-maſt, I have fixed the fore-maſt head to be of the ſame length as the main-maſt head), and by the ſecond method, the main-maſt head would be 15 feet 2 inches and a quarter; difference 22 inches and a quarter; and the fore-maſt head 14 feet 5 inches; difference from the firſt method 13 inches.

The pole-mizen-top-maſt the whole length is 62 feet 4 inches. I deduct the pole 21 feet therefrom, and the remainder being 41 feet 4 inches, is the length of the mizen-top maſt, from heel to hound; one-fourth of which is 10 feet 4 inches, for the head of the mizen-maſt; and by the firſt method, the head of the mizen-maſt is 10 feet; difference 4 inches.

The pole main-top-gallant-maſt the whole length is 48 feet 8 inches. I deduct the pole 16 feet, and the remainder being 32 feet 8 inches, is the length of the main-top-gallant-maſt, from heel to hound; one-fourth of which is 8 feet 2 inches, for the head of the main-top-maſt; and by the firſt method, the head of the main-top-maſt is 8 feet; difference 2 inches only.

The fore-top-maſt head calculated in the ſame way, would give but little difference alſo from the firſt method. In fact, either of theſe methods of finding the lengths of maſt-heads will anſwer very well, as their difference is too trifling to be of any conſequence.

The only true way of maſting a ſhip, is by her own dimenſions, and not at random, as merchantmen moſtly are: and with reſpect to yards, I am clearly of opinion, that the ſhips of war of all nations carry too ſquare yards, for the following reaſons: 1ſt, Where a ſhip of this ſort is going by the wind, and her yards braced up, you will find in general that the after part of her ſails becomes a back ſail; conſequently inſtead

inſtead of increaſing the velocity, as is intended, they cauſe a counter action. 2dly, By a ſhip having too ſquare yards, the unneceſſary and additional weight tends to make them crank, or lay down more than they otherwiſe would. 3dly, With yards too ſquare, the ſtay-ſails between the maſts are rendered uſeleſs. Whereas ſhips with moderate yards, having their maſts properly extended, in the manner I have ſtated, may not only carry their ſtay-ſails to advantage, when cloſe hauled, but they will hold up their ſides to the breeze; by which means their velocity muſt naturally be increaſed. I have often noticed the diſproportion of our former frigates' maſts and yards, and lamented the want of ſome good general ſyſtem of maſting in this country, and of our never having got the proper rules by which the French and Engliſh maſt their ſhips of war: but thoſe nations are very tenacious of communicating any ſort of improvements that they make in naval architecture, particularly ſuch are approved of by the heads of their naval departments.

By many drawings which I have made at my leiſure when at ſea, I at laſt fixed on the principles now laid down, as the beſt I could deviſe; and if they ſhould accord with the judgment of others, who are competent to an opinion on the ſubject, I ſhall be extremely happy.