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LETTER

FROM

GABRIEL SNODGRASS, Esq.

TO THE

Right Honorable HENRY DUNDAS,

PRESIDENT OF THE BOARD OF COMMISSIONERS FOR THE AFFAIRS OF INDIA, ONE OF HIS MAJESTY'S PRINCIPAL SECRETARIES OF STATE, &c. &c.

AND TO THE

Hon. the CHAIRMAN, the DEPUTY CHAIRMAN,

AND

COURT of DIRECTORS of the EAST-INDIA COMPANY,

ON THE

MODE OF IMPROVING

THE NAVY OF GREAT BRITAIN:

TO WHICH IS ADDED AN

APPENDIX.

Printed by Order of the Hon. Court of Directors,
1797.

Mayor Court Series XII (a)
Vol no: 44.
G/1=12283

To the Right Honorable HENRY DUNDAS, Prefident of the Board of Commiffioners for the Affairs of India, one of His MAJESTY's Principal Secretaries of State, &c. &c. &c. and

To the Honorable the CHAIRMAN, the DEPUTY CHAIRMAN, and the COURT OF DIRECTORS of the Eaft-India Company.

GENTLEMEN,

I AM fenfibly flattered by your permiffion to dedicate to you the refult of the experience, which I have acquired in a feries of years in the Company's fervice. It is a reward of which an honeft man may be fairly proud—the approbation of his fervices, by thofe who are the beft able to appreciate their value.

While an attention to my duty produced improvements in the building and repairing of the Company's fhips, I could not but feel an anxiety to extend thofe improvements to the Navy; in confequence, my ftrenuous endeavors have not been wanting to afford to my countrymen, in the fulleft extent, what I conceived to be advantages material to Great Britain.

If the arguments I ufe in fupport of thefe opinions be too defultory, and if I expref's myfelf in a ftyle not fufficiently polifhed, I am perfuaded you will pardon thefe faults. I impute blame to no individual; I mean not to offend; if I fpeak truth you will approve it;—your approbation, and that of my Country, is all I defire.

In the firſt place, I take the liberty of aſſerting (and from experience) that the Eaſt-India Company's ſhips, as now conſtructed, are the firſt and ſafeſt ſhips in Europe. In ſupport of the aſſertion which I have made in favor of the conſtruction of thoſe ſhips, I beg leave to ſubmit, in the Appendix, a liſt of the number of ſhips built and repaired under my inſpection, from the year 1757 to 1794, making in all 989, of which (as will appear by the ſaid paper) there was only one, the Earl of Chatham, which was ſuppoſed to have foundered. If the improvements adopted in thoſe ſhips were extended to the Navy much labor and expence would be ſaved to the nation.

Appendix No. VII.

Upon that idea the following remarks are founded; but, before I proceed to enumerate the particular circumſtances which render the Company's ſhips ſuperior to our ſhips of war, I muſt be permitted to remark, with deference to the opinions of the perſons employed by Government in the department of ſhip-building, that radical errors appear to prevail reſpecting the article of timber.

In the firſt place, a much greater quantity of rough timber than can be neceſſary is kept in ſtore; for I muſt contend, that a ſtock ſufficient for one year's conſumption would equally ſerve the purpoſes to which it is at preſent applied in any of his Majeſty's dock yards.

No ſhip was ever yet built entirely with timber that had laid to ſeaſon three years, two years, or even one year; conſequently, that part of the ſhip which was formed of the moſt unſeaſoned wood muſt be expected to decay firſt, and thus a progreſſive decay in the ſeveral parts of the ſhip, ſubjects her to the neceſſity of continual repairs, at an immenſe expence, and to the great detriment of the ſervice.

A ſecond error is in the preparation of timber for ſervice; upon this and upon the other point above-mentioned, I cannot ſubmit better information than what is contained

contained in my anſwers to queſtions put to me by the Commiſſioners of the Land Revenue, in the year 1791, which are publiſhed in their eleventh report to the Houſe of Commons.

Appendix No. II.

I there recommended that Government ſhould always have twenty or thirty ſail of line-of-battle ſhips conſtantly on the ſtocks, to be built by contract, and to ſtand to ſeaſon under cover (as is deſcribed in my anſwer to the thirty-fifth queſtion) by which means the ſhips would laſt from eighteen to twenty years, inſtead of only eleven years and three quarters, which is ſaid by the Navy Board to be the average duration of ſhips of the preſent Navy.

Indeed, I hope I ſhall be forgiven in requeſting particular attention to thoſe anſwers, as containing, in my humble opinion, ſuggeſtions which, if carried into execution, would be the means of reducing, not only the conſumption of oak timber, but alſo the expence of building and repairing ſhips in the Navy, by at leaſt *one-half*. My opinions ſtill continue the ſame as thoſe which I then expreſſed.

No ſhip ſhould ever have what is called a thorough repair, or *any timbers* ſhifted; inſtead of this, their bottoms and upper works ſhould be doubled with three-inch oak plank, from keel to gunwale, and ſtrengthened with iron knees, ſtandards, and even with iron ryders, if neceſſary, all which might be done at a ſmall expence; and ſhips ſo repaired would be ſtronger and ſafer, and be able to keep the ſeas longer, in the worſt weather, than any new ſhips in his Majeſty's Navy.

This meaſure would be the means of ſaving great quantities of valuable ſtraight and crooked (commonly called compaſs) oak timber, which otherwiſe muſt be expended by giving ſhips thorough repairs; and it ſhould be more eſpecially adopted with reſpect to ſuch ſhips as have their top-ſides of the abſurd old faſhion of *tumbling in*, than which nothing

Appendix No. III.

nothing can poſſibly be more extravagant and ridiculous, as many of the timbers muſt be much weakened by being cut acroſs the grain; and ſuch ſhips as have had a ſecond thorough repair, muſt alſo be further weakened, as the timbers are always conſiderably reduced in the moulding way on each repair, and thoſe timbers are originally much too ſlight: on the contrary, great advantages would be derived from having little or no tumble-home to the ſides, as it gives more room upon deck, a greater ſpread to the ſhrouds, additional ſecurity to the maſts, makes the ſhip ſtiffer, a much better ſea boat, and, in every reſpect, ſafer, ſtronger, and better.

As all ſhips of the Navy are every way deficient of iron to ſtrengthen and connect the ſides and beams together, they ſhould be built with diagonal braces, as deſcribed by me in the aforeſaid eleventh report, and with the knees, ſtandards, breaſt-hooks, and crutches, of iron, it being obviouſly impoſſible, by any means, to make a ſhip equally ſtrong with wooden knees, &c. The iron may be made to any ſize, ſtrength, and length, ſo as to admit of as many additional bolts as may be judged neceſſary.

APPENDIX No. II.

It is upwards of twenty-four years ſince I firſt introduced in the Eaſt-India Company's ſhipping the mode of faſtening on the outſide and inſide plank with bolts, and leaving the tree-nail holes open for air until the ſhips were nearly finiſhed and ready for caulking, which has been, and is now univerſally acknowledged to be the beſt method of ſeaſoning the timbers and plank of any yet adopted. But although this is a matter of ſo much importance to the preſervation of the ſhips of the Navy, it has not been practiſed in his Majeſty's dock yards, nor have I ever heard of its being introduced into any contract for building ſhips of war in the Merchants' yards.

It is more than ſeventeen years ſince I brought into uſe, for the Eaſt-India ſhips, round-headed rudders, requiring no rudder-coats. Experience taught me how dangerous

gerous the old faſhioned rudder-coats were, particularly in ſmall ſhips of the Navy, many of which, I cannot doubt, were loſt from the ſea having carried away their rudder-coat.

The round-headed rudders are now univerſally acknowledged to be much ſuperior, in every reſpect, to the ſquare-headed rudders of the ſhips of the Navy; and I am very anxious that theſe ſhould be introduced into all ſhips to be built in the King's yards, and provided for in the contracts made, in future, for ſhips of war to be built in Merchants' yards.

About twenty-ſeven years ago I alſo introduced four-inch bottoms to ſhips for the Eaſt-India Company's ſervice, inſtead of three-inch bottoms; and there are ſhips of leſs than ſix hundred tons burthen, built for that ſervice, with four-inch bottoms, alſo with ſheathing of three-fourths of an inch thick, and coppered as uſual; whilſt, on the contrary, there have been frigates of a thouſand tons burthen, lately built for Government in Merchants' yards, with three-inch bottoms, and a ſhip of eight hundred tons with a fir bottom only three inches thick; and there are ſhips of ſeventy-four guns, now building in thoſe yards, of eighteen hundred tons burthen, with not more than four-inch bottoms, which ſhips, I preſume, are intended to go to ſea, as uſual, without any wood ſheathing.

It appears to me that continuing the practice of *thin* bottoms tends to riſk the loſs of the ſhips and the lives of his Majeſty's ſubjects, more eſpecially if fir be taken inſtead of Engliſh, Quebec, or Eaſt-country oak plank, which may always be procured. In my opinion, no ſhips of four hundred tons and upwards ſhould have leſs than a bottom of four-inch oak plank;—all ſhips of the Navy, of eight hundred tons and upwards, ſhould have not leſs than five-inch plank;—line-of-battle ſhips ſhould have bottoms at leaſt ſix inches thick;—and all ſhips ſhould have the addi-

tion of wood ſheathing. The thickneſs of the inſide plank of thoſe ſhips may then generally be reduced in proportion.

It is many years ſince the keels of all the East-India ſhips have been rabbitted in the middle, which is certainly ſafer and better than having the rabbit on the upper edge, as is the practice in the ſhips of his Majeſty's Navy at this time.

About twenty-ſix years ſince, I had the capſtands to the ſhips in the Company's ſervice fitted with an iron ſpindle, paul-head, and catch-pauls. This has ever ſince been allowed effectually to prevent the people from being thrown from the bars, which, is well known, has frequently happened on board of his Majeſty's ſhips, and whereby many lives have been loſt, and great numbers crippled.

Every old capſtand in the King's ſhips ſhould be fitted with an iron ſpindle and catch-pauls, which may be done in a ſhort time, and at a very moderate expence, compared with the great ſafety and other advantages that muſt attend this improvement.

I have made it a practice, for many years, to add iron knees under the beams to all old ſhips in the Company's ſervice; and, of late years, to ſuch ſhips as have made three voyages, I have frequently added an iron knee under every beam of the lower and middle decks, from the fore-maſt to the mizen-maſt, where there has not been a ſtandard. If his Majeſty's ſhip the Centaur (although French-built) and others that have foundered at ſea, had been fitted in this manner, it would have prevented their ſides from ſeparating from the ends of their beams, and conſequently might, in all probability, have prevented thoſe ſhips from foundering.

Indeed, I am perſuaded that the loſs of moſt of the ſhips of war, and even merchant ſhips that have foundered at

at ſea, has been occaſioned by their having been inſufficient in point of ſtrength.

After having ſtated, in my anſwers to the queſtions put to me by the Commiſſioners of the Land Revenue in the year 1791, every alteration I then thought neceſſary to be made in future, ſo as to prevent accidents of that kind, even in the worſt weather, I cannot but ſincerely regret that my remarks have not been attended to. I feel this the more when I conſider the frequent loſſes of the King's ſhips, particularly the very recent cataſtrophe of his Majeſty's ſhip Leda, when (as it is ſaid) only ſeven of the whole crew were ſaved.

Out of the great number of ſhips that have been loſt from getting on ſhore or ſtriking on the rocks, there can be no doubt many of them might have been ſaved if their bottoms had been thicker when originally built, and the old ſhips doubled with three-inch oak plank when they required conſiderable repairs.

Whenever a ſhip is loſt at ſea, a ſtrict inquiry ought always to be made of the ſurvivors as to every particular, in order that the *cauſe* of ſuch loſs may be aſcertained:—the reſult of ſuch inquiry ſhould be made as public as poſſible to the eye of obſervation.

The great number of King's ſhips, of all rates, which have foundered at ſea, and the number of lives that have been loſt in conſequence, are ſtriking proofs that thoſe ſhips were not conſtructed, in all reſpects, as they might have been, ſo as to encounter the moſt ſevere ſtorm. I am fully convinced that all ſhips may be ſo conſtructed, and I preſume I have pointed out, in the different parts of this publication, effectual means for the purpoſe.

I ſincerely hope that this will attract the attention of Government, and alſo induce profeſſional men to make ſuch further

further obſervations on building, conſtructing, and repairing ſhips for the Navy of Great Britain, as may prevent the like dreadful conſequences in future.

The principal cauſes of theſe misfortunes, in caſe of ſudden violent ſtorms, or the ſhips broaching too, appear to me as follows, *viz.*

In the firſt place, The deep waiſt in thoſe ſhips, and more eſpecially in the frigates and ſloops of war, which occaſions them to ſhip a great deal of water on the main-deck.

Secondly, The ballaſt, water, and every thing in the hold, ſhifting and falling to leeward, from want of ſhifting boards and the pillars not being properly ſecured to prevent the ſame, whereby the ſhips are liable to become water-logged, and thus, before the hatches are ſufficiently ſecured, they may *fill* and founder.

Captain Inglefield's narrative of the loſs of the Centaur of ſeventy-four guns, will clearly evince that not only ſmall ſhips, but all ſhips of war, however large, ſhould have ſhifting boards in the hold, and the pillars better ſecured; and as a farther ſecurity from the guns doing damage, in caſe of their breaking looſe, I recommend ſubſtantial comings to all the hatch-ways, at leaſt two feet above the decks, alſo thick pieces of oak in mid-ſhips, between the hatch-ways, let down upon the beams, equally well ſecured and of the ſame height above the deck as the comings, which muſt prevent the guns from going further to leeward.

The ſterns of ſhips of war ſhould have little or no rake, in order to give an opportunity of fighting a greater number of ſtern chaſe-guns, which cannot be done with ſafety where the ſterns have a great over-hanging, as is the caſe with the ſhips of his Majeſty's Navy. There ſhould be ſtrong dead-lights to their ſtern windows, and no quarter-

galleries, which are not only unneceſſary in thoſe ſhips, as when they are cloſe hauled, they very much impede their ſailing, but are alſo dangerous (particularly in ſmall ſhips) in caſe of the galleries being carried away; neither ſhould there be any ſcuttles through the ſides, or their tillars under the gun decks of any ſhip; there ſhould be whole ports inſtead of half ports between decks, and no line-of-battle ſhips ſhould work their cables on the lower deck.

I am confident if all ſhips had firm and fluſh upper decks, in place of deep waiſts (as I recommended in my anſwers in the year 1791, before-mentioned) they would be far ſuperior, not only as ſhips of war, but alſo in point of ſafety, as it would then be almoſt impoſſible (except through great neglect) for any ſhip to founder in deep water, even in the heavieſt ſeas or the moſt ſevere ſtorm. I feel myſelf ſo deeply intereſted in this ſubject, that I muſt take the liberty of referring to Steel's Liſt of Ships loſt or foundered at Sea, and I am perſuaded that I am rendering a ſervice to the community by pointing out what I am certain would prevent thoſe fatal conſequences in future. APPENDIX No. I.

In addition to the above ſuggeſtions, which come more particularly within the profeſſed object of this addreſs, allow me, Honorable Sirs, to ſubmit the following ideas to your conſideration.

As it is apprehended there may be a want of oak timber in this country, I preſume it is now time that Government ſhould give orders to plant and encloſe every part of the King's foreſts and waſte lands with oaks, as I recommended in a report to an Open Committee of the Houſe of Commons, printed in the year 1771. APPENDIX No. III.

I would further recommend that, whenever a peace ſhall take place, all thoſe ſhips that were contracted for, or built for the Eaſt-India Company's ſervice, and purchaſed by Government, ſhould be returned to be employed in that

 ſervice

APPENDIX.

LIST OF APPENDIX.

No. I. A Liſt of Britiſh Ships of War, loſt or foundered, from 1775 to 1784, extracted from a Book publiſhed by STEEL in the Year 1785.

No. II. Extracts from the Eleventh Report of the Commiſſioners of the Land Revenue, and of the Appendix to that Report.

No. III. Two Engravings, intended to exhibit the impropriety of Tumble-home Sides for Ships.

No. IV. Evidence given by Mr. Snodgraſs before a Committee of the Houſe of Commons, appointed in March 1771, to conſider how his Majeſty's Navy might be better ſupplied with Timber.

No. V. A Letter from Mr. Snodgraſs to the Admiralty Board.

No. VI. A Letter from Mr. Snodgraſs to the Society for the Improvement of Naval Architecture.

No. VII. A Liſt of Ships in the United Eaſt-India Company's Service, which have been loſt, burnt, or captured, from the Seaſon 1757 to the Seaſon 1794.

No. VIII. Letter from Captain Lowis to Mr. Snodgraſs reſpecting the Ship Woodcot.

APPENDIX, No. I.

A LIST of Britiſh Ships of War, loſt or foundered, from 1775 to 1784, extracted from a Book publiſhed by STEEL in the Year 1785.

Suppoſed No. of Men.	No. of Guns.	Ships' Names.	Where loſt, &c.
120	16	Falcon - - -	Foundered on the Coaſt of America, - - Crew periſhed.
120	18	Mentor } - -	Ditto near Bermudas, with the crew of the Cerberus on board, in addition to her own crew, All periſhed.
180	28	Cerberus }	
120	18	Pomona - - -	Loſt in the Weſt-Indies, Crew periſhed.
120	18	Ferret - - -	Ditto Ditto - - ditto
220	32	Repulſe - - -	Ditto in North America, - ditto
120	20	Veſtal - - -	Ditto on the Newfoundland Station, - - - ditto
120	16	Pegaſus - - -	Ditto on ditto, - - ditto
100	12	Sprightly - -	Ditto at Guernſey, - - ditto
120	16	Swallow - - -	Ditto coming from the Cape of Good Hope, - - ditto
110	14	Diſpatch - - -	Ditto in North America, - ditto
120	20	North - - -	Ditto near Halifax, - - ditto
600	74	Thunderer - -	Ditto in the Weſt-Indies, - ditto
250	42	La Blanche - -	Ditto Ditto, - - ditto
180	28	Laurel - - -	Ditto Ditto, - - ditto
180	28	Shark - - -	Ditto in North America, - ditto
120	18	Rover - - -	Ditto (don't mention where) - ditto
110	14	Barbadoes - -	Ditto in the Weſt-Indies, - ditto
110	14	Camelion - -	Ditto Ditto, - - ditto
60	10	Victor *(Brig)* -	Ditto Ditto, - - ditto
120	16	Delight - - -	Ditto on her paſſage to North America, - - - ditto
60	14	Pheaſant *(Cutter)*	Ditto going convoy to Guernſey, ditto
3360		*Carr. forward*	

3360 *Brought forward.*

Suppoſed No. of Men.	No. of Guns.	Ships' Names.	Where loſt, &c.
100	8	Thunderer *(Bomb)*	Loſt in the Britiſh Channel, Crew periſhed
500	64	Sterling Caſtle -	Ditto in the Weſt-Indies, - - - Crew chiefly periſhed.
180	28	Andromeda - -	Ditto - Ditto, - - ditto
120	16	Beaver's Prize -	Ditto - Ditto, - - ditto
600	74	Centaur - - -	Foundered coming from Jamaica, - - - - Only 12 ſaved.
4860		*Total*	

No mention of the Crew of the following ſhips, whether any were ſaved or not, but I preſume that may be aſcertained from the books at the Navy Office.

180	26	Earl of Bute -	Foundered in the Gulph of Florida.
120	16	Cupid - - -	Ditto off Newfoundland.
350	50	Leviathan - -	Ditto coming from Jamaica.
160	24	Penelope - -	Ditto in the Weſt-Indies.
850	104	Ville de Paris -	Suppoſed to have foundered coming from Jamaica.
600	74	Glorieux - - -	Ditto ditto ditto.
180	28	Hinchinbrook -	Foundered at Jamaica.
350	50	Cato - - - -	Suppoſed to be loſt on her paſſage to the Eaſt-Indies.
	8	Savage - - -	Loſt at the Iſland of Scaterie.
180	28	Liverpool - -	Ditto in Jamaica Bay.
120	20	Syren - - -	Ditto off Point Judith near Rhode Iſland.
220	32	Arethuſa - -	Ditto off Uſhant.
220	32	Grampus }	Ditto near Newfoundland.
220	32	Tortoiſe } - -	
120	16	Zebra - - -	Ditto near New York.
	12	Spy - - - -	Ditto at Newfoundland.

Otter

Suppoſed No. of Men.	No. of Guns.	Ships' Names.	Where loſt, &c.
	10	Otter - - - -	Loſt in Florida.
120	16	Viper - - -	Ditto in the Gulph of St. Lawrence.
280	44	Phœnix - - -	Ditto in the Weſt-Indies.
220	32	Sartine - - -	Ditto in the Eaſt-Indies.
160	24	Deal Caſtle - -	Ditto in the Weſt-Indies.
120	20	Scarborough - -	Ditto Ditto.
120	18	Bellona - - -	Ditto at the Mouth of the Elbe.
	14	Endeavor - -	Ditto at Jamaica.
	8	Incendiary *(Fire-ſhip)* }	Ditto near the Iſle of Wight.
180	28	Greyhound - -	Ditto near Deal.
160	24	Pelican - - -	Ditto at Jamaica.
160	24	Syren - - - -	Ditto upon the Coaſt of Suſſex.
120	16	Hope - - - -	Ditto off Savannah.
120	16	Duchefs Cumberland	Ditto off Newfoundland.
	14	Race-horſe - -	Ditto off Beachy Head.
	14	Rattle-ſnake - -	Ditto off the Iſland Trinidada.
250	36	Santa Monica -	Ditto off Tortola.
180	28	Solebay - - -	Ditto off Nevis.
	14	Repulſe *(Cutter)*	Ditto off Yarmouth.
	14	Placentia *(Brig)*	Ditto off Newfoundland.
160	24	Crocodile - - -	Ditto off the Start Point, coming from the Eaſt-Indies.
	14	Antelope }	Ditto in the Hurricane at Jamaica.
	10	Duke of Rutland }	

APPENDIX, No. II.

EXTRACTS from the Eleventh Report of the Commiſſioners of the Land Revenue, and of the Appendix to that Report.

(PAGE 26.) The Commiſſioners of the Navy, in anſwer to our enquiries concerning the duration of ſhips of war, give as their opinion, that ſhips built in the dock-yards laſt, on an average, about fifteen years, and thoſe built by contract, in the merchants' yards, about ten years. This difference they impute, among other cauſes, to the timber uſed in the dock-yards being better ſeaſoned, and the ſhips a longer time in building, which laſt circumſtance alone contributes greatly to their duration. The merchant builders being employed to build ſhips of war only in caſes of emergency, are often, from the urgency of the ſervice, preſſed by the Navy Board to compleat them in a ſhorter time than is ſpecified in the contract; and, not having a ſufficient ſtock of timber on hand, they are obliged, at a ſhort notice, to provide what is wanted, and to work it up before the juices are ſufficiently exhauſted to render it fit for uſe.

If this opinion of the Commiſſioners of the Navy be well founded (and no perſons can have better opportunities of judging of this matter) it follows, that as the tonnage of the ſhips built by contract, or purchaſed during the preſent reign, amounts to 256,656 tons, and of thoſe built in the dock-yards to only 131,852 tons, the medium duration of the ſhips which compoſe the preſent Navy, taken one with another, is only about eleven years and three quarters.

Every addition to the duration of ſhips being obviouſly a proportional ſaving of timber, if means could be deviſed

deviſed to make ſhips of war laſt eighteen years, one-third part of the preſent conſumption of timber for the Navy would be ſaved; and inſtead of 50,000 loads being neceſſary for the annual ſupply, 33,333 loads would be ſufficient.

(PAGE 33.) It appears, from the anſwers of Mr. Snodgraſs, that, in the ſhips built for the Eaſt-India Company, iron knees have, for many years, been uſed inſtead of oak, and are found to anſwer better than oak, being lighter, cheaper, and ſtronger. They have alſo been adopted in the conſtruction of ſhips of war in France, for a great while paſt; and it ſeems extraordinary that, notwithſtanding the apprehenſions of a ſcarcity of oak timber in this country, and though the difficulty of procuring knees has been ſuch as to induce the Navy Board to make trial of cheſnut and aſh, yet iron has been very little uſed in the conſtruction of ours. It would, undoubtedly, prove a great ſaving of timber, and of that kind which is already moſt difficult to procure, and in which, by grubbing of hedge rows, in conſequence of the extenſion of tillage and improvements in agriculture, a ſtill farther decreaſe is ſpeedily to be apprehended. This is, therefore, a very important ſuggeſtion; and, being founded on experience, well deſerves conſideration.

In the anſwers of Mr. Snodgraſs in particular, and in thoſe alſo of the merchant builders, whoſe opinions we have obtained on the means of preventing waſte, and increaſing the duration of ſhips, many alterations, beſides thoſe which we have mentioned, are ſuggeſted as improvements in the form and conſtruction of ſhips. Our view, in the enquiries we have made of perſons in that profeſſion, has been to diſcover whether any alteration in the preſent practice would be likely to contribute to the ſaving of timber, by rendering ſhips more laſting; and whatever appeared to us to have that tendency, being connected with the object of our appointment, is inſerted in this report. But we have not *here* detailed the other improvements which have been ſuggeſted in the form and mechaniſm of ſhips, not from

 thinking

thinking them of little importance, but becauſe they are matters which do not fall within the limits of our duty. They, however, appear to us to be ſo well deſerving of the conſideration of thoſe whoſe province it is to ſeek for improvements in naval architecture, that we have inſerted them at length in the appendix, and annexed a ſection, drawn by Mr. Snodgraſs, of a ſeventy-four gun ſhip and a frigate, as built in his Majeſty's dock-yards, and another upon a plan recommended by him, not thinking it right, in a matter of ſo much importance to this country, to keep back alterations ſuggeſted by very intelligent men, poſſeſſed of great profeſſional ſkill and long experience.

Eaſt-India Houſe, May 12th, 1791.

GENTLEMEN,

In conſequence of your application to the Court of Directors of the Eaſt-India Company to permit me, as their Surveyor of Shipping, to anſwer ſuch queſtions as you might think proper to put to me, I received their commands to communicate to you every information that you might deſire: I have accordingly conſidered the queſtions ſent to me from your Board with the utmoſt attention I am capable of, and have given the fulleſt anſwers thereto in my power, which are encloſed herewith.

If any thing that I have ſuggeſted may be of the leaſt ſervice to the Public, it will give me the higheſt ſatisfaction; and I ſhall at all times be happy to communicate any further information in my power.

I am,

GENTLEMEN,

Your moſt obedient humble ſervant,

(Signed) GABL. SNODGRASS.

The Commiſſioners of the Land Revenue.

QUESTIONS propoſed by the Commiſſioners of the Land Revenue to Mr. Gabriel Snodgraſs, with his anſwers thereto.

QUESTION 1. Does your opinion continue the ſame that you gave before the Committee of the Houſe of Commons in 1771, on all the points on which you were then examined; if not, be ſo good as to mention in what particular points it is altered?

ANSWER. My opinion continues the ſame, in all reſpects, as at that time; except on the following points, *viz.*

Reſpecting the building of ſhips in docks my opinion is altered. I now think the building of them on ſlips to be preferable; and, if they are to ſtand any time to ſeaſon before they are launched, a ſhed or roof ſhould be built over them. But I ſtill continue of the ſame opinion that the laying up old ſhips in docks, under proper cover, would be very proper, and that a few experiments of this kind ought to be made, in ſome of his Majeſty's yards, before it is generally adopted.

In the copy of my letter to John Purling, Eſq. printed with the report of the Committee in 1771, (page 35) it is ſaid that ſhips may go *eight* voyages to India in twelve or fourteen years. This muſt be a miſtake, as I never thought of ſhips going more than ſix voyages in that number of years.

In what is ſaid (page 36 of that report) reſpecting the not building ſhips for the Navy in the Merchants' yards, my opinion is alſo altered. I am now certain that it would be much for the intereſt of the Nation, and for the future good of the Navy, if Government were to contract for ſhips of war to be built in private yards in time of *peace*, or whenever there is but little work in thoſe yards, as proper time may then be allowed for the building and ſeaſoning of them, and

proper

proper attention paid to the materials, workmanſhip, &c. and this meaſure, for two good reaſons, *ought* to be adopted; firſt, That Government may always have a ſucceſſion of ſeaſoned and durable ſhips, at a moderate price, which would prevent the neceſſity that ariſes, in time of war, of building ſhips in great *haſte* and with *green* materials, which certainly is the principal cauſe of the rapid decay of ſhips built in this manner, and of the *bad* ſtate of many of the ſhips of the preſent Navy, and alſo of the extraordinary expence and conſumption of timber in building and repairing of them: and, ſecondly, That the ſhipwrights in the private yards may find conſtant employment, which would increaſe their numbers and continue them in this country, and be highly advantageous to the Nation in time of war. The contractors may alſo undertake building ſhips in the King's yards, by the ſhipwrights employed in thoſe yards, and ſlips may be ſeparated from the reſt of the yard by a fence put up for that purpoſe.

It has been ſuggeſted by ſome Gentlemen, that ſhips of war, built in the Merchant's yards, are not ſo durable as thoſe built in the King's yards. This, certainly, is a great miſtake, if the ſame time is allowed for building and ſeaſoning, as in the King's yards; or the *fault* muſt be with thoſe who form the contracts and ſhould ſee they are complied with, as it is well known and allowed, that the Merchants' builders buy ſounder and better timber, in general, than what is received into his Majeſty's yards for the uſe of the Navy; conſequently, if ſhips built in the Merchants' yards were allowed a ſufficient time for ſeaſoning, &c. and properly attended to while building, there is no doubt but they would be equal, if not ſuperior, to ſhips built in any of his Majeſty's yards, and at a much cheaper rate. For, if the prime coſt of a ſhip of war, built in Merchants' yards, was compared to the real expence of building one of the ſame dimenſions and ſcantlings in the King's yards, I much doubt whether the difference of the ſums would not be found nearly as *two* to *one*.

QUESTION 2. What is the number of Britiſh-built ſhips, at this time in the ſervice of the Eaſt-India Company, on the eſtabliſhment; and what is their tonnage?

ANSWER. There are now ninety-one Britiſh ſhips, built and building, on the Company's eſtabliſhment; and the amount of their tonnage is about 79,913 tons.

QUESTION 3. What other ſhips are conſtantly, or occaſionally employed in the Company's ſervice; and to what amount of tonnage?

ANSWER. Two ſhips, built at Bombay, are conſtantly employed in the Company's ſervice to and from India;—The amount of their tonnage is 1,727 tons. Very few ſhips have been *occaſionally* employed; except, lately, ſome few ſmall ſhips, returning from Botany Bay, have brought home teas from China.

QUESTION 4. Are there any ſhips now building for the ſame ſervice, and of what tonnage; and are ſuch ſhips intended to be employed in the room of ſhips of equal tonnage, to be forthwith broken up or ſold, or in addition to the preſent ſhipping?

ANSWER. Four ſhips are now building of ſomething more than twelve hundred tons each, in the room of four other ſhips of about eight hundred tons each, which are worn out and diſpoſed of by their owners.

QUESTION 5. At what time did the reſtriction, impoſed by the act of 12 Geo. III. againſt building more ſhips for the Eaſt-India Company, until their whole tonnage ſhould be reduced to 45,000 tons, expire; and how ſoon after that reſtriction ceaſed, did the Company begin to build and increaſe their ſhipping?

ANSWER. I cannot tell the preciſe time the reſtriction expired, but ſuppoſe it was ſome time in 1776, as in that year the Company began to build and increaſe their ſhipping.

QUESTION 6. Has the general conſumption of timber, for the building and repairing of ſhips, increaſed ſince the year 1771?

ANSWER. The conſumption of timber, for the Navy only, I ſuppoſe has been more than double, from 1771 to 1791, to what it was from 1751 to 1771; and the general tonnage of Eaſt-India ſhipping (Britiſh-built) has encreaſed, ſince the year 1776, from about 45,000 tons, to 79,913 tons, including the tonnage of the four ſhips now building.

QUESTION 7. Is oak, of any other country than Britain, uſed in the conſtruction of Eaſt-India ſhips; and if ſo, in what proportion?

ANSWER. About one-half of the plank of the bottoms of Eaſt-India ſhips is Dantzick oak plank. No large foreign oak is uſed in any part of thoſe ſhips.

QUESTION 8. From what part of Britain is the oak generally brought that is uſed for the conſtruction of Eaſt-India ſhips?

ANSWER. The merchant builders are not confined by their contracts to buy timber from any particular part of Britain, provided it is equal in goodneſs to that of the growth of Suſſex.

QUESTION 9. What do you ſuppoſe to be the difference between foreign oak timber imported into this country, and that of Britiſh growth, in point of duration?

ANSWER. All foreign oak, imported into this country, is very inferior to Engliſh oak; but I cannot aſcertain the exact difference in point of duration.

QUESTION 10. Has the price of ſhips, built for the Eaſt-India Company, riſen; and, if ſo, how much ſince 1771?

ANSWER. The price of ſhips, built for the Eaſt-India Company's ſervice, has riſen, ſince the year 1771, from twenty to forty ſhillings per ton, which has been occaſioned, partly from their increaſed tonnage, partly from their being more ſubſtantially built, from the contracts being made fuller, and by not admitting ſo large extra bills as formerly.

QUESTION 11. Has Government any competitor, beſides the Eaſt-India Company, in the purchaſe of large oak timber fit for the uſe of the Navy?

ANSWER. There are certainly many more competitors in the purchaſe of large oak timber, fit for the uſe of the Navy, than the Eaſt-India Company, ſuch as the Office of Ordnance, Brewers, Millwrights, &c. &c. and no Britiſh ſhips, of 300 tons and upwards, are built without having ſome principal oak timber and plank uſed in them, fit for the uſe of the Navy. But as the whole quantity of large oak timber uſed in the Eaſt-India Company's ſervice, and for all other marine purpoſes, is ſo ſmall compared to that uſed for the Royal Navy, the Navy Board have it much in their power, at all times, to regulate the price. I am of opinion, that Eaſt-India ſhips of 1,200 tons are built with timber of no larger meetings than is uſed for building and repairing the largeſt frigates in his Majeſty's yards.

QUESTION 12. How long may it take to build an Eaſt-India ſhip under the preſent regulations?

ANSWER. Eighteen months is the ſhorteſt time allowed at preſent.

QUESTION 13. How long, under former regulations?

ANSWER. I do not recollect any regulation for the time ſhips ſhould be in building formerly; ſome have been built in ſix months.

QUESTION

QUESTION 14. How many voyages might a ſhip be able to perform under each circumſtance?

ANSWER. The ſhips now in the Company's ſervice may go ſix voyages, if they can be performed in twelve years, with as much propriety as the former ſhips went four voyages.

QUESTION 15. What is the length of time of a voyage in the Eaſt-India Company's ſervice at preſent, and what was it uſually before the year 1771?

ANSWER. The preſent ſhips being coppered make their paſſages, out and home, in about two months leſs time than the ſhips that were not coppered; but formerly, when the ſhips had filled bottoms, (that is filled with nails) and were kept going regularly, they made four voyages in eight years. The preſent ſhips do no more, as they do not go out until the ſeaſon after their arrival.

QUESTION 16. After what number of voyages are Eaſt-India ſhips uſually broken up or diſpoſed of?

ANSWER. Uſually after having made four voyages; but lately the Company have given leave that all ſhips in their ſervice may go ſix voyages, if, on examination, the owners ſhould think them worth repairing; but it is very improbable that any of them will go more than ſix voyages in the Company's ſervice. When they have gone the number of voyages they are ſuppoſed to be fit for, they are either broken up or ſold. Of the laſt eighteen ſhips, eleven were broken up; of the reſt, two were loſt, one was burnt, and the remaining four were, I believe, ſold.

QUESTION 17. What number of loads of rough timber are conſumed, on an average, in building an Eaſt-India ſhip, in proportion to her tonnage, including plank and thick ſtuff?

ANSWER.

ANSWER. I am not certain; but ſuppoſe, as iron is uſed for knees, &c. in thoſe ſhips, it may be about one load and a half to a ton.

QUESTION 18. What proportion does the timber uſed in repairing an India ſhip, during the time ſhe continues in the Company's ſervice, bear, on an average, to the whole quantity uſed in her firſt conſtruction?

ANSWER. The quantity of timber uſed in repairing Eaſt-India ſhips, during the time they are in that ſervice, is quite uncertain: in general very little is uſed, for when their timbers are too *bad* to admit of being ſtrengthened with ryders, ſtandards, &c. the expence of ſhifting them is ſo great, that no ſhips, lately, have had large repairs, and it is not likely any will in future.

QUESTION 19. What is your opinion of keeping a large ſtock of naval timber together, in its rough ſtate, for three years, or more, before uſing it?

ANSWER. Keeping three years ſtock of timber, thick-ſtuff, plank, &c. in his Majeſty's yards is ſo obviouſly deſtructive of timber in general, and ſo extravagantly expenſive, that it is next to a miracle its having continued ſo long.

QUESTION 20. If timber ſuſtains damage from being ſo kept, what proportion of it do you think may be thereby rendered unfit for ſhip-building?

ANSWER. Rough timber, piled together in ſuch vaſt quantities as is practiſed in the King's yards, and to remain in that ſtate for three years or more, muſt certainly receive much damage; but what proportion of it may be thereby rendered unfit for ſhip-building I cannot exactly aſcertain—It may be one-third or more.

QUESTION 21. How far do you think it practicable to mould timber, for the various purpoſes of ſhip-building, at or near the places where it grows, before it is brought to the building yard?

ANSWER. It may be done to great advantage, eſpecially where land carriage is expenſive.

QUESTION 22. Would not that practice be the means of preſerving much timber that is now loſt by converſion in the dock yards?

ANSWER. Certainly it would, and more eſpecially if converted by contractors.

QUESTION 23. In what degree or proportion is naval timber, in general, diminiſhed in quantity, in being converted from its rough ſtate into the proper forms for the purpoſes of ſhip-building: that is to ſay, how many loads of converted timber are produced from a certain number of loads of rough timber, on an average, in ſquare meaſure?

ANSWER. About one-half in the merchants' yards, but I ſuppoſe it to be much more diminiſhed in the King's yards; that is to ſay, two loads of rough timber will not, in the King's yards, produce one load of converted timber.

QUESTION 24. What do you conceive to be the beſt method of preſerving timber in a converted ſtate?

ANSWER. All converted timber, thick-ſtuff, plank, &c. ſhould be placed under cover, where there is a moderate currrent of air, as ſoon as it is received into the yards.

QUESTION 25. Is there a greater difficulty in procuring oak knee-timber now than formerly?

ANSWER.

ANSWER. I believe not. However great the difficulty has been, or may be at preſent, it is not of the ſmalleſt conſequence with reſpect to ſhip-building, as iron knees may be ſubſtituted, in general, to a much greater advantage.

QUESTION 29. Is aſh timber, or the Spaniſh cheſnut, uſed for knees?

ANSWER. None uſed that I know of, nor is there the leaſt occaſion for either.

QUESTION 27. Are they found to anſwer the purpoſe, and to be nearly as durable as oak?

ANSWER. I never had any experience of them.

QUESTION 28. What ſubſtitute do you make uſe of when knee-timber cannot be had?

ANSWER. Iron is the beſt ſubſtitute.

QUESTION 29. If iron be recommended, in what part of ſhips can it be uſed to advantage?

ANSWER. Iron may be uſed for hanging knees and ſtandards to all the decks, for all breaſt-hooks (except the deck-hooks) ryders, crutches, wing-tranſom, and other tranſom-knees, and for knees in general. I have had great experience of iron for many years, and am confident it may be uſed for the above purpoſes in all ſhips of war, and other ſhips, to much greater advantage than wood.

QUESTION 30. May not beech, elm, Dantzick, and Riga timber, ſupply the place of oak in many parts of a ſhip; and if ſo, in what parts?

ANSWER. Beech and elm may be uſed in all ſhip's bottoms, from the keel to the floor-heads; Dantzick plank may be uſed in the bottoms of all ſhips, under the light draught of water, in place of Engliſh oak; Riga timber and

Quebec oak may be uſed in ſome part of the ſhips of the Navy, if there was a neceſſity, from want of Engliſh oak. Foreign plank will be found to be as dear as Engliſh converted oak from the interior parts of this kingdom, the growth of which, even there, ought to be encouraged, in preference to foreign oak, if it ſhould coſt more money, as being more durable and advantageous to the nation in general, and to the landed intereſt in particular: but I am firmly of opinion, there never will be a ſcarcity of oak timber in this kingdom, *if the King's foreſts and waſte lands were properly planted with oaks, and conſtantly taken care of afterwards.*

QUESTION 31. Can you ſuggeſt any alteration, in the manner of framing large ſhips, that would leſſen the conſumption of oak timber?

ANSWER. By making the top-ſides of all the King's ſhips (in future) to tumble home very little: ſee the annexed midſhip ſections for a ſeventy-four gun ſhip and a frigate, No. 2 and 4: alſo by ſiding the timbers of the frame leſs, and moulding them more. This would add ſtrength to the ſhips, and leſſen the conſumption of timber.

QUESTION 32. Have you ever conſidered the manner of framing ſlips or docks, for building and docking large ſhips; and whether any means can be uſed to leſſen the quantity of timber made uſe of for ſuch purpoſes: or can you ſuggeſt any means by which either of them may be improved?

ANSWER. Inferior timber being generally uſed for framing ſlips and docks, it is not very material as to the quantity made uſe of; but, with reſpect to the mode of launching and docking ſhips in his Majeſty's yards, I am of opinion there is great room for improvement; and I beg leave to obſerve, that few things are ſo obviouſly abſurd as the old method (which is at preſent practiſed in the King's yards) of launching ſhips on a curve line, with ſhort bulge-

ways

ways and ſlices under each end of them, and alſo with ſpurs, by which method it is impoſſible to launch any ſhip without *hogging*, and conſequently injuring them more or leſs. To prevent ſhips from receiving ſuch injury, in future, I would recommend, that their keels be put on blocks, of ſufficient height that the *ways* for launching them may be laid on a ſtraight line, with a declivity of near an inch to a foot, for large ſhips, and of a full inch to a foot, for the ſmaller claſs of ſhips:—to have bulgeways as uſual, (but fitted without either ſpurs or ſlices, as all King's ſhips are docked, after they are launched, to be coppered; a plank ſecured to the bottom at both ends of the bulgeways, to prevent the heads of the puppets from flying out, would be ſafer and much better than ſpurs):—in addition to the bulgeways to have ſliding planks, or ways in the middle line to receive the keel, from about fourteen feet afore the ſtern-poſt, and to be continued as low down as the launch is laid for the bulgeways, and to be of ſuch a height as that the *fore foot* may run ſafely over it, and of the ſame declivity as the ſliding planks for the bulgeways. By this method, it would be impoſſible that any ſhip ſhould receive the leaſt damage in launching; for when the blocks are all ſplit out from under the keel, the ſhip would be perfectly ſafe, and as well ſupported, all fore and aft, as when they were all under, and might remain in that ſtate until the next ſpring tides, or longer, if it ſhould be required by want of water or any other cauſe.

The mode of docking large ſhips at Portſmouth, and the other naval yards, by heaving them an end on the blocks, with tackles, when there is not ſufficient water to float them in; and alſo of raiſing them; with wedges and ſhores, in order to ſhift their keels, falſe-keels, &c. when required, is certainly very abſurd, and the more ſurprizing that it ſhould have continued to this time, when by taking a view of the locks, &c. on the various inland navigations in this country, they would, at once, point out a more rational, and much eaſier method of docking large ſhips, and raiſing them on blocks of ſufficient height for ſhifting

keels,

keels, or doing any repairs that may be wanted, without the leaſt difficulty, by filling the docks with water, to any height required, by means of a reſervoir ſufficiently large for that purpoſe, which may be always ſupplied and kept full by a ſteam engine or otherwiſe, at a very ſmall expence, and to the greateſt advantage.

Had proper engineers been originally employed by Government, for the general conſtruction of the docks in his Majeſty's ſeveral yards, who had previouſly ſurveyed and taken plans of all the naval docks in Europe, I am clearly of opinion they would have been much better conſtructed, and at a conſiderable leſs expence.

QUESTION 33. Can you propoſe any better method of preſerving ſhips, after they are built, than lying afloat at moorings?

ANSWER. See the anſwer to the firſt queſtion.

QUESTION 34. Suppoſing an Eaſt-India ſhip to lye ſome years under cover, when building, and proper attention paid, in that time, to the ſeaſoning of her frame and other timber, and leaving her tree-nail holes open, how long might ſuch a ſhip laſt, either in years or voyages?

ANSWER. Ships built under ſuch regulations may laſt from twelve to fifteen years, and perform ſix voyages with a ſmall expence for repairs; as ſhips built in a ſhort time, with green materials, will coſt repairing for four voyages.

QUESTION 35. Can you ſuggeſt any means by which the conſumption of oak timber may be leſſened in ſhip-building, or any improvement by which the duration of ſhips would be increaſed, and in which the expence would not exceed the value of the timber ſo ſaved?—If you can, be ſo good as to ſtate it, or any other improvement whatever, in the conſtruction or

preſer-

preſervation of ſhips in general, that you may be able to ſuggeſt.

ANSWER. Never to have more than one year's conſumption of timber in any of his Majeſty's yards.

No rough timber ſhould be kept in the weather, longer than one year before it is converted; for timber laying in that ſtate, expoſed to wet and dry, receives more damage than is generally imagined.

All timber ſhould be converted, as ſoon as received into the yards, and afterwards ſhould ſtand to ſeaſon in the ſhip's frame, under a roof ſufficiently large to cover the whole ſhip.

Timber ſhould alſo be ſpread abroad as much as poſſible, in order to lay the moulds readily upon the moſt proper pieces, by which method a great ſaving of timber would be made in the converſion, and alſo be of great advantage, in point of ſtrength, to the ſhips, as there would be no occaſion to uſe any timber but what was of proper ſize and growth;—it would alſo ſave the expence of piling, unpiling, &c. as is practiſed in his Majeſty's yards.

All timber, deſigned for ſhips' frames, ſhould be contracted for to be ſerved into the yards ready converted to their reſpective moulds, and the ſhips to be put on the ſtocks and compleatly timbered within a certain time, and to have a ſhed built over them (to be included in the ſaid contract) and to remain in that ſtate to ſeaſon during pleaſure, or until wanted, when each ſhip ſhould be compleatly finiſhed by another contract. All the beams, knees, thick ſtuff, plank, &c. ſhould be provided as ſoon as the ſhip is in frame, and placed under cover, ſo as to have the ſame ſeaſoning. All thick ſtuff, plank, &c. that requires to be boiled in the kiln, if it was afterwards placed on racks and burnt, ſo as to exhauſt the moiſture occaſioned by its being boiled, and alſo to bring it to its round, would be of great advantage to the ſhips.

Govern-

Government ſhould have twenty or thirty ſail of line-of-battle ſhips, of ſeventy-four guns and upwards, conſtantly on the ſtocks (under proper cover) nearly finiſhed, or in ſuch ſtate that they may be launched in a ſhort time, on any emergency; and ſhould have ſhips built for the Navy in private yards, in times of peace, &c. (as recommended in my firſt anſwer.)

I am of opinion that all the rough timber, now in his Majeſty's ſeveral dock yards, ſhould be immediately converted into ſhips' frames, and as many of them put on the ſtocks, as all the timber in thoſe yards will produce: but if there ſhould not be a ſufficient quantity to compleat all the frames ſo put up, let contracts be made with timber-merchants, or others, to compleat the ſeveral frames, and to build a roof over each of them, including every expence attending the ſame. By this means a great part of that unneceſſary ſtock of timber, now in the King's yards, would be preſerved, except ſuch as is already rotten or otherwiſe defective.

No ſhips ſhould ever have what is called *thorough repairs*, or *any* timbers ſhifted; but ſhould have temporary ſlight repairs, with iron ryders, ſtandards, &c. and to have new ſhips put on the ſtocks, in their room, when neceſſary; as it is a well known fact, that many ſhips have *each* coſt nearly as much repairing, as *two* new ſhips, of the ſame dimenſions and ſcantlings, would coſt building: perhaps this has been done on an idea of ſaving timber, but certainly it is a great miſtake.

In building ſhips, the plank of the bottoms, inſide plank, &c. ſhould be partially bolted on, and all the tree-nail holes to be bored through, as ſoon as the plank is worked, but no tree-nails drove until the ſhip is nearly finiſhed, or ready for caulking; alſo to have the tree-nails well ſeaſoned, before they are drove, and made of the beſt oak in the kingdom.

I am

I am of opinion that all the ſhips of the preſent Navy are too ſhort, from ten to thirty feet, according to their rates. If ſhips, in future, were to be built ſo much longer as to admit of an additional timber between every port, and if the foremoſt and aftermoſt gun ports were placed a greater diſtance from the extremities, they would be ſtronger, and ſafer, have more room for fighting their guns, and, I am perſuaded, would be found to anſwer every other purpoſe much better than the preſent ſhips of the Navy, and there would be no neceſſity of uſing long thick ſtuff and plank for a three-port ſhift in ſuch ſhips, as a two-port ſhift would be quite ſufficient.

The foremaſts of all the ſhips of the Navy are placed too far forward from four to ſix feet, the ſhips are too lofty abaft, and too low in midſhips; they would be much better and ſafer, if their forecaſtles and quarter-decks were joined together; for, if they carry *two*, *three*, or *four* tier of guns *forward* and *abaft*, they certainly ought to carry the ſame in *midſhips*, as it is an abſurdity, and alſo a great injury to any ſhip, to load the extremities with more weight of metal than the midſhips; and no ſhips, however ſmall, that have forecaſtles and quarter-decks, ſhould go to ſea with deep waiſts,—they certainly ought to have fluſh upper-decks.

Ships of the Navy are not ſufficiently ſtrong to carry the uſual weight of metal; on the whole they have plenty of timber, but are every way deficient in iron to ſtrengthen and connect the ſides and beams together, ſo as to prevent their working in bad weather or long engagements, when they uſually break many of the fore and aft bolts of the knees, and the ſhips ſpread, ſo as to leave the ends of the beams ſhort of the ſides: to prevent which, they ſhould have iron hanging-knees (with a greater number of fore and aft bolts than is cuſtomary for the ſhips of the Navy) to all the beams in the ſhip; alſo iron ſtandards, flayed* to the decks (without ſhoels) between every port; and all the old ſhips of the preſent Navy ſhould have iron, inſtead of wood ſtandards, and an additional iron hanging knee under every

* layed

beam in the ſhip, where there is not a ſtandard; and alſo to have diagonal braces fixed to them, as after-mentioned and deſcribed in the annexed midſhip ſections, Nos. 2 and 4.

All breaſt-hooks ſhould be of iron (except the deck-hooks) alſo all the crutches, wing-tranſom, and other tranſom-knees, and knees in general; as they are lighter, cheaper and ſtronger than wood, and may be made to any ſize and length, ſo as to have any number of additional bolts.

All bolts of the knees, breaſt-hooks, and crutches, ſhould be drove from the inſide and clenched on the outſide plank; and the bolts for all iron knees, ſtandards, &c. to have collar-heads.

I particularly recommend diagonal braces to be fixed from the keelſon to the gun-deck clamps; ſix or eight pair of them, well ſecured at each end with iron knees and ſtraps, to all the ſhips in the Navy, would effectually prevent their ſtraining and working in bad weather, in the manner they now do.

The bottoms of all ſhips in the Navy are much too thin: ſhips of ſeventy-four guns and upwards ſhould have ſix-inch bottoms, and no ſhip's bottom ought to be leſs than four inches thick, and the edges ſhould be rabbetted ſo as to require little or no caulking. See ſections, Nos. 2 and 4.

The wales and inſide ſtuff of thoſe ſhips are much too thick, and is an unneceſſary conſumption of oak timber; as wales, &c. eight inches thick, would be ſufficient for the largeſt ſhips in the Navy.

The capſtands, throughout the Navy, are fitted on a *bad* principle, as they require a much greater number of men than would be neceſſary if they were fitted with an iron axis or ſpindle, as certainly all capſtands ought to be, and alſo with paul-heads and catch-pauls, to ſecure the whelps and prevent the people from being thrown from the bars, which has frequently happened in the ſhips of the Navy, and

and many of their people have received much damage. This ſort of capſtand, with iron ſpindle, paul-head, and catch-pauls, has been in uſe, on board all the Eaſt-India ſhips, for a great number of years, and none of the ſpindles, or any other part of the capſtand, have ever failed, nor has the leaſt accident happened from them. Every capſtand in the Navy may be altered to the ſame plan, at a very trifling expence, conſidering its great utility.

All ſhips' rudders ſhould be ſhort of the under-ſide of the keel, from eighteen inches to two feet, and ſhould be hung in the center, and have a round head, to work in a circle, ſo as to require no rudder-coat; and thoſe ſhips that have no round-houſe, their rudders ſhould run up, and ſteer with a yoke, abaft the rudder-head, above the upper-deck.

Cables are, in general, very much injured by ſmall ryding-bitts, and croſs-pieces; and more eſpecially from the fore-part of the bitts and after-part of the croſs-pieces not being made circular, or their edges rounded, when new. Seventy-four gun ſhips' bitts and their croſs pieces are not more than twenty inches each, whereas thoſe of the Eaſt-India ſhips are two feet; and the fore-part of the bitts and the after-part of the croſs-pieces are ſo rounded, that the cables cannot be the leaſt injured by them. Laſt year, one Eaſt-India ſhip (the Woodford) had caſt-iron rollers fitted to her bows, to eaſe the friction of the cables, in place of bolſters or naval hoods.

All ſcuppers ſhould be of caſt-iron, without having any lap on the deck or ſpirketting, as *they* cannot be *broke* by the working of the ſhip.

The heads and quarter galleries of all ſhips ſhould be reduced, and alſo the great overhanging of the ſterns.

If the foregoing were put into execution in ſhips of war, I am certain they would be *much ſtronger*, *ſafer*, and *more durable* than the preſent ſhips of his Majeſty's navy; and they would alſo be able to keep the ſeas, for years, without

docking.

docking. I have no idea of a ſhip of war, that is properly built, *foundering*, or not keeping the ſeas in the *worſt weather.*

The fewer ſhips that are built for the Navy, in future, not capable of mounting ſeventy-four guns and upwards, the better; as ſhips of ſixty-four, fifty, and forty-four guns, alſo ſmall frigates, ſloops &c. conſume vaſt quantities of oak timber, are maintained at a great expence to the nation, and are, by no means, equally ſerviceable.

But I am of opinion (contrary to the ideas of ſome gentlemen) it would be for the intereſt of Government, and alſo of the Eaſt-India Company, if they were to have twenty ſail of ſhips built for the China trade *(when new ſhips are wanted)* that may be capable of fighting ſixty guns, with a cargo on board them. They might carry eighteen pounder guns on their middle-decks, and ſix or nine pounder guns on their upper-decks; and, when deep loaded, would be able to keep their lower tier of ports open longer than any ſhips in his Majeſty's Navy. Such ſhips being more defenſible, would require a leſs number of ſhips of war to protect them, which would ſave the vaſt expence of convoys, and of ſhips being ſtationed in India, &c. in time of war: it would alſo be a great ſaving of oak timber, as the ſwift decay of ſhips ſtationed in India is very evident, and is a matter that ought to be particularly attended to.

I am farther of opinion, if the Company were to carry on their trade, in general, in large ſhips, they would not be ſo deſtructive to the growth of oak timber as ſmall ſhips; for if two ſhips were to be built of ſix hundred tons each, and one of twelve hundred tons, it would be found that the former (two) had conſumed near three-fourths more, in number, of oak trees, than the latter; conſequently, the ſmall ſhips would increaſe the conſumption of young growing timber trees, and tend greatly to prevent the growth and ſupply of large timber.

I have found, on enquiry, that oak timber, under forty feet meetings, has increaſed in price, ſince the year

1771,

1771, about fifteen ſhillings per load, whereas timber of ſixty feet meetings has increaſed only five ſhillings per load, which is a proof there has been a greater demand for ſmall timber than for large; and if the conſumption of the former continues to be greater, it will (unleſs proper precautions are taken) ultimately cauſe a ſcarcity of the latter. But I am confident that more timber, large and ſmall, may be ſaved, in future, in his Majeſty's yards, and from what I have recommended reſpecting the royal foreſts, &c. than will be required for the conſtant building and repairing a neceſſary number and tonnage of ſhips for the Eaſt-India Company's ſervice.

After taking care to plant and improve the King's foreſts and waſte lands, to the greateſt advantage, I farther recommend, that Government particularly attend to the ſhip-wrights in their own yards; for, at preſent, they are much too low in eſtimation, and too few in number; and, if there is not a greater number brought up, and kept in the King's yards, it is probable the Navy, and of courſe the Nation, will receive a ſevere check, whenever there may be a neceſſity of fitting out a fleet on any emergency.

Their pay was probably ſettled at two ſhillings and one penny per day in Charles the Second's time, which is now as low as the pay of a common labourer in the merchants' builders yards in the River Thames, who are at no expence for tools, &c. This pay is certainly too low for any artificer that has ſerved an apprenticeſhip, and particularly ſo for ſuch a valuable body of mechanics as the ſhip-wrights are to this Nation; for if they are too few in numbers, *that* muſt greatly impede the equipment of a fleet, and increaſe the expence to the Nation, *far* above that of maintaining and keeping half as many more in his Majeſty's yards, in time of peace, even if they were allowed half-a-crown a day, which, at this time, is very moderate, and by no means in proportion to their pay at the time it was firſt ſettled. There are always many ways of employing ſhip-wrights in the King's yards, if there ſhould not be ſufficient work in their

own

line to employ them; but no other mechanics can be ſubſtituted in *their* room if there ſhould be a deficiency in numbers of *them*.

And I further beg leave to obſerve, from the previous obſervations, and recommendations herein contained, together with what was ſuggeſted by me on the ſame ſubject, and printed with the report of the Committee of the Houſe of Commons in 1771, that Government have the power, not only to double the growth of oak timber in the foreſts and waſte lands, but alſo greatly to reduce the conſumption of timber for building and repairing the Navy. This, with the ſupply that may be obtained at very reaſonable rates, from the uſual annual falls of private gentlemens' timber, would (except from miſmanagement) effectually prevent the want of that article for the Navy, in future.

(Signed) GABL. SNODGRASS.

Eaſt-India-Houſe,
May 12, 1791.

APPENDIX, No. IV.

EVIDENCE given by Mr. Snodgraſs before a Committee of the Houſe of Commons, appointed in March, 1771, to conſider how his Majeſty's Navy might be better ſupplied with Timber.

AFTER having recited the evidence of ſeveral reſpectable ſhip-builders and timber-merchants, the Committee then proceeded to examine Mr. Gabriel Snodgraſs, Surveyor to the Eaſt-India Company, who ſaid, that after he had ſerved his apprenticeſhip to Mr. Snell, a builder's meaſurer in one of the King's dock yards, he became a working ſhipwright there; was then recommended by Mr. Benjamin Slade into the ſervice of the Eaſt-India Company, and went to Bengal as their ſhip-wright, and had the ſuperintendency of all the Company's ſhipping at that place; that he has been their Surveyor in England ever ſince the year 1757, and has been converſant in ſhip-building ever ſince he became a ſhipwright, and particularly attentive to the breaking up of ſhips of war, foreign as well as Britiſh. And he delivered in to your Committee a paper, containing his general ideas with reſpect to the promoting the growth and reducing the conſumption of oak timber; a copy of which paper is as follows, *viz.*

" In the firſt place, I am of opinion, that the foreſts " and waſte lands belonging to the Crown may be made, " in thirty or forty years time, capable of producing a re- " gular ſucceſſive ſupply of timber, ſufficient for the Royal " Navy.

" I am

" I am alſo of opinion, that there is yet plenty of " large timber within forty or fifty miles of water-carriage, " and in the interior parts of the kingdom great quantities " of large timber; and that it is in the power of Govern- " ment to manage the ſupplies from each county, ſo as to " encourage its growth all over the kingdom, and thereby " render it highly improbable ever to be in want of large " or ſmall timber for the Navy, without circumſcribing " the conſumption of any ſort, for that would, aſſuredly, " greatly diſcourage the growth of timber in general: but, " if any doubts remain, the Lords Lieutenants and the " landed gentlemen, may, in the courſe of this ſummer, " inform Government what quantity of large timber is grow- " ing in each county.

" With reſpect to the conſumption of oak timber, " I am of opinion, that three men of war may be built in " the merchants' yards with little more timber, and at as " little expence, as two are built in the King's yards; but " I do not mean to ſay, it is a right meaſure to build or " repair King's ſhips in the merchants' yards; for, I firmly " believe that mode has greatly raiſed the price of building " merchant ſhips, as well as the price of timber in general: " and ſure I am, that there are people in the King's yards " as capable of building ſhips as cheap, and as good as thoſe " built in the merchants' yards, if they had the ſame en- " couragement. I am alſo of opinion, that much timber " might be ſaved by a little alteration in the conſtruction " of the top-ſides of the King's ſhips; and, in my opinion, " would be attended with great utility to ſeventy-four gun " ſhips.

" I ſhall next proceed to the preſervation of ſhip- " ping, in general, and here I would recommend all ſhips " to be built under the cover of a roof, and the King's " ſhips to be built in docks under a roof, never to be " floated out before they are wanted for ſervice, and, on " their return, when no farther ſervice is required of them,

" to

" to be laid up in thoſe docks again. That as the expence " of the gates, &c. is the moſt material, I would recom- " mend the lengthening the preſent docks; and this may " be done ſo as to require but few new gates to be made, " even for the whole Navy of England, and would ſave " all the expence of mooring, the ordinary, &c. &c. and " cauſe the ſhips in the Navy to laſt and continue ſound, " at leaſt half as long again as they do at preſent, and ſave " the expence of four-inch plank, with the money ex- " pended in repairing the damage done to the bottoms by " the worms, as I have been informed the Triumph, and " ſeveral of the new ſhips bottoms in the river Medway, " have lately been much injured by them; likewiſe the " annual caulking, painting, and repairs, &c. &c. would " be ſaved.

" Now, with reſpect to the Eaſt-India Company's " ſhips, the old ones now in their ſervice are built ſlighter, " in proportion to their tonnage, than any other merchant " ſhips in the river Thames; they are too narrow for their " depths, which muſt be maintained, on account of their " ſtowage in the hold, and the neceſſary heighth between " decks. Nothing but the conſtant repairs, attended with " great expence, has made them tolerably ſafe for four " voyages; it was, therefore, highly neceſſary for theſe, " and many other reaſons, to build ſhips ſtronger and " broader; and, conſequently, the ſhips built latterly, I " am of opinion, will run five or ſix voyages with much " leſs conſumption of timber, as well as expence in repairs, " than the old ſhips run three, and four voyages; they " alſo ſail cheaper, and conſume a conſiderable leſs number " of oak trees, in proportion to their tonnage; they are " ſafer, ſtiffer, and much more defenſible; they are more " healthy for the ſeamen and recruits; are alſo very ad- " vantageous to the Company, in reducing their freights, " by means of the additional ſurplus tonnage brought " home on half freight, which enables the Company to " lower the price of their teas, ſo as to prevent the ſmug-

" gling

" gling that article from abroad in ſo great a latitude. " Other nations are ſo ſenſible of theſe advantages, that " they trade in much larger bottoms than any in the Com- " pany's employ.

" And, with reſpect to their ſcantling, ſo much has " been ſaid to the Committee of the Honorable Houſe of " Commons, relative thereto, that I need only obſerve, it " appears to me many gentlemen have formed wrong ideas " on that head, partly owing to their having been com- " pared to ſixty-gun ſhips, &c. and therefore, in order to " ſet this matter in the cleareſt light, I beg leave to obſerve, " that although one of the largeſt Eaſt-India ſhips carries, " both outward and homeward-bound, as much tonnage " to ſea as a ſixty-four gun ſhip, and, homeward-bound, " their cargoes are often ſix times the value of a ſixty-four " gun ſhip, yet two of them were built for £10. 10*s.* per " ton each. A ſixty-gun ſhip coſts, even in the merchants' " yards, £16. 12*s.* 6*d.* per ton, and the difference of build- " ing each ſhip is as follows, *viz.*

" One India ſhip, 864 tons, at £10. 10*s.* per " ton, £9,072.—Five ſhips is £45,360.

" One ſixty-four gun ſhip, 1,396 tons, at " £16. 12*s.* 6*d.* per ton, £22,759.—Two " ſhips is £45,518.

" The above ſixty-four gun ſhip is ſuppoſed to be " built in the merchants' yard. If the compariſon was " made with a ſixty-four gun ſhip, built in the King's yard, " then it would appear, that three of the largeſt ſhips in " the Company's ſervice did not coſt ſo much building as " one ſixty-four gun ſhip. By this, I preſume, it will ap- " pear impoſſible for their ſcantling to be nearly equal; " and part of the ſhips now building, although ſeven hun- " dred and fifty-eight tons, builders' tonnage, and who " will carry to ſea twelve hundred tons, their principal " timbers are not ſo much ſided as a thirty-two gun ſhip " of war, nor are larger than thoſe propoſed by Mr. Randall

" for a ſix hundred ton ſhip. This is owing to the builders " being allowed to make their own contracts, which is a " great indulgence, conſidering the advantages ariſing to " them by repairs: yet ſome of the gentlemen builders are " more moderate than others; and it gives me pleaſure to " obſerve, Mr. Randall propoſes a four-inch bottom for " his ſix hundred ton ſhip, and gives juſt reaſons for the " ſame: indeed, I have heard three-inch bottoms had been " propoſed; but I judged humanity would not ſuffer any " man to alter that great improvement in the Company's " ſhips, as knowing the great additional ſtrength and ſafety " added thereby. I am alſo of opinion, many ſhips have " been loſt with a three-inch bottom that a four-inch bot- " tom would have ſaved; and am confident, it will be the " the cauſe of ſaving much timber, not only in repairs, " but by enabling them to go a greater number of voyages. " All ſhips of five hundred tons and upwards ſhould have " four-inch bottoms; for it is a known fact, that no na- " tion builds with ſo thin bottoms, or makes uſe of ſo " thin ſheathing, as the Engliſh: and if the Company " were to allow the captains and officers money, in lieu " of privilege in trade, it would further prevent ſmuggling " and interfering in the Company's trade; and were they " to build their own ſhips, it would not only be a very " great ſaving in their freights, but one-half of the quantity " of timber, now conſumed in building and repairing, " would be then ſufficient; for there are now ſixty-one " thouſand tons of ſhipping in the ſervice, whereas, if the " above ſcheme was adopted, forty thouſand tons would, " in my opinion, be full ſufficient; and as the ſhips would, " in general, go out the ſeaſon after their arrival, they " would make ſix voyages, nearly, in the ſame number of " years that they are now making four voyages. I forgot " to mention, in its proper place, that it appears to me, " the price of ſmall timber and the building ſmall ſhips has " advanced full as much, or more, than large timber and " the building large ſhips; and that it is my opinion, the

" building

" building ſmall ſhips is more prejudicial to the growth of " timber, than the building large ſhips.

" Permit me the liberty of obſerving here, that the " before-going obſervations do not ariſe from any intereſted " views to myſelf, as I never had, nor do I ever expect, any " emolument myſelf from either large or ſmall ſhips, more " than the ſalary allowed me by the Company; and this I " remark to ſave the trouble of aſking queſtions relative " thereto.

" GABL. SNODGRASS,
" *Surveyor of Shipping to the Honorable*
" *Eaſt-India Company.*

" Eaſt-India-Houſe,
" the 22d April, 1771."

He likewiſe gave in another paper, being a copy of a repreſentation made by him to Mr. Purling, when he was Deputy Chairman of the Eaſt-India Company; a copy of which is as follows, *viz.*

" SIR, " *Eaſt-India Houſe, the 12th March, 1771.*

" You deſire my thoughts, not only on the Company's " ſhips, but on ſhipping in general, what methods I would " propoſe to prevent their decaying in ſo ſhort a time, how " to leſſen the conſumption and aſſure a conſtant and regular " ſupply of oak timber for building them, as likewiſe if it " is a real fact, that large oak timber and large ſhips are " dearer now, in proportion to their tonnage, than ſmall " ſhips and ſmall timber, taking the prices of laſt war to " compare by, and if any of the Eaſt-India Company's " ſhips, that have been lately built, are likely to conſume " more timber in repairs than the old ſhips have, or if they " conſume more timber in building them than the men of " war do, in proportion to each ſhip's real tonnage, taken " from their greateſt loaded draft of water; or if I can think " of any method of leſſening the preſent conſumption of " timber, in the India ſervice in particular?—to all which

" I ſhall

APPENDIX, No. V.

LETTER from Mr. Snodgraſs to the Admiralty Board, dated 13th February, 1795.

MY LORDS,

I am informed, that your Lordſhips have been impreſſed with an idea, that the Eaſt-India Company having large ſhips built for their ſervice is very prejudicial to the procuring large timber for the uſe of the Navy.

From the conviction of long experience, I am of a very different opinion, and am certain that if Government will attend to what I ſtated, in anſwer to ſome queſtions put to me by the Commiſſioners of the Land Revenue, in the year 1791, which was publiſhed with their eleventh report, and alſo to what I ſtated to a Committee of the Houſe of Commons, in the year 1791,* on the ſame ſubject; it will be the means of reducing the conſumption of oak timber, and the expences of building and repairing the ſhips of the Navy *full one-third*, compared with what it has been during the reign of his preſent Majeſty; and the timber ſaved thereby, will be ſufficient for the conſtant building and repairing the whole tonnage of large ſhipping, required for the ſervice of the Eaſt-India Company.

* 1771

And I further beg leave to obſerve, that if Government were at this time to order every old ſhip of war that requires a conſiderable repair to be put into dock, and to double their bottoms and top-ſides, from keel to gunwale, with three-inch plank, and to ſtrengthen them with as many iron ryders, ſtandards, knees, &c. as may be found

neceſſary,

neceſſary, they may be got ready for ſea in a ſhort time, and at a very moderate expence, and thoſe ſhips would then be as ſafe and as ſerviceable for years to come (even to cruize in winter ſeaſons) as any ſhips now in his Majeſty's ſervice. This meaſure will obviate, at preſent, the neceſſity of contracting for building new ſhips for the Navy, which, at this time, muſt be a very great extra expence, and attended with many other diſadvantages obvious to every profeſſional man.

I have the honor to ſubſcribe myſelf, with great conſideration,

My Lords,

Your Lordſhips'

Moſt obedient humble ſervant,

(Signed) Gabl. Snodgrass.

Eaſt-India-Houſe,
13th February, 1795.

To the Right Honorable, the Lords Commiſſioners for executing the Office of Lord High Admiral of Great Britain.

Appendix, No. VI.

Letter from Mr. Snodgraſs to the Society for the Improvement of Naval Architecture.

Gentlemen,

Having obſerved, in a book publiſhed by *Steel* in the year 1785, that a great number of Britiſh ſhips of war had, within a few years, been *loſt* or *foundered*, and that with many of them the whole crew periſhed;

From motives of humanity to my fellow creatures, and with a view of doing good to the Public, I am induced to ſubmit to the inſpection of your ſociety, the accompanying model of the midſhip part of a ſeventy-four gun ſhip. It was made from a drawing which I ſent to the Commiſſioners of his Majeſty's Land Revenue, with my anſwers to ſome queſtions they put to me in the year 1791, and which is publiſhed in their eleventh report. The ſaid queſtions, with my anſwers thereto, and a liſt of Britiſh ſhips of war, loſt or foundered, from the year 1775 to 1784, extracted from *Steel's* book, I beg leave to ſubmit alſo to your peruſal.

Since I gave my anſwers to the Commiſſioners of the Land Revenue, as above-mentioned, I am ſtill more confirmed in my opinion, that if Government were to build ſhips of war, agreeable to the plans I then recommended, there would be no danger of ſuch ſhips *foundering at ſea*; and were they alſo to follow the advice I have given in my ſaid anſwers, I am perſuaded it would be the means of reducing both the conſumption of timber, and alſo the expences of building and repairing the ſhips of the Navy, more than *one-third*, compared to what it has been during the reign of his preſent Majeſty.

Accord-

According to the ſtatement of the Commiſſioners of his Majeſty's Navy, as publiſhed in the aforeſaid report, (page 26) it appears that the tonnage of ſhips built by contract, or purchaſed during the preſent reign, amounted to 256,656 tons, and of thoſe built in his Majeſty's dock yards to *only* 131,852 tons, ſo that 124,804 tons have been built by contract, or purchaſed from the merchants, in the *above* period, *more* than were built in his Majeſty's yards:— it appears, that the medium duration of the ſhips which compoſe the preſent Navy, taken one with another, is only about eleven years and three quarters.

From my long experience, I have no doubt that ſhips of war may be built to laſt eighteen years, or longer, without requiring any material repairs, which would reduce the conſumption of timber for the Navy full one-third. The annual ſaving from this, according to the ſtatement of the Commiſſioners of the Land Revenue, would be 16,667 loads, the preſent annual ſupply required for the uſe of the Navy alone being 50,000 loads.

I with pleaſure ſubmit the whole of my proceedings in this buſineſs to your conſideration, from a conviction that a ſociety, calculated for the expreſs purpoſe of the advancement of Naval Architecture, is the only medium through which diſcoveries are likely to be inveſtigated with candour, and ſubmitted to the Public with the remarks of men of the firſt ability, in the profeſſion of navigating, as well as building ſhips: and under this idea, I flatter myſelf ſomething may be done for the improvement of ſhips of the Royal Navy, and for the ſafety of thoſe who navigate them; an object which, [illegible], appears to me of the utmoſt importance in a country like England, whoſe *principal* and beſt defence is in the ſtrength of her Navy.

I have the honor to be,

GENTLEMEN,

Your moſt obedient humble ſervant,

(Signed) GABL. SNODGRASS.

March, 1794.

APPENDIX, No. VII.

A LIST of Ships in the United Eaſt-India Company's Service, which have been loſt, burnt, or captured, from the Seaſon 1757 to the Seaſon 1794, both inclufive.

Seaſon.	No. of Ships ſent out.	Ships' Names.	Where loſt, &c.
1757	20	Stretham - - -	Wrecked in Bengal River.
1758	22	Denham - - -	Burnt in Bencoolen Road, to prevent her falling into the hands of the French.
		Ajax - - - -	Captured by the French.
		Griffin - - -	Wrecked at the Iſland of Zelo.
1759	20	Earl Temple - -	Ditto to the ſouthward of the Parrafells.
1760	18	- - - - -	None loſt.
1761	21	Walpole - - -	Captured by the French, outwards.
		Winchelſea - -	Wrecked in Bengal River.
		Elizabeth - - -	Burnt at China.
1762	20	- - - - -	None loſt.
1763	27	Earl of Holderneſs	Wrecked outwards, near the Downs.
1764	23	Falmouth - -	Stranded on Sogar Bank, near Bengal.
		Albion - - -	Wrecked outwards, near the Downs.
1765	22	- - - - -	None loſt.
1766	25	Lord Clive - -	Wrecked nine miles to the ſouthward of Bologne.
		Earl Chatham -	Suppoſed to have foundered, as ſhe was never heard of.
1767	27	- - - - -	None loſt.
1768	32	Lord Holland -	Wrecked coming out of Bengal River.
1769	30	Vereliſt - - -	Ditto near the Mauritius.
1770	31	- - - - -	None loſt.
1771	26	Duke of Albany -	Wrecked on the Long Sand in Bengal River.
		Lord Mansfield -	Ditto in Bengal River.
1772	25	Huntingdon - -	Ditto off Johanna.
		Royal Captain -	Ditto on the ſhoals off Pelawar.
1773	14	- - - - -	None loſt.
1774	15	- - - - -	Ditto ditto.
1775	19	M. of Rockingham	Wrecked on the Coaſt of Coromandel.
	437	*Carr. forward.*	

437 *Brought forward.*

Season.	No. of Ships ſent out.	Ships' Names.	Where loſt, &c.
1776	23	Valentine - -	Wrecked near St. Iſle de Merchands.
1777	21	Oſterley * - - -	Taken by the French, homeward bound.
		Colebrooke - -	Wrecked going into Falſe Bay.
		Stafford - - -	Ditto coming out of Bengal River.
1778	22	General Barker -	Ditto on the Coaſt of Holland.
		London - - -	Run down by the Ruſſel man of war.
1779	25	Earl of Dartmouth	Wrecked on the Carnicobar.
		Groſvenor - -	Ditto to the eaſtward of the Cape.
		Royal George -	Taken by the Combined Fleets of France and Spain.
		Hilſborough -	
		Mountſtuart -	
		Gatton - - -	
		Godfrey - -	
1780	21	Blandford - -	Taken by the French off Ganjam.
		Fortitude - -	Ditto by La Fine, French frigate.
		Earl of Hertford -	Wrecked in Madras Roads.
		Hinchinbrook -	Ditto in Bengal River.
		Major - - - -	Burnt at Culpee.
		Duke of Athol -	Ditto in Madras Roads.
		Fairford - - -	Ditto in Bombay Harbour.
1782	24	Duke of Kingſton	Ditto off Ceylon.
1783	13	- - - - - -	None loſt.
1784	27	Halſwell - - -	Wrecked near Peverell Point.
1785	43	Mars - - - -	Ditto in Margate Roads.
1786	34	Hartwell - - -	Ditto off Bonaviſta.
1787	31	- - - - - -	None loſt.
1788	32	Vanſittart - -	Wrecked in the Straits of Gaſper.
1789	31	Foulis - - -	Not heard of ſince ſhe ſailed from Madras for Bencoolen on the 8th March, 1791, (ſuppoſed burnt).
1790	25	- - - - - -	None loſt.
1791	28	Winterton - -	Wrecked off Madagaſcar.
1792	43	Princeſs Royal -	Taken by the French in the Straits of Sunda.
		Pigot - - - -	Ditto by ditto at Bencoolen.
1793	46	- - - - - -	None loſt.
1794	34	Triton - - -	Taken by the French in Bengal River.
	988	*Total.*	

APPENDIX, No. VIII.

Copy of a Letter from Captain Lowis, to Mr. Snodgraſs, reſpecting the Ship Woodcot, July 4, 1795.

SIR,

In conſequence of your requeſt, that I would ſtate to you the damage ſuſtained by the Woodcot, in the hurricane ſhe encountered on her laſt outward-bound paſſage, I ſhall, to the beſt of my recollection, relate the particulars.

On the 28th of April, being in latitude 15° 30′ South, longitude 70° Eaſt, the weather dark and ſqually, with a confuſed ſea, the wind veering from E. S. E. to E. N. E. and increaſing; at eight P. M. we wore ſhip to the Northward, and at eleven laid her too under a mizen-ſtay-ſail, as it looked very unſettled: ſoon after midnight the hurricane came on with exceſſive violence, and the ſea roſe almoſt inſtantaneouſly to a tremendous height. In a very few minutes the mizen-maſt went into three pieces, about eight feet above the poop, and the main and fore-top-maſts almoſt at the ſame time. The ſhip then fell off in the trough of the ſea, and rolled with ſuch violence that it was with the utmoſt difficulty we could keep ourſelves faſt upon deck, and utterly impoſſible to make any attempt to get aloft to cut away the wreck of the top-maſts. Soon after this, the fore-maſt went about twelve feet above the deck, and the main-maſt, by the board, almoſt immediately after. The ſea was, by this time, breaking over the ſhip in all directions, ſo that it was with the utmoſt danger we got clear of the wreck of our maſts. One heavy ſea, in particular, came over our ſtarboard gangway, broke the wheel, ſtove in the bulk-heads of the cuddy and round-houſe, and

nearly

nearly filled the cabins. Almoſt at the ſame time, one of the dead-lights in the great cabin was ſtove in, by the wreck of one of the maſts going a ſtern, and the ſea ruſhed in with ſuch violence that it was with the greateſt difficulty we could get it ſecured again; and, had the dead-lights not been fitted on the plan you have lately adopted, I have reaſon to think we never ſhould have got it done. Your new doors for the quarter-galleries we found equally beneficial, as our galleries were both gone, and a heavy ſea beating continually againſt the doors, which, upon the old plan, never would have ſtood. We now expected, every minute, that the ſhip would founder, as ſhe rolled and ſtrained in ſuch manner that we thought it impoſſible ſhe would keep together. The ſea broke over the poop almoſt continually, and we could not venture from under the poop-deck without the greateſt danger of being waſhed overboard. Fortunately, our tarpaulins were ſtrongly battened down, our boats ſcuttled, and our booms ſecured in ſuch a manner as gave us hopes of ſaving them, if the ſhip outlived the ſtorm. Fortunately, towards the day-light, the hurricane began to abate, and ſoon after it fell little winds; but, as it ſtill looked threatening, we immediately ſet about ſecuring and examining every thing we could: we found our larboard main-channel gone, and moſt of the bolts of the fore one ſtarted, our quarter-galleries ſhattered to pieces, and great part of the balcony-rail, and carved work of the ſtern. Before we could get our decks cleared, the hurricane came on again from the N. W. if poſſible, with greater violence than before; indeed, we ſeemed to be quite in the vortex of a whirlwind, for the wreck of the bulk-heads, and even the heavy doors of the cuddy were carried up as high as the poop, and thrown down again upon deck with great violence. The ſpray of the ſea was carried up in ſuch quantities as to darken the air all round us; and, from the change of the wind, the ſea made a dreadful breach over us. The whole frame of the ſhip ſeemed looſened, and the water forced in through every ſeam of her upper works; ſo that we had every reaſon to fear that ſhe muſt have gone

down,

down, as it was with the utmoſt difficulty the people could ſtand at the pumps, from the heavy and continued rolling of the ſhip. Fortunately, in the evening, it again became moderate; but the ſea continued ſo high it was impoſſible to do any thing with the ſhip. Next morning the weather was moderate and fair, we got a cloſe reefed mizen-top-ſail ſet upon the ſtump of the fore-maſt, and wore ſhip, and in the evening a top-gallant-maſt up abaft; but the ſea continued ſo high and the motion ſo violent, we were afraid to caſt looſe our booms. The day following, the ſea being more regular, we got up a jury-fore-maſt and main-maſt, and proceeded to Madras, where the cargo was landed and the ſhip ſurveyed; and, to the ſurprize of every body, not one of the iron knees was found in the leaſt ſtrained, or a bolt broke; and, as I am certain they never can have a more ſevere trial, I am convinced they may be depended upon at all times. Indeed, during the Woodcot's firſt voyage, I had a ſufficient proof of their goodneſs, as we met with a tiffoon in the Eaſtern Ocean, which laſted three days; we afterwards beat round the Cape in the middle of winter, in moſt ſevere weather, and did not arrive in England until the middle of November; and, upon the whole, went through as much bad weather as moſt ſhips; and at that time, you may remember, the *iron* knees turned out equally well. I can therefore declare, as far as I can judge from the experience of three voyages, that iron knees anſwer every purpoſe of ſtrength and ſecurity, and, of courſe, give great additional room for ſtowage. I ſhall be happy to give you any further information, in my power, upon this ſubject, and am,

SIR,

Your obedient humble ſervant,

(Signed) N. LOWIS.

July 4, 1795.