A

TREATISE

ON THE

SCURVY.

IN THREE PARTS.

CONTAINING

An Inquiry into the Nature, Cauſes, and Cure, of that Diſeaſe.

Together with

A Critical and Chronological View of what has been publiſhed on the Subject.

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The SECOND EDITION corrected, with Additions and Improvements.

LONDON:

Printed for A. MILLAR in the *Strand*.

MDCCLVII.

CHAP. IV.

The prophylaxis, *or means of preventing this diſeaſe, eſpecially at ſea.*

FOR the prevention of this diſeaſe at land, a warm, dry, pure air, with a diet of eaſy digeſtion, conſiſting chiefly of a due mixture of animal and vegetable ſubſtances (which is found to be the moſt wholſome food, and agreeable to the generality of conſtitutions) will for the moſt part prove ſufficient.

Thoſe who are liable to it by living in marſhy wet ſoils, and in places ſubject to great rains and fogs; and others who inhabit unwholſome damp apartments, as the lower floors and cellars of a houſe in winter, ſhould remedy theſe inconveniencies by keeping conſtant fires, to correct this hurtful moiſture; which will ſtill prove more effectual for the purpoſe, if made of aromatic woods. But it is rather adviſeable for perſons threatened with this malady, to remove into dry, chearful, and better-aired habitations. Their principal food in ſuch a caſe ſhould be broths made of freſh fleſh-meats, together with plenty of recent vegetables, if they can be procured; otherwiſe of preſerved roots and fruits. Their bread ought to be made of wheat-flour, ſufficiently leavened, and well baked; and at their

the teeth too bare; or remaining lax, and covering too much of them; and being ſubject to bleed on the ſlighteſt touch.

meals

meals they are to drink a glaſs of good ſound beer, cyder, wine, or the like fermented liquor. The obſervance of theſe directions, together with moderate exerciſe, cleanlineſs of body, and contentment of mind, procured by agreeable and entertaining amuſements, will prove ſufficient to prevent this diſeaſe from raiſing to any great height, where it is not altogether conſtitutional.

In towns or garriſons when beſieged, officers ſhould take care that the beds, barracks, and quarters for the ſoldiers, be kept dry, clean, and warm, for their refreſhment when off duty; and that their men be ſufficiently provided with thick cloaks and warm cloaths, for ſhelter againſt the inclemency of cold, and rains, when neceſſarily expoſed to them. The ammunition-bread ſhould be light, and well baked, and their other proviſions as ſound and wholſome as poſſible. To correct the too groſs and ſolid quality of theſe, they would do well to join vegetables, even the moſt common, and ſuch as are to be met with on the ramparts, with their other food. This precept becomes ſtill more neceſſary, when the garriſon's proviſions in ſtore are ſpoiled or unſound; in which caſe the uſe of vinegar is recommended by ſeveral authors. *Bachſtrom*'s advice, of ſowing the ſeeds of the antiſcorbutic plants *(a)*, ſo that theſe may grow up with the graſs on the ramparts, will, upon this occaſion, be found very beneficial. They can

(a) Vid. Obſervationes circa ſcorbutum, &c. p. 36.

indeed

indeed be under no difficulty in procuring ſome of the moſt ſalutary of them at all times, if they are provided with their ſeeds, ſuch as the garden-creſſes; which, in a few days, even in their apartments, will ſupply them with a freſh antiſcorbutic ſalad. When the army is in the field, they generally meet with ſuch plenty of wholſome vegetables, as are ſufficient to prevent this diſeaſe becoming fatal to many of them, except in deſert and depopulated countries.

But the prevention of this calamity at ſea, and the preſervation of a truly valuable part of mankind, *viz.* the ſeamen of all nations, from its fatal and deſtructive malignity in long voyages and cruiſes, is what in a particular manner demands our attention, and has exerciſed the genius of ſome of the moſt eminent phyſicians in all parts of *Europe* for above a century paſt.

A *German* who had acquired a conſiderable fortune in the *Eaſt-Indies*, by being *Dutch* Governor of *Sumatra*, was ſo affected with pity and humanity for the many afflicted ſailors he had obſerved in this malady, that, imagining the art of chemiſtry, which at that time made a great noiſe in the world, might probably furniſh ſome remedy for their relief, he erected and endowed a perpetual profeſſorſhip of that ſcience at *Leipſic*. He nominated his countryman Dr. *Michael*, a very great chemiſt, who was the firſt univerſity-profeſſor of chemiſtry in *Europe*; and remitted

ted him a conſiderable ſum of money, in order to bear the expence of his experiments, with a promiſe of a much greater, in caſe he ſucceeded in the diſcovery of a remedy for prevention of the ſcurvy at ſea. The Doctor ſpent an incredible deal of time and labour in preparing the moſt elaborated chemical medicines. Volatile and fixed ſalts, ſpirits of all ſorts, eſſences, elixirs, electaries, *&c.* were yearly ſent over to the *Eaſt-Indies*; nay, even the *quinta eſſentia* (which became afterwards a celebrated *noſtrum* for the ſcurvy in *Germany)* of the chemical oil of the ſeeds of ſcurvy-graſs. But all proved ineffectual.

Bontekoe recommended to the *Dutch* ſailors an acrid alcaline ſpirit; *Glauber (b)* and *Boerhaave*, a ſtrong mineral acid, *viz. ſp. ſalis.* The Royal navy of *Great Britain* has been ſupplied, at a conſiderable expence to the government, by the advice of an eminent phyſician, with a large quantity of *elixir* of *vitriol*; which is the ſtrong mineral acid of vitriol combined with aromatics. Wine-vinegar was likewiſe preſcribed upon this occaſion by the college of phyſicians at *London*, when conſulted by the Lords of the Admiralty; which differs from all the former, being a mild vegetable acid procured by fermentation. Vinegar has been indeed much uſed in the fleet at all times. Many ſhips, eſpecially thoſe fitted out at *Plymouth*, carried with them cyder for this purpoſe, upon the recommendation of

(b) In his book, intitled, *Conſolatio navigantium, &c.*

the

the learned Dr. *Huxham*. The lateſt propoſal to the Lords of the Admiralty was a magazine of dried ſpinage prepared in the manner of hay. This was to be moiſtened and boiled in their food. To which it was objected by a very ingenious phyſician *(c)*, That no moiſture whatever could reſtore the natural juices of the plant loſt by evaporation, and, as he imagined, altered by a fermentation which they underwent in drying.

Moreover, all the remedies which could be uſed in the circumſtances of ſailors, that at any time have been propoſed for the many various diſeaſes going under the name of a *ſcurvy at land*, have likewiſe been tried to prevent and cure this diſeaſe at ſea: the effects of ſeveral of which, beſides the before-mentioned, I have myſelf experienced, *viz.* ſalt-water, tar-water, decoctions of guajac and ſaſſafras, bitters with *cort. winteran.* and ſuch warm antiſcorbutics as can be preſerved at ſea, *viz.* garlic, muſtard-ſeed, *pulv. ari comp. et ſpirit. cochlear.*; which laſt was formerly always put up in ſea-medicine cheſts. I have alſo in various ſtages, and for different ſymptoms of this diſtemper, made trial of

(c) Dr. Cockburn.—The Doctor's judgment is fully confirmed by experience. We find the college of phyſicians at *Vienna* ſent to *Hungary* great quantities of the moſt approved antiſcorbutic herbs dried in this manner; which were found to be of no benefit. Many of theſe would have their virtues as little impaired by drying as ſpinage, *e g.* marſh trefoil. *Kramer* tried almoſt every ſpecies of dried herbs to no purpoſe. Vid. part 3. chap. 2.

moſt

most of the mineral and fossil remedies which have been recommended for the scurvy at land; such as mercurial, chalybeate, antimonial, vitriolic, and sulphurious medicines. But, before I mention the result of these experiments, and the observations made upon the effects of several remedies that have been most approved of in this disease, it may not be amiss to take notice, that the want of success hitherto in preventing this fatal malady at sea, seems chiefly owing to these two causes.

1*st*, The methods of preservation have been put in practice too late; that is, when the disease was already bred; it being generally then that *elixir vitriol*, vinegar, cyder, and other antiscorbutics, were administered: whereas certain precautions seem necessary to prevent the first attacks; it being found, that almost all diseases are easier prevented than removed.

2*dly*, Too high an opinion has been entertained of certain medicines recommended by physicians at land, rather from a presumption founded on their theory of the disease, than from any experience of their effects at sea. Indeed the causes which they were supposed to obviate, were often none of the true and real occasions of the distemper. Thus lime-water has been long since prescribed to correct the too great quantity of sea-salt necessarily used by sailors. And the college of physicians at *London* gives it as their opinion, that *Lowndes*'s salt made from brine, was prefer-

able for ſalting ſea-proviſions, to that made of ſea-water, even to the bay-ſalt; from a ſuſpicion of ſome noxious qualities in this ſalt which might occaſion the ſcurvy. *Sp. ſal. el. vitriol.* and vinegar, were deemed proper antidotes to the rank and putrid ſtate of ſea-proviſions, and water; or perhaps to the putreſcent ſtate of the humours in this diſeaſe.

But whatever good effect for the laſt purpoſes theſe may be ſuppoſed to have had in a ſmaller degree; yet experience has abundantly ſhewn, that they have not been ſufficient to prevent this diſeaſe, much leſs to cure it. And the ſame may be ſaid of many others. The conſequence of which is, the world has now almoſt deſpaired of finding out a method of preventing this dreadful evil at ſea; and it is become the received opinion, that it is altogether impoſſible there, either to prevent or cure it. But it is ſurpriſing, that this ill-grounded belief, ſo fatal in its conſequences, ſhould have gained credit, when we ſee people recovering from this diſeaſe every day (even in the moſt deplorable condition, and in its laſt ſtages) in a ſhort time, when proper helps are adminiſtered. I have already given an inſtance of ſeventy people cured in the bad air of a ſhip, without being landed *(d)*. I ſhall hereafter produce other inſtances of this diſeaſe being cured at ſea, though theſe muſt have occurred to every perſon who has

(d) P. 61.

had occaſion there to be converſant with ſcorbutical caſes *(e)*.

It may be proper, in order fully to remove this prejudice, to obſerve, that an epidemical ſcurvy, either at ſea or land, is an adventitious, not a natural diſeaſe: that is to ſay, it is not owing to any ſpontaneous degeneracy of the human body, from a healthful condition into this morbid ſtate; but to the influence of very powerful and active, but ſuch plain and obvious cauſes as have been before aſſigned *(f)*. And it is conſtantly experienced, that when theſe cauſes do not ſubſiſt, or are corrected and guarded againſt, the diſeaſe may be effectually prevented. This will admit of a demonſtration from many facts. Officers are ſeldom or never affected with the ſcurvy; even the ſubaltern and petty officers generally keep free from it, while it commits great ravage among the common ſeamen. There have occurred frequent inſtances of *Engliſh* and *Dutch* ſhips being in company together, where the former were in great diſtreſs from this diſeaſe; while the latter, by a very ſmall difference in their diet, were quite healthy. But what is ſufficient to convince the greateſt ſceptic, that this calamity may be effectually prevented, is the preſent healthfulneſs of *Newfoundland*, the northern parts of *Canada*, and of our factories at *Hudſon*'s

(e) Many inſtances have already been given in Mr. *Ives*'s journal, part 2. chap. 1.

(f) Part 2. chap. 1.

bay. In thoſe parts of the world, the ſcurvy was formerly more fatal to the firſt adventurers and planters, than it was ever known at ſea; which facts I ſhall have occaſion preſently to mention, and account for. And as it is a ſatisfaction to know that this diſeaſe may effectually be prevented, ſo it is likewiſe an encouragement to the utmoſt diligence in diſcovering, and putting in practice, the means proper for that purpoſe.

It being of the utmoſt conſequence to guard againſt the firſt approaches of ſo dreadful an enemy, I ſhall here endeavour to lay down the meaſures proper to be taken for this end, with that minuteneſs and accuracy which the importance of the ſubject, and the preſervation of ſo many valuable and uſeful lives, juſtly demand; and at the ſame time ſhall, as much as poſſible, avoid offering any thing that may be judged impracticable, or liable to exception, on account of the difficulty or diſagreeableneſs of complying with it. And, *laſtly*, I ſhall propoſe nothing dictated merely from theory; but ſhall confirm all by experience and facts, the ſureſt and moſt unerring guides.

What I propoſe is, firſt, to relate the effects of ſeveral medicines tried at ſea in this diſeaſe, on purpoſe to diſcover what might promiſe the moſt certain protection againſt it upon that element.

The medicine which ſucceeded upon trial, I ſhall afterwards confirm to be the ſureſt

preſervative, and moſt efficacious remedy, by the experience of others.

I ſhall then endeavour to give it the moſt convenient portable form, and ſhew the method of preſerving its virtues entire for years, ſo that it may be carried to the moſt diſtant parts of the world in ſmall bulk, and at any time prepared by the ſailors themſelves: adding ſome farther directions, given chiefly with a view to inform the captains and commanders of ſhips and fleets, of methods proper both to preſerve their own health, and that of their crew.

It will not be amiſs further to obſerve, in what method convaleſcents ought to be treated, or thoſe who are weak, and recovering from other diſeaſes, in order to prevent their falling into the ſcurvy; which will include ſome neceſſary rules for reſiſting the beginnings of this evil, when, through want of care, or neglect, the diſeaſe is bred in a ſhip.

As the ſalutary effects of the preſcribed meaſures will be rendered ſtill more certain, and univerſally beneficial, where proper regard is had to ſuch a ſtate of air, diet, and regimen, as may contribute to the general intentions of preſervation or cure; I ſhall conclude the precepts relating to the preſervation of ſeamen, with ſhewing the beſt means of obviating many inconveniencies which attend long voyages, and of removing the ſeveral cauſes productive of this miſchief.

The

The following are the experiments.

On the 20th of *May* 1747, I took twelve patients in the ſcurvy, on board the *Saliſbury* at ſea. Their caſes were as ſimilar as I could have them. They all in general had putrid gums, the ſpots and laſſitude, with weakneſs of their knees. They lay together in one place, being a proper apartment for the ſick in the fore-hold; and had one diet common to all, *viz.* water-gruel ſweetened with ſugar in the morning; freſh mutton-broth often times for dinner; at other times light puddings, boiled biſcuit with ſugar, *&c.* and for ſupper, barley and raiſins, rice and currants, ſago and wine, or the like. Two of theſe were ordered each a quart of cyder a-day. Two others took twenty-five drops of *elixir vitriol.* three times a-day, upon an empty ſtomach; uſing a gargle ſtrongly acidulated with it for their mouths. Two others took two ſpoonfuls of vinegar three times a-day, upon an empty ſtomach; having their gruels and their other food well acidulated with it, as alſo the gargle for their mouth. Two of the worſt patients, with the tendons in the ham rigid (a ſymptom none of the reſt had) were put under a courſe of ſea-water. Of this they drank half a pint every day, and ſometimes more or leſs, as it operated, by way of gentle phyſic. Two others had each two oranges and one lemon given them every day. Theſe they eat with greedineſs, at different times, upon an empty ſtomach. They continued

but ſix days under this courſe, having conſumed the quantity that could be ſpared. The two remaining patients, took the bigneſs of a nutmeg three times a-day, of an electary recommended by an hoſpital-ſurgeon, made of garlic, muſtard-ſeed, *rad. raphan.* balſam of *Peru*, and gum myrrh; uſing for common drink, barley-water well acidulated with tamarinds; by a decoction of which, with the addition of *cremor tartar*, they were gently purged three or four times during the courſe.

The conſequence was, that the moſt ſudden and viſible good effects were perceived from the uſe of the oranges and lemons; one of thoſe who had taken them, being at the end of ſix days fit for duty. The ſpots were not indeed at that time quite off his body, nor his gums ſound; but without any other medicine, than a gargariſm of *elixir vitriol.* he became quite healthy before we came into *Plymouth*, which was on the 16th of *June*. The other was the beſt recovered of any in his condition; and being now deemed pretty well, was appointed nurſe to the reſt of the ſick.

Next to the oranges, I thought the cyder *(g)* had the beſt effects. It was indeed not very ſound,

(g) Extract of a letter from Mr. Ives.

I judge it proper to communicate to you, what good effects I have obſerved in the ſcurvy, from the uſe of cyder and ſea-water, during the laſt cruiſe I made in the weſtern ſquadron, with my honoured benefactor Admiral *Martin*. But as I do not pretend to have taken notice of any thing, more than merely

found, being inclinable to be aigre or pricked. However, thoſe who had taken it, were in a fairer way of recovery than the others at the end of the fortnight, which was the length of time all theſe different courſes were continued, except the oranges. The putrefaction of their gums, but eſpecially their laſſitude and weakneſs, were ſomewhat abated, and their appetite increaſed by it.

merely a palliative benefit from them, I think, without mentioning particular caſes, it will be ſufficient for me to inform you, that, in our preceding cruiſe with the weſtern ſquadron, his Majeſty's ſhip *Yarmouth*, of 70 guns and 500 men, was not only troubled with the ſcurvy in common with other ſhips, but, in ſpite of all my endeavours, loſt in it a proportioned number of men. Upon our return from that cruiſe, I took an opportunity to repreſent to the Admiral, that as vegetable juices of all ſorts were from experience found to be the only true antiſcorbutics, and I had myſelf formerly experienced the good effects of apples, it was reaſonable to preſume that cyder muſt certainly be of ſervice. This ſuggeſtion agreed with ſome accounts the Admiral had received from others; and he with great readineſs bought, and put under my care, ſeveral hogſheads of the beſt *South Ham* cyder. During the next cruiſe, each ſcorbutic patient had daily a quart or three pints of cyder; and as many of them as I could prevail on, took twice a-week three quarters of a pint of ſea-water in a morning. In all other reſpects I treated them as I uſed to do people in the ſcurvy; which you well know, from the converſation which has often paſſed betwixt us on this ſubject, was with ſquill vomits, pills compoſed of ſoap, ſquills, garlic, *&c. elixir vitriol.* and other medicines ſuited to the different ſtages and ſymptoms of the malady. In one word, we had this cruiſe as many ſcorbutic patients as any other ſhip, in proportion to our complement of men. But although all the reſt buried a great many, ſome to the number of 20, others 30, 40, 50, and upwards; yet the *Yarmouth* did not bury more than two or three; and theſe at the latter end of the cruiſe, all our cyder having been expended for a week or ten days before. Upon our arrival at port, we ſent to the hoſpital a great many in very dreadful circumſtances.

As to the *elixir of vitriol*, I obſerved that the mouths of thoſe who had uſed it by way of gargariſm, were in a much cleaner and better condition than many of the reſt, eſpecially thoſe who uſed the vinegar; but perceived otherwiſe no good effects from its internal uſe upon the other ſymptoms. I indeed never had a great opinion of the efficacy of this medicine in the ſcurvy, ſince our longeſt cruiſe in the *Saliſbury*, from the 10th of *Auguſt* to the 28th of *October* 1746; when we had but one ſcorbutic caſe in the ſhip. The patient was a marine (one *Walſh*); who, after recovering from a quotidian ague in the latter end of *September*, had taken the *elixir vitriol.* by way of reſtorative for three weeks; and yet at length contracted the diſeaſe, while under a courſe of medicine recommended for its prevention.

There was no remarkable alteration upon thoſe who took the electary and tamarind decoction, the ſea-water, or vinegar, upon comparing their condition, at the end of the fortnight, with others who had taken nothing but a little lenitive electary and *cremor tartar*, at times, in order to keep their belly open; or a gentle pectoral in the evening, for relief of their breaſt. Only one of them, while taking the vinegar, fell into a gentle flux at the end of ten days. This I attributed to the genius and courſe of the diſeaſe, rather than to the uſe of the medicine. As I ſhall have occaſion elſewhere to take notice of the effects

fects of other medicines in this diſeaſe, I ſhall here only obſerve, that the reſult of all my experiments was, that oranges and lemons were the moſt effectual remedies for this diſtemper at ſea. I am apt to think oranges preferable to lemons, though perhaps both given together will be found moſt ſerviceable.

It may be now proper to confirm the efficacy of theſe fruits by the experience of others. The firſt proof that I ſhall produce, is borrowed from the learned Dr. *Mead (h)*.

" One year when that brave Admiral Sir " *Charles Wager* commanded our Fleet in the " *Baltic*, his ſailors were terribly afflicted " with the ſcurvy: but he obſerved, that " the *Dutch* ſhips then in company were " much more free from this diſeaſe. He " could impute this to nothing but their dif- " ferent food, which was ſtock-fiſh and gort; " whereas ours was ſalt fiſh and oat-meal *(i)*. " He was then come laſt from the *Mediter-* " *ranean*, and had at *Leghorn* taken in a great " quantity of lemons and oranges. Recol- " lecting from what he had often heard, how " effectual theſe fruits were in the cure of " this diſtemper, he ordered a cheſt of each " to be brought upon deck, and opened, every " day. The men, beſides eating what they " would, mixed the juice in their beer. It " was alſo their conſtant diverſion to pelt

(h) Diſcourſe on the ſcurvy, p. 111.

(i) The firſt is ſeldom now put on board ſhips of war, and of the laſt, *Engliſh* ſailors eat but little.

" one

" one another with the rinds, ſo that the deck " was always ſtrewed and wet with the fra- " grant liquor. The happy effect was, that " he brought his ſailors home in good health".

I have been favoured upon this occaſion, by different gentlemen, with many inſtances of the like good effects of theſe fruits in this diſeaſe at ſea; particularly by Mr. *Francis Ruſſel*, now ſurgeon general to the iſland of *Minorca*, in a cruiſe performed by the *Princeſs Caroline* off the iſlands of *Sardinia* and *Corſica*; where, according to his relation, ſome of theſe fruits got at *Vado*, preſerved great part of the crew, which otherwiſe muſt undoubtedly have periſhed.

An ingenious ſurgeon of great merit and experience in the *Guernſey*, when extremely diſtreſſed by the ſcurvy *(k)*, has the following obſervation in his letter upon it. " I have " great reaſon to believe, that ſeveral lives " were abſolutely preſerved, when we were " at ſea, by a lemon ſqueezed into ſix or " eight ounces of *Malaga* wine mixed with " water, and given twice a-day."

I am informed, it was principally oranges which ſo ſpeedily and ſurpriſingly recovered Lord *Anſon*'s people at the iſland of *Tinian*. Of which that noble, brave, and experienced commander was ſo ſenſible, that, before he left the iſland, one man was ordered on ſhore from each meſs to lay in a ſtock of them for their future ſecurity.

(k) See the caſe of that ſhip, chap. 1. p. 60.

My

My ingenious friend Mr. *Murray*, who has favoured me with ſo many uſeful obſervations upon this diſeaſe; and has had the greateſt opportunities of being acquainted with it, as he for a conſiderable time attended the naval hoſpital at *Jamaica*, whilſt our great fleets were in the *Weſt-Indies*, and was likewiſe ſurgeon of the *Canterbury*, expreſſes himſelf thus in his letter. "As to oranges and lemons, "I have always found them, when properly "and ſufficiently uſed, an infallible cure "in every ſtage and ſpecies of the diſeaſe, if "there was any degree of natural ſtrength "left; and where a diarrhœa, lientry, or "dyſentery, were not joined to the other "ſcorbutic ſymptoms. Of which we had a "moſt convincing proof, when we arrived "at the *Daniſh* iſland of *St. Thomas (l)*; "where fifty patients belonging to the *Can-* "*terbury*, and ſeventy to the *Norwich*, in all "the different ſtages of this diſtemper, were "cured, in a little more than twelve days, "by limes alone; where little or no other "refreſhments could be obtained."

It was reaſonable to aſcribe this to the eminent virtues of theſe fruits; as it is well known, and daily experienced, that without ſuch remedies ſcorbutic people will infallibly die in the pureſt land-air. But what cures ſuch deplorable caſes, muſt ſtill more powerfully prevent them. Perhaps one hiſtory more may ſuffice to put this out of doubt.

(l) See the former part of this letter, chap. 1. p. 67.

"In

" In the firſt voyage made to the *Eaſt-In-*
" *dies (m)*, on account of the *Engliſh Eaſt-*
" *India* company, there were employed four
" ſhips, commanded by Captain *James Lan-*
" *caſter* their General, *viz.* the *Dragon*, hav-
" ing the General and 202 men, the *Hector*
" 108 men, the *Suſan* 82, and the *Aſcenſion*
" 32. They left *England* about the 18th
" of *April*; in *July* the people were taken ill
" on their paſſage with the ſcurvy; by the
" 1ſt of *Auguſt*, all the ſhips, except the Ge-
" neral's, were ſo thin of men, that they had
" ſcarce enough to hand the ſails; and, up-
" on having a contrary wind for fifteen or
" ſixteen days, the few who were well be-
" fore, began alſo to fall ſick. Whence the
" want of hands was ſo great in theſe ſhips,
" that the merchants who were ſent to diſ-
" poſe of their cargoes in the *Eaſt-Indies*,
" were obliged to take their turn at the helm,
" and do the ſailors duty, till they arrived at
" *Saldania (n)*; where the General ſent his
" boats, and went on board himſelf, to aſſiſt
" the other three ſhips; who were in ſo
" weakly a condition, that they were hardly
" able to let fall an anchor, nor could they
" hoiſt out their boat without his aſſiſtance.
" All this time the General's ſhip continued
" pretty healthy. The reaſon why his crew
" was in better health than the reſt of the

(m) Vid. *Harris*'s collection of voyages, and *Purchas*'s collection, vol. 1. p. 147.

(n) A bay near the Cape of *Good Hope*.

" ſhips,

" ſhips, was owing to the juice of lemons; " of which the General having brought ſome " bottles to ſea, he gave to each, as long as " it laſted, three ſpoonfuls every morning " faſting. By this he cured many of his " men, and preſerved the reſt: ſo that al- " though his ſhip contained double the num- " ber of any of the others; yet (through the " mercy of God, and to the preſervation of " the other three ſhips) he neither had ſo " many men ſick, nor loſt ſo many as they " did."

Here indeed is a remarkable and authentic proof of the great efficacy of juice of lemons againſt this diſeaſe; as large and crouded ſhips are more afflicted with it, and always in a higher degree, than thoſe that are ſmall and airy. This little ſquadron loſt 105 men by the ſcurvy. Upon its afterwards breaking out among them when in the *Eaſt-Indies*, in a council held at ſea it was determined, to put directly into ſome port where they could be ſupplied with oranges and lemons, as the moſt effectual and experienced remedies to remove and prevent this dreadful calamity.

I cannot omit upon this occaſion obſerving, what caution is at all times neceſſary in our reaſoning on the effects of medicines, even in the way of analogy, which would ſeem the leaſt liable to error. For ſome might naturally conclude, that theſe fruits are but ſo many acids, for which tamarinds, vinegar, *ſp. ſal. el. vitriol.* and others of the ſame tribe, would

would prove excellent *ſuccedaneums.* But, upon bringing this to the teſt of experience, we find the contrary. Few ſhips have ever been in want of vinegar, and, for many years before the end of the late war, all were ſupplied ſufficiently with *el. vitriol.* Notwithſtanding which, the *Channel* fleet often put on ſhore a thouſand men miſerably over run with this diſeaſe, beſides ſome hundreds who died in their cruiſes. Upon thoſe occaſions tar-water, ſalt water, vinegar, and *el. vitriol.* eſpecially, with many other things, have been abundantly tried to no purpoſe: whereas there is not an inſtance of a ſhip's crew being ever afflicted with this diſeaſe, where the before-mentioned fruits were properly, duly, and in ſufficient quantity, adminiſtered.

I elſewhere obſerved the uncertainty of ſuch theories as are founded upon the chemical principles of acid and alcali *(o)*: for although acids agree in certain properties; yet they differ widely in others, and eſpecially in their effects upon the human body. Of theory in phyſic the ſame may perhaps be ſaid, as has been obſerved by ſome of zeal in religion, That it is indeed abſolutely neceſſary; yet, by carrying it too far, it may be doubted whether it has done more good or hurt in the world.

Some will perhaps ſay, that theſe fruits have been often uſed in the ſcurvy without ſucceſs; as appears from the experience of

(o) Part 1. chap. 3.

phy-

phyſicians, who preſcribe them every day in that diſeaſe at land. And here we may again obſerve the fatal conſequence of confounding this malady with others. Legions of diſtempers (according to *Willis* and others) very different from the real and genuine ſcurvy, have been claſſed under its name: and becauſe the moſt approved antiſcorbutics fail to remove ſuch diſeaſes, hence we are told by authors *(p)*, that it is the maſterpiece of art to cure it. But this is contradicted by the daily experience of ſeamen, by the journals of our ſea-hoſpitals, and by the yearly experience of our *Engliſh Eaſt-India* ſhips at *St. Helena*, and the Cape of *Good Hope*. So that nothing can be more abſurd, than to object againſt the efficacy of theſe fruits in preventing and curing the real ſcurvy, becauſe they do not cure very different diſeaſes.

Some new preſervative might here have been recommended; ſeveral indeed might have been propoſed, and with great ſhew of the probability of their ſucceſs; and their novelty might have procured them a favourable reception in the world. But theſe fruits have this peculiar advantage above any thing that can be propoſed for trial, that their experienced virtues have ſtood the teſt of near 200 years. They were providentially diſcovered, even before the diſeaſe was well known, or at leaſt had been deſcribed by phyſicians. *Ronſſeus*, the firſt writer on this ſubject, men-

(p) *Boerhaave*, and many others.

tions

tions them *(q)*; and obſerves, that in all probability the *Dutch* ſailors had by accident fallen upon this remedy, when afflicted with the ſcurvy, in their return from *Spain*, loaded with theſe fruits, eſpecially oranges. Experience ſoon taught them, that by thus eating part of their cargo, they might be reſtored to health. And if people had been leſs aſſiduous in finding out new remedies, and truſted more to the efficacy of theſe fruits, for preventing this fatal peſtilence to ſeamen, the lives of many thouſand ſailors, and others *(r)*, (eſpecially during the laſt war) might in all probability have been preſerved. But ſome have been miſled to recommend many other things, as of equal, if not ſuperior antiſcorbutic qualities to theſe; and have reduced them to a level with other acids, and many falſely ſuppoſed antiſcorbutic medicines: from whence the many unhappy diſappointments

(q) Epiſt. 2.

(r) Vid *Kramer*'s obſervations, part 3. chap 2. the beſt ever made on this diſeaſe; which abundantly confirm all that is here advanced. In a book publiſhed afterwards he makes the following remarks. The ſcurvy is the moſt loathſome diſeaſe in nature; for which no cure is to be found in your medicine cheſt, no not in the beſt-furniſhed apothecary's ſhop. Pharmacy gives no relief, ſurgery as little. Beware of bleeding; ſhun mercury as a poiſon: you may rub the gums, you may greaſe the rigid tendons in the ham, to little purpoſe. But if you can get green vegetables; if you can prepare a ſufficient quantity of freſh noble antiſcorbutic juices; if you have oranges, lemons, or citrons; or their pulp and juice preſerved with ſugar in caſks, ſo that you can make a lemonade, or rather give to the quantity of three or four ounces of their juice in whey, you will, without other aſſiſtance, cure this dreadful evil. *Krameri medicina caſtrenſis.*

hitherto

hitherto met with in preventing this diſeaſe at ſea, ſeem to have ariſen.

We are told, that at the ſiege of *Thorn*, when this calamity raged with great violence in the town, it was the laſt and moſt earneſt petition of the diſeaſed, that ſome of theſe fruits might be permitted to enter their gates, as the only hopes of life, and laſt comfort of the dying patient *(s)*. In this diſeaſe, when drugs of all ſorts are nauſeated and abhorred, the very ſight of theſe fruits raiſes the drooping ſpirits of the almoſt expiring patient. I have often obſerved (upon ſeeing ſcorbutic people landed at our naval hoſpitals) that the eating of them was attended with a pleaſure eaſier to be imagined than deſcribed. Hence Lord *Delawar*, a very great ſufferer in this malady (in the relation of his caſe to the Lords and others of the council of *Virginia)* very pathetically expreſſes himſelf thus. "Heaven "has kindly provided theſe fruits as a ſpecific "for the moſt terrible of evils *(t)*."

As oranges and lemons are liable to ſpoil, and cannot be procured at every port, nor at all ſeaſons in equal plenty; and it may be inconvenient to take on board ſuch large quantities as are neceſſary in ſhips for their preſervation from this and other diſeaſes; the next thing to be propoſed, is the method of preſerving their virtues entire for years in a

(s) Bachſtrom obſerv. circa ſcorbutum, p. 15.
(t) Purchas, vol. 4. p. 16.

convenient and ſmall bulk. It is done in the following eaſy manner.

Let the ſqueezed juice of theſe fruits be well cleared from the pulp, and depurated by ſtanding for ſome time; then poured off from the groſs ſediment: or, to have it ſtill purer, it may be filtrated. Let it then be put into any clean open veſſel of china or ſtone-ware, which ſhould be wider at the top than bottom, ſo that there may be the largeſt ſurface above to favour the evaporation. For this purpoſe a china baſon or punch-bowl is proper *(u)*; as generally made in the form required. Into this pour the purified juice; and put it into a pan of water, upon a clear fire. Let the water come almoſt to boil, and continue nearly in that ſtate of boiling (with the baſon containing the juice in the middle of it) until the juice is found to be of the conſiſtence of a thick ſyrup when cold. The ſlower the evaporation of the juice the better; and it will require at leaſt twelve or fourteen hours continuance in the bath heat, before it is reduced to a proper conſiſtence.

(u) In the former edition I had ſaid, that a common earthen veſſel, well glaſed, would anſwer the purpoſe. But I have ſince been informed by a very ingenious gentleman, that making this *rob* in a coarſe earthen veſſel, he found the glaſing of it diſſolved by the acid, and converted into a ſugar of lead. To prevent the dangerous conſequences of which, I publiſhed a ſhort paper in the *Edinburgh* Monthly Magazine in *May* 1754, which was ſoon after reprinted in the Gentleman's Magazine. It was then drawn up in haſte. Since that time, by repeated experiments, I find that the coarſe glaſed earthen veſſels are unfit for this and ſome other uſes.

It

It is then, when cold, to be corked up in a bottle for uſe. Two dozen of good oranges, weighing five pounds four ounces, will yield one pound nine ounces and a half of depurated juice; and when evaporated, there will remain about five ounces of the *rob* or extract; which in bulk will be equal to leſs than three ounces of water. So that thus the acid, and virtues of twelve dozen of lemons or oranges, may be put into a quart-bottle, and preſerved for ſeveral years.

I have ſome of the extract of lemons now by me, which was made four years ago. And when this is mixed with water, or made into punch, few are able to diſtinguiſh it from the freſh ſqueezed juice mixed up in like manner; except when both are preſent, and their different taſtes compared at the ſame time; when the freſh fruits diſcover a greater degree of ſmartneſs and fragrancy.

The learned Dr. *Mead* aſcribes ſome ſalutary effects to the fragrancy of the freſh fruits, when he obſerves, that by the ſailors pelting each other with the rinds in Admiral *Wager*'s ſhip, the decks were ſtrewed and wet with this wholſome liquor. Was any thing to be expected from perfuming the air with the fragrancy of theſe fruits, it is eaſily done at any time by a few drops of their eſſence, or the aromatic oil contained in the rinds. An addition of a ſmall quantity of this to the extract, gives it the ſmell and fragrancy of the freſh fruit in great perfection. And if it is alſo re-

quired to be taken inwardly, a few drops of it upon ſugar may be given along with the extract. But it is the ſaponaceous juice alone, of theſe fruits, that is here requiſite; and their entire ſalutary virtues may be obtained by taking that inwardly; as appears plainly by the relation of Captain *Lancaſter*'s voyage, where the juice of lemons kept in bottles, not only prevented the diſeaſe, but cured it, at ſea. This juice muſt either have been mixed up with ſpirits, or ſomething elſe, to preſerve it *(w)*; and conſequently differed much more in

(w) Lemon juice is extremely difficult to preſerve, whereas orange-juice will keep in any voyage by the following method. Let the fruit be well picked, ſo that no orange is ſqueeſed which is in the leaſt ſpoilt, which might otherwiſe taint the whole of the juice. After ſtraining, it muſt be put in a clean veſſel (a caſk is commonly uſed) and a large ſediment will be depoſited, beſides a cake of lighter *feces*, which ſwims atop. The clear juice in the middle of theſe muſt be drawn off by means of a cock free from either, and put into ſmall pint bottles. Each bottle, after having a little of the beſt *Florence* oil poured atop of the juice, muſt be well corked, and the acceſs of the air prevented by a covering of wax or reſin over the cork. I have been told, that as orange-juice will keep ſo well, and may be bought at any ſeaſon of the year in *London*, there ſeems no occaſion for recommending the *rob* of theſe fruits; and that even oranges and lemons properly taken care of, may be preſerved long at ſea. But ſuch who talk in this manner, are unacquainted with the conveniencies at ſea, the diſpoſition of mariners and ſome of their officers. 'Tis neceſſary they ſhould conſider we are not now preſcribing for perſons at land, who have large cellars and ample conveniencies, nor for the captains of men of war and their officers, who are ſeldom afflicted with this diſeaſe. Theſe gentlemen may for their proper and infallible ſecurity, carry out the juices of ſcurvy-graſs, creſſes, and oranges, or the *ſucci ad ſcorbuticos*, which by a method of preſerving them now ſufficiently known, will keep good and freſh the ſpace of a year or two. But no maſter of a merchant ſhip will, no captain of

in quality from the freſh fruit than what is propoſed.

However, if it be judged of any conſequence to preſerve the perfect fragrancy of the

of a man of war can, lay up a neceſſary ſtore of ſuch juices, or even a ſufficient quantity of oranges, or of their juice, for the preſervation of a whole ſhip's company. Beſides, when a ſhip touches at a proper place where a ſupply of oranges, limes, or citrons can be had, and it is in the power of every ſailor to purchaſe as many as he will, they have neither conveniencies for keeping the fruits, nor of depurating and preſerving the juice of oranges. Whereas, by making the *rob* of theſe fruits in the manner here directed, with little more than a day's trouble, they may lay up in a quart bottle as much as will ſerve them for ſeveral years in other voyages, and by its conſtant uſe, purify their conſtitution entirely from the ſcorbutic taint. Now though it is well known ſome of the ſailors are very thoughtleſs, and take but little concern about their health, yet doubtleſs there are many among them who reflect, and will take the proper pains when inſtructed. For the ſake of theſe the *rob* is recommended, as alſo to the ſurgeons of ſhips (when in a place where plenty of theſe fruits can be procured, and their virtues can be reduced into ſo ſmall a compaſs) leaving it to the officers to provide themſelves with the freſh fruits or their juices. 'Tis indeed a pity that the men of war and the ſhips in the *Eaſt-India* company's ſervice, are not ſupplied with either the juice of oranges, or the extract of lemons. I am informed, there are perſons in *London* who would inſure the keeping of the orange juice made by them for a twelvemonth: and one may almoſt affirm, that three gallons of ſuch juice, which may be purchaſed for leſs than twenty ſhillings, will preſerve a merchant-ſhip from the ſcurvy in a paſſage round *Cape Horn*. But however cheap, however ſimple this remedy may appear to be, if it is not to be had at ſea, the whole cheſt of ſea-medicines will not avail the unhappy patients. Some perſons cannot be brought to believe, that a diſeaſe ſo dreadful and fatal at ſea, can poſſibly be prevented or cured by ſuch eaſy means. They would have more faith in ſome elaborate compoſition dignified with the pompous title of an antiſcorbutic golden elixir, or the like. But the affair in queſtion is of too ſerious and important a nature to trifle with; and where the health and lives of ſo many thouſands

the fruit, I have found, upon experiment, that there are ſeveral other ways of doing it. They who intend this extract for acidulating punch, may infuſe ſome of the freſh peel of the oranges or lemons into the ſpirit before it is uſed. I have known ſome who diſtil brandy themſelves from their ſpoiled wines, throw theſe peels into the ſtill. Either of the methods makes a moſt agreeable and fragrant punch with the *rob.* The eſſential oil of the rind is thus ſo ſubtiliſed, and incorporated with the ſpirit, as to be itſelf converted as it were into a purer ſpirit. And it will not then have the heating quality, nor affect the head afterwards ſo much as the ſimple oil may do, when taken in too great a quantity.

But, for this purpoſe, I find it is ſufficient to add a very ſmall quantity of the outer peel to the extract a little before it is taken off the fire, and there will be all that is requiſite to make it entirely equal to the freſheſt fruit; in ſo much that the niceſt taſte will not be able to diſtinguiſh any difference. Its virtues

are concerned, it would be unpardonable to impoſe upon the public. Facts are ſufficient to convince the unprejudiced, and the following is too much to the purpoſe to be omitted. A ſhip lately upon going out of port, found they had a man on board bad in the ſcurvy. The officers being well provided with lemons for punch, ordered all their ſqueeſed lemons to be given him. He every day eat the pulp, rind, and what little juice remained behind, of three or four lemons: by which means the diſeaſe was ſo far from gaining ground upon him, that after continuing three months at ſea in a cruiſe, he returned much freer from the ſcurvy, than when he ſet out on the voyage.

(as

(as muſt appear to any one ſo far converſant in chemical principles, as to know there is nothing more loſt here than water, with a ſcarce perceptible acid) will be found nothing inferior to the freſh fruit *(x)*.

In this manner prepared, it muſt be kept in bottles, where it will remain good for ſeveral years. When made in a proper place and ſeaſon, it will come very cheap; and our navy may be ſupplied with it at a much eaſier rate than any thing as yet propoſed. It will be found extremely wholſome on all occaſions, but eſpecially to correct bad brandy, and other noxious ſpirits, often drank by ſailors in immoderate quantities. Rum in the *Weſt-Indies*, arrack or brandy, when ſerved them by way of allowance, ſhould always be firſt mixed up

(x) This I think cannot be doubted by any perſon who has uſed it, or who will take the pains to make proper compariſons and trials with it, and the freſheſt orange or lemon-juice. Indeed the benefit preſumed to be derived from the flavour is ſo ſmall, that the plain extract is quite ſufficient. Officers, by putting in a little of the candied peel in their punch, will give it the agreeable flavour wanted. And there is another and very elegant method of obtaining and preſerving the entire virtues of the lemon or orange ſkins. Rub the outſide of the ſkins againſt a piece of loaf-ſugar. The inequalities on the ſurface of the ſugar ſerve as a grater, and tear open the little cells in which the eſſential oil is contained. This eſſence flows plentifully out, and is imbibed by the ſugar. When one part of the ſugar is ſufficiently impregnated and wet, ſcrape it off with a knife, and put it into a bottle: repeat the ſame operation until the whole eſſence is extracted from the rinds. The ſugar does not in the leaſt impair or alter its aromatic virtues; and in this manner it will keep good for many years. When mixed with the juice or *rob*, the whole virtue of the fruit is exhibited.

with the *rob*. This will not only make them more palatable, but, what is a matter of much greater moment, will convert theſe poiſonous pernicious draughts into a ſovereign remedy for, and a preſervative againſt a ſcorbutic habit, the bane of ſeafaring people.

I ſhall add one obſervation in its favour. The iſland of *Jamaica* is much leſs liable to ſickneſs at preſent than formerly. Our fleets in the *Weſt-Indies* in the beginning of the war were much more ſickly than in the latter end of it, when indeed they were ſurpriſingly healthy. This, with great reaſon, has been univerſally aſcribed to the drinking a great quantity of this acid, by making their punch ſour and weak.

I proceed to ſome farther directions given for the information of commanders of ſhips, and thoſe who have proper conveniencies, who may relieve the ſick, upon occaſion, with their ſtores. And it may be proper to acquaint them, that moſt berries, and ſeveral fruits, when gathered two thirds ripe on a dry day, while the ſun ſhines, if put into earthen pots, or rather in dry bottles, well corked, and ſealed up, ſo that no air or moiſture can enter, will keep a long time, and, at the end of a year, be as freſh as when new pulled. Theſe the captains may ſupply themſelves with at every port in *England*, from the paſtry-cooks ſhops, with proper directions for their preſervation. Green gooſeberies will keep for years, if, after being put into dry bottles,

bottles, their moiſture is exhaled, by putting the bottles ſlightly corked into a pot of water, which is allowed to come nearly to boil, and continue ſo for a little; when a very ſmall quantity of juice yielded by them is to be thrown away, and they are afterwards kept cloſe ſtopt. Theſe would prove a ſovereign remedy for the ſick: and, by ſuch methods, ſhips in long voyages, when touching at any place for water and proviſions, may likewiſe lay up a ſea-ſtore of berries and fruits.

Various wholſome herbs and roots may likewiſe be preſerved at ſea, according to the different directions given for that purpoſe in books of chemiſtry and confectionary; ſuch as ſmall onions in a pickle of vinegar, *&c.* Moſt green vegetables, as cabbage, *French* beans, and others, are preſerved, if put when dry in clean dry ſtone-jars, with a layer of ſalt at bottom; then a thin layer of the vegetable covered with ſalt, and ſo alternately, till the jar is full; when the whole is to be covered with ſalt and well preſſed down with a weight, and its mouth cloſe ſtopt, that no air or moiſture may enter. At uſing, the ſalt is to be waſhed off by warm water; when the vegetable, after keeping a year, will be found freſh and green. I have been told, that in this manner that ſovereign never-failing remedy, the *Greenland* ſcurvy-graſs *(y)*, may be pre-

(y) Vid. a letter concerning it, chap. 5. alſo the extraordinary caſe of a ſailor related by *Bachſtrom.*

ſerved,

ſerved, and that parts of it have been brought over quite freſh and green.

Every common ſailor ought to lay in a ſtock of onions. I never obſerved any that uſed them fall into the ſcurvy at ſea. When this ſtock is exhauſted, the captains may have recourſe to their pickled ſmall onions; and with fowls, mutton, or portable ſoop, and the pickled cabbage before-mentioned, of which the *Dutch* (z) ſell great quantities, they will be able

(z) The *Dutch* ſailors are much leſs liable to the ſcurvy than the *Engliſh*, owing to this pickled vegetable carried to ſea. *Vid. Krameri epiſtolam de ſcorbuto.* A meſs of this given twice a-week boiled in their peas, ſeems all the addition requiſite to be made to the preſent victualling of the navy, for the effectual prevention of the ſcurvy. It may be objected, That its ſaltneſs would rather prove hurtful in this diſeaſe. But this objection is founded upon a very falſe opinion, that ſea-ſalt breeds the ſcurvy: the contrary of which has been fully demonſtrated, chap 1. and is confirmed by numberleſs inſtances of giving ſalt water in very bad ſcurvies, both at ſea and land, with great benefit to the patient. See Mr. *Ives*'s letter, p. 150. Dr. *Grainger*'s, chap. 5.

The truth is, that vegetables preſerved in this manner, ſo far from being ſalt after duly waſhing them in warm water, require to be eat with ſalt: they are thus preſerved quite ſucculent and green. Their virtue is the ſame as if taken freſh out of the garden, and the method infinitely ſuperior to the drying of them, like hay, as was propoſed; which would entirely deſtroy their antiſcorbutic quality; as will be made appear when we come to inquire (chap. 6.) into the properties and virtues peculiar to green ſucculent vegetables, ſo eſſentially requiſite for the prevention, and in the cure of this malady. To the ſurgeon's neceſſaries in long and ſickly voyages, it would not be amiſs to add ſome boxes of portable ſoop; and at all times ſome pots of preſerved ſmall onions, together with ſome *French* prunes. When the ſcurvy begins to appear, or even when its approach is apprehended, the ſhip's company ought to have ſome of theſe onions, or when there are none on board, ſome garlic or ſhellot

able to make a broth at ſea, almoſt the ſame with what is uſed in our naval hoſpitals for recovery of ſcorbutic people. I have known ſeveral captains, who, by carrying out boxes filled with earth, which ſtood in their quarter-galleries, were ſupplied with wholſome ſalads, after being ſome months out of harbour.

ſhellot (ſupplied them by the ſurgeon) boiled in their water-gruel; and of this they ought to make a hearty breakfaſt. They ſhould be put on $\frac{1}{4}$ or $\frac{1}{3}$ ſhort-allowance of ſalt beef and pork, to be eat with muſtard and vinegar, and have a ſmall quantity of ginger given them by the ſurgeon to mix in their puddings, which will make them much lighter. In *lieu* of their ſalt meat, the purſer may ſupply them with cyder, wine, or the ſpruce beer afterwards recommended; or if they are ſerved with brandy, he may furniſh them with ſugar and a ſufficient quantity of orange-juice to make it into punch. A gallon of orange juice is ſold for ſix ſhillings, which allowing an ounce of it to each man in the day, will ſerve 128 men, and the expence be three-pence halfpenny a week for each; whereas when at $\frac{1}{3}$ ſhort-allowance of beef and pork, there becomes $4\frac{2}{3}$d. *per* week due each man. This overplus of the ſhort-allowance money will be ſufficient to enable the purſer to furniſh molaſſes for the punch of the ſhip's company, as alſo a meſs of either green or pickled cabbage once a week. Theſe are to be had at any port in *England* for a farthing a piece. If they are likely to ſpoil, they may be ſerved out in their peas-ſoop, after being a week or two at ſea, which would be a great refreſhment to the people, and the means of ſecuring them againſt a future ſcurvy. The peas ought always to be ſerved out in full allowance, and this meſs would be greatly improved by the addition of dried mint or thyme, garlic, *&c.* Thus might the ſcurvy in all probability be effectually prevented in our navy, without putting the government to a farthing expence, by a commutation of proviſions and neceſſaries, at the diſcretion of the purſer and ſurgeon, and a proper regulation of their diet. It is demonſtrable from the moſt inconteſtable experience, that a ſoop of boiled cabbage and onions, will cure an adventitious ſcurvy in its firſt ſtage, either at ſea or land, in any part of the world. By a like ſoop, with addi-

bour. A caſk of rich garden-mould put occaſionally in boxes on the poop, and ſown with the ſeed of garden-creſſes, would furniſh theſe at any time. Such ſeeds will likewiſe grow in wet cotton.

Beſides freſh and preſerved fruits and vegetables, fermented liquors of all ſorts are

addition of freſh fleſh-meat, ſeventy people were perfectly cured in the *Guernſey*, without one of them ſetting foot on ſhore. This was not owing to the fleſh in their ſoop, but to the vegetables: for I have known ſome favourites of the Captain's who had freſh mutton-ſoop given them almoſt every day, without the leaſt benefit, until they arrived at port; where they were cured in a few days by the ſame ſoop, with the addition of vegetables. And that vegetables have the ſame effect at ſea as at land, is plain from Mr. *Ives*'s journal (ſee p. 100.) where the people continued to recover at ſea from the 29th *November* that they left *Vado*, until the 25th *December*, by means of fruits given them.

A gentleman on board the Commodore at that time told me, that the whole ſquadron was greatly diſtreſſed with the ſcurvy, and in particular the Commodore's ſhip; in ſo much, that, after having uſed all means, to no purpoſe, that could be thought of to put a ſtop to the malady, he was at laſt obliged, for the preſervation of his people, to ſtretch over to the coaſt of *Italy*, and leave his ſtation for a while. At this time many were extremely bad. Upon his arrival at *Vado*, he found the whole country covered with ſnow; and ſuch was the ſeverity of the winter, that there was hardly any kind of greens to be got for the relief of his diſtreſſed crew. Upon which this excellent commander (now Adm. *Oſborn*) very wiſely directed his people to buy up all the oranges and lemons in the town. His boats brought on board a conſiderable quantity of them. He likewiſe ſupplied his ſquadron with ſome freſh beef. Being obliged to make but a very ſhort continuance at *Vado*, he directly returned to his ſtation with a ſtore of theſe fruits, but with his men ſtill in a bad condition. He continued cruiſing at ſea for three weeks, in very rough weather. Notwithſtanding which, by means of theſe fruits, many who were very bad, and all who were in the firſt ſtage of the diſeaſe, were perfectly recovered while at ſea, and the lives of the whole crew preſerved.

found

found beneficial in this diſeaſe. Some of them however are more antiſcorbutic than others. By my own experience, I found cyder the beſt of any I have had occaſion to try. And it would ſeem an excellent method of preſerving other vegetable juices (gooſeberries, blackberries, currants, elderberries, or even *Seville* oranges) to ferment them into made wines or beer. Theſe I am perſuaded will be found preferable to many medicated antiſcorbutic ales and wines by infuſion, that might here be recommended.

It is pretty remarkable, that the firſt northern colonies in *America* were extremely ſubject to this diſeaſe. The *French* eſpecially upon their firſt planting *Canada* and *New-France*, ſuffered ſo much by the mortality it occaſioned in the winter-ſeaſon, that they had often thoughts of abandoning their ſettlement; even the natives were not exempted from the ravage of this cruel evil *(a)*: whereas not only theſe colonies, but others in a colder and more northern ſituation, are at preſent quite healthy. One would be apt to aſcribe this, to the many hardſhips and inconveniencies infant-colonies are neceſſarily expoſed to; were it not, that we ſee many poor people wintering yearly in *Newfoundland*, where this diſeaſe was formerly ſo fatal, who from poverty ſuffer equal, if not greater hardſhips, than the firſt planters during the ſeverity of winter. They are, for almoſt eight months

(a) See part 3. chap. 1.

in

in the year, deſtitute of freſh vegetables, and live entirely on ſalt and dried fiſh, coarſe bread, and much worſe fare than a ſhip's proviſions. Their air is likewiſe groſſer, colder, and moiſter, than is commonly the caſe at ſea. Notwithſtanding which, they keep pretty free from the ſcurvy. And this is aſcribed to their common drink, which is ſpruce beer.

It is indeed matter of ſurpriſe, and was taken notice of before as the moſt convincing proof that this calamity may be prevented any where, that the people who reſide at our factories in *Hudſon*'s bay, are ſo very healthy; where, according to *Ellis*'s account, they ſometimes do not bury one man in ſeven years out of a hundred that are in their four factories *(b)*: whereas the firſt adventurers to that part of the world, who wintered in the ſame places, were almoſt all deſtroyed by the ſcurvy, *viz.* Capt. *Monck*'s people in 1619 *(c)*, Capt. *Thomas James*'s at *Charleton* iſland in 1631 *(d)*, and moſt others who attempted it. A ſet of ſailors, conſiſting of ſeven men, was left two winters ſucceſſively, in the years 1633 and 1634, at *Greenland* and *Spitzbergen*, by way of experiment: but every man of them next ſpring was found to have died of the ſcurvy *(e)*. The unhappy fate of thoſe people, who all periſhed in this great miſery, and

(b) See voyage to *Hudſon*'s bay.
(c) *Churchill*'s collection of voyages, vol. 1. p. 541.
(d) *Harris*'s collection of voyages, vol. 2. p. 406.
(e) *Churchill*'s collection, vol. 2. p. 347.

left

left behind them a journal of their piteous misfortunes, ſeems to have been owing to the world's ignorance of the diſtemper at that time, and the pernicious methods recommended to them for preſervation; which we find were chiefly purging antiſcorbutic potions, diſtilled ſpirits, *viz.* brandy, and the like; all which infallibly increaſed the malady, and haſtened their unhappy end.

From theſe unſucceſsful trials it was judged impracticable to paſs the winter in thoſe parts. But the following accident afforded the moſt convincing evidence of this miſtake. A boat's crew, conſiſting of eight men, was by chance left behind, and obliged to winter in almoſt the ſame place *(f)*. The ſeaſon proved equally rigorous and ſevere. The poor fellows had nothing to truſt to for ſuſtenance but what their guns procured. Thus luckily were every one of them preſerved alive, by being unprovided with what might have been deemed neceſſary (though in effect pernicious) means of ſubſiſtence and preſervation. They had no brandy, no coarſe hard biſcuit, nor ſalt fleſh-meats, *&c.*

But what deſerves particular conſideration, is, that thoſe who live on the coarſeſt food, with a ſalt diet, and uſe ſpruce beer at the ſame time, are ſeldom or never afflicted in the coldeſt and moſt norther countries. It was obſerved in *Holland*, that when the cuſtom of drinking wine more freely was practiſed,

(f) Churchill, vol. 4. p. 745.

this diſtemper became leſs frequent *(g)*. And among the firſt cures recommended to the world was wine, with wormwood infuſed in it *(h)*; which was afterwards long uſed by way of prevention in *Saxony*, where this evil was peculiarly endemic *(i)*. Fermented vinous liquors of any kind are indeed very beneficial. But it appears by the experience of the northern *American* colonies, as alſo of ſeveral countries up the *Baltic* in *Europe*, *&c.* that genuine ſpruce beer is, above all others, not only an effectual preſervative againſt it, but an excellent remedy.

The antiſcorbutic virtue of the fir was, like many other of our beſt medicines, accidentally diſcovered in *Europe (k)*. When the *Swedes* carried on a war againſt the *Muſcovites*, almoſt all the ſoldiers of their army were deſtroyed by the true marſh or marine ſcurvy, having rotten gums, rigid tendons, *&c.* But a ſtop was put to the progreſs of this diſeaſe, by the advice of *Erbenius* the King's phyſician, with a ſimple decoction of fir-tops; by which the moſt deplorable caſes were perfectly recovered, and the reſt of the ſoldiers prevented from falling into it. It alſo proved an excellent gargle for the putrid gums. From thence this medicine came

(g) Bruneri tract. de ſcorbuto.

(h) See part 3. chap. 1. *Olaus Magnus.*

(i) See part 3. chap. 2.

(k) Vid. Moellenbroek de arthritide vaga ſcorbutica, p. 116. *Etmulleri opera*, p. 2. ſaid by ſome to have occurred in the army of *Uladiſlaus* King of *Poland.*

into

into great reputation, and the common fir, *picea major*, or *abies rubra*, was afterwards called *pinus antiſcorbutica*. *Pinus ſylveſtris*, the mountain-pine, has likewiſe been found highly antiſcorbutic, of which a late accident has furniſhed a convincing proof. In the year 1736 two ſquadrons of ſhips fitted out by the court of *Ruſſia*, were obliged to winter in *Siberia*. One commanded by *Demetrius Laptiew*, not far from the mouth of the river *Lena*, was attacked by the ſcurvy. The men in their diſtreſs by chance found near them this tree growing in the mountains, and experienced it to have a moſt ſurpriſing antiſcorbutic virtue. At the ſame time while *Alexius Tſchirikow* was paſſing the winter in the river *Judoma*, where it runs into the river *Maja*, a conſiderable number of his men were dreadfully afflicted with that diſeaſe. After various fruitleſs attempts to diſcover a remedy able to put a ſtop to this cruel diſaſter, he at length accidentally hit alſo upon the pines which grew plentifully on the mountains, by which all his men were recovered in a few days. In ſome the medicine proved gently laxative, in others it affected the body ſo mildly, that its operation was ſcarce ſenſible *(l)*.

I am inclined to believe, from the deſcription given by *Cartier* of the *ameda* tree, with a decoction of the bark and leaves of which his crew was ſo ſpeedily recovered, that it was

(l) Gmelin flor. Sibiric p. 181.

the large ſwampy *American* ſpruce tree *(m)*. For although the pines and firs, of which there is a great variety, differ from each other in their ſize and outward form, the length and diſpoſition of their leaves, hardneſs of wood, *&c.* yet they ſeem all to have analogous medicinal virtues, and great efficacy in this diſeaſe. The ſhrub ſpruce, of that ſort vulgarly called the *black*, which makes this moſt wholſome drink, affords a balſam ſuperior to moſt turpentines, though known only to a few phyſicians.

A ſimple decoction of the tops, cones, leaves, or even green bark and wood of theſe trees, is an excellent antiſcorbutic: but it will I am apt to think become much more ſo when fermented, as in making ſpruce beer; where the *moloſſes* contributes, by its diaphoretic quality, to make it a more ſuitable medicine. By carrying a few bags of ſpruce to ſea, this wholſome drink may be prepared at any time. But where it cannot be had, the common fir-tops uſed for fuel in the ſhip, ſhould be firſt boiled in water, and the decoction afterwards fermented with *moloſſes*, in the common method of making ſpruce beer; to which a ſmall quantity of wormwood and horſe-radiſh root (which it is eaſy to preſerve freſh at ſea) may be added. It ought to be

(m) See part 3. chap. 1. *Hackluit*'s collection of voyages, vol. 3. p. 225. Some have believed it to be the ſaſſafra, others the white thorn; but, in his third voyage, he mentions the white thorn, and makes the *ameda* to be three fathom in circumference.

drunk

drunk when pretty briſk or new, and taken in ſufficient quantity, which will be found the moſt efficacious antiſcorbutic perhaps of any fermented liquor, as being of a diuretic and diaphoretic quality. In extremity tar-water may be tried, fermented in like manner; by which it will certainly become much more antiſcorbutic.

We come now to obſerve what treatment is proper for convaleſcents, or thoſe who are recovering from tedious fits of ſickneſs, by which they have been greatly exhauſted and weakened. Here the prevention of the ſcurvy will depend much upon two articles, *viz.* a proper diet and exerciſe. The former muſt be adapted to the weakneſs of their digeſtive powers, and the ſharp acrimonious condition of the blood and juices. The latter muſt be ſuited to the debilitated ſtate of their body. We find, that when people in this condition at land, and much more ſo in the moiſt ſea-air, are put directly upon a groſs viſcid diet, they are very apt to become ſcorbutic. For theſe, in the firſt place, we would recommend an allowance of flour inſtead of ſalt beef and pork; and (ſea-biſcuit being too groſs food for them) this muſt be well leavened, and baked into freſh bread, inſtead of being cooked into puddings and dumplings, as is common; which will be found an excellent antiſcorbutic; and is, together with vegetables, eagerly longed for by ſcorbutic perſons. It may appear a direction not eaſily to be com-

plied with, to people unacquainted with ſea-conveniencies. But many ſhips, eſpecially all ſhips of war, have an oven; and it is a practice with moſt captains, to have their own bread baked twice or thrice a-week, while at ſea. When the patient is extremely weak, a little of this freſh bread ſhould be boiled in water, and made into panada; adding a few drops of the juice or extract of lemons, and a ſpoonful of wine.

The other parts of diet ſhould be oat-meal and rice gruels, flumery, roaſted or ſtewed apples, if they can be got, ſtewed barley, with raiſins or currants, ſago and wine, *&c.* but particularly the pickled green cabbage, and ſmall onions, boiled with the portable ſoop made weak. Moſt food and drink ought to be acidulated with the orange or lemon-juice; which at ſuch times proves highly grateful, both to the palate and ſtomach of the patient; who by degrees, as his appetite, but eſpecially as his ſtrength increaſes, is to be indulged with more ſolid food: though he would do well to abſtain for ſome time from groſſer animal ſubſtances, and take no other reſtorative but wine, with the proper vegetable and lighteſt farinaceous ſubſtances. A caution is here requiſite, that to the convaleſcents nouriſhment ſhould be given often, but in a ſmall quantity at a time, ſo as not to oppreſs the organs of digeſtion.

It is likewiſe a matter of great importance, that the body weakened by preceding ſickneſs, be

be by degrees habituated to exerciſe. Nothing can be more inhumane, than to oblige a poor weak man to undergo more fatigue than his ſtrength can bear; nor any thing more prejudicial to his recovery, than, under the notion of preſerving him from the ſcurvy, to force him too ſoon to do the ſhip's duty. On the other hand, a total neglect of exerciſe is peculiarly productive of this diſeaſe. The rule then is, to proportion the continuance and degree of it, to the ſtrength and condition of the patients; to begin with the moſt gentle and eaſy at firſt, and proceed gradually to the more violent, as they acquire ſtrength. Thus, after being accuſtomed to ſit up ſome hours through the day in bed, they are then to be allowed to get out of it, and continue ſo, as long as their ſtrength, without great wearineſs or fatigue, will permit. They may next be put into a ſling hung below the forecaſtle, or betwixt decks; which will affect them not only by cauſing a change of air, but at the ſame time give ſpirits and refreſhment. They will afterwards be able to bear riding on a croſs deal laid betwixt two cheſts, where the ſucceſſive concuſſions of the body will be more ſenſibly perceived. And it is to be remarked, that as weak perſons at land generally find the greateſt benefit from exerciſe in a coach, chaiſe, or on horſeback; ſo the convaleſcents in a ſhip, eſpecially ſcorbutical people, will receive much more advantage from this exerciſe, than from walking,

running, or any kind of muſcular motion, in which a great exertion of ſtrength is required. The reaſon ſeems to be, becauſe theſe latter are attended with a waſte and diſſipation of ſpirits; and are generally followed with wearineſs and fatigue: whereas, by the frequent ſucceeding agitations of a jolting machine, the circulation is promoted, the fibres of the body ſtrengthened, and the weakened animal functions invigorated, without any conſiderable loſs of ſpirits, which ſuch people cannot well bear.

Theſe and the like exerciſes are abſolutely neceſſary to prevent the ſcurvy in thoſe who have hurts, ſprained joints, ulcers on their legs, and other ailments, which confine them below, and diſable them from walking; in which caſe they ſoon become ſcorbutic, when living on the groſs ſea-diet.

Others upon recovery may, at the ſame time they practiſe theſe exerciſes, be made to walk a little upon deck, ſo as not to over-fatigue themſelves; and afterwards be put upon ſuch duty as their condition will permit them to perform: having recourſe, if needful, to *elixir vitriol*, bitters, the bark, or ſteel, according as they may be requiſite to perfect their ſtrength and recovery. To which, however, nothing will contribute ſo much, and at the ſame time more effectually prevent the ſcurvy, as bodily exerciſe; which will be found to agree beſt with them when the ſtomach is not full, or rather juſt before meals. It is obſerved, that

that when ſcorbutic people uſe no exerciſe, the diſeaſe advances very faſt upon them at ſea: therefore, if they can bear only the moſt gentle motions, theſe are often to be practiſed; and the body is not to be permitted continually to reſt, without ſome ſort of action. When confined to bed, frictions may be uſed upon their limbs and body. Let it however be remembered, that too violent exerciſe is as dangerous and pernicious in this diſeaſe as too little.

I proceed now to point out the means of correcting or removing many inconveniencies which occur at ſea, eſpecially thoſe which are obſerved to be productive of this malady. A moſt powerful and principal cauſe of which *(n)*, and indeed of many others at ſea, is the moiſture of the air, and conſequently the dampneſs of their lodging; eſpecially during a long continuance of thick cloſe weather, or a ſtormy and rainy ſeaſon. And this is found to be the moſt frequent cauſe of this fatal diſeaſe, whoſe effects are rendered ſtill more pernicious when combined with cold; theſe require in a particular manner to be guarded againſt. And they are either immediately to be corrected, or their effects and conſequences prevented.

As to the firſt: Although we cannot at once remove a perſon into another climate, or into the land-air; yet we can eaſily give to the air he breathes, a more ſalutary quality,

(n) See Part 2. chap. 1.

by rendering it at any time warmer or colder, moiſter or drier, as the exigency of the caſe and circumſtances may require. I obſerved elſewhere *(o)*, that the noxious qualities of the moiſt air at ſea were greatly heightened by being confined in ſo cloſe a place as a ſhip, without a ſucceſſion, or freſh ſupply of it. But as that inconvenience is guarded againſt by the uſe of *Sutton*'s machine (or the much more effectual and excellent invention of ventilators by the reverend Dr. *Hales) (p)* which extracts all ſuch foul and putrid air, and thus will prevent many infectious malignant fevers cauſed from thence; ſo there ſeems nothing wanting to make it likewiſe an excellent preſervative againſt the ſcurvy, but that it ſhould correct the moiſture of the ſea-air, and dry or warm it betwixt decks when needful.

This I conjecture it might be made to do by ſome additional contrivances, which may invert its operation; that is, inſtead of drawing up the air from below, the air warmed by the fire in the gallery or fire-place, may be forced betwixt decks through its pipes when requiſite. I mention it only (for experiments alone muſt make this improvement, and with ſuch caution as to prevent detriment by it) to induce ſomething of this kind to be thought of by proper judges. If the additional machinery were but ſmall, and not

(o) Part 2. chap. 1.
(p) See his book on ventilators.

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incommodious in the ſhip, the advantages derived from it would be very great. Theſe are evident from what has been ſaid in diſcourſing on the cauſes of the ſcurvy *(q)*. It muſt prove highly ſerviceable in cold climates, and in northern voyages in the winter (where the ſailors not only become terribly ſcorbutic, but are often chilled to death with the cold, and at other times have their limbs mortified) if, by a ſimple contrivance of this ſort, the fire uſed for dreſſing their victuals, could be made to warm them even when in bed. When the *French* men of war winter in *Canada*, or *Lewiſburg*, they have always a ſtove between the decks.

Fire made with any of the aromatic woods, or even with common fir or pine, juniper, and the like, effectually corrects this diſpoſition of the air, and at the ſame time renders it more ſalutary in other reſpects. It is obſervable, that betwixt the tropics, the rainy ſeaſons prove the moſt unhealthy and dangerous, not only at land, but in ſhips; giving riſe to malignant fevers, ſcurvies, *&c.* In this caſe, without any inconvenience or danger, a clear open fire, properly ſecured, when in harbour, might be lighted betwixt decks, to ſtand upon the hatchways in a ſtove; which would greatly purify the air, and deſtroy its hurtful moiſture, without much increaſing the heat, if burnt in an open hatchway. There is certainly leſs danger, nay, leſs

(q) Chap. I.

heat,

heat, attending a fire burning for an hour or two in the day there, guarded by a centinel, than having fifty or ſixty candles lighted in an evening; or burning them conſtantly night and day in the orlope, and other dark places: whence ſuch parts of the ſhip are continually replete with the nauſeous effluvia of rank corrupted tallow. It would ſeem indeed no difficult matter, to convert even theſe into medicinal preſervatives againſt the ſcurvy, and other putrid diſeaſes from bad moiſt air, by the addition of ſome proper aromatic in their compoſition. The burning of ſpirits will be of ſervice in the ſick-apartment. The captains, or thoſe who can afford them, will find the myrtle wax candles the beſt for uſe in a moiſt ſea-air.

Next to be conſidered, are the beſt means of preventing the effects and ill conſequences of ſuch air, when not corrected by the methods propoſed.

Fire, as before obſerved, is the moſt certain conſumer and drier of humidity. We moreover find, that the exhalations of aromatics, though, properly ſpeaking, they do not dry up moiſture, yet prevent the pernicious effects of it upon the human body, by diffuſing through the air a ſubtile acid, of an antiſeptic and aſtringent quality, oppoſite to the putrid and relaxing tendency of moiſture. Thus we often obſerve many aſthmatic perſons greatly affected with a moiſt wind, and in a damp ſeaſon hardly able to breathe; but upon throw-

throwing a little benzoin, or the like aromatic gum, on a red-hot iron, by which their chamber is well perfumed, and the air replete with theſe aromatic particles, they are ſenſible of relief, and breathe much more freely. So here I would recommend a moſt ſimple and eaſy operation, to be performed in ſuch damp ſeaſons in a ſhip; which is, putting a red-hot loggerhead in a bucket of tar, which ſhould be moved about, ſo that all the ſhip, once or twice a-day, may be filled with this wholſome antiſeptic vapour.

Perſons for proper ſecurity, during a ſcorbutic and moiſt conſtitution of air, ſhould go well cloathed, and ſhift often with dry linen. Drineſs and cleanlineſs of body are excellent preſervatives againſt this malady. They ſhould uſe the fleſh-bruſh, or frictions with a dry cloth on their ſkin; eat a bit of raw onion, or a head of garlic, in a morning before they are expoſed to the rains and waſhings of the ſea. Whatever promotes perſpiration is uſeful; and perhaps nothing will do it more effectually at this time than a raw onion. Nor ought theſe farther precautions to be omitted, of uſing proper exerciſe in the day, and having their bedding kept always dry, not binding it up cloſe together till ſufficiently aired and dried.

When they are threatened with the approach of this diſeaſe, they ought, at going to bed, to promote a gentle *diaphoreſis*, by draughts of water-gruel and vinegar, with the

the addition of lemon-juice, or the extract. They ſhould uſe plenty of muſtard and onions with their victuals; and may then indulge more freely in the uſe of fermented vinous liquors, *viz.* cyder, beer, and wine: but when of neceſſity obliged to drink ſpirits, they ought always to dilute them a little with water, and acidulate them with the acid of oranges or lemons. Theſe directions will preſerve ſeamen not only from the ſcurvy, but from many other diſeaſes, as coughs, catarrhs, *&c.* ariſing from an obſtructed perſpiration in a moiſt air.

The water and proviſions being often in ſuch an unſound and corrupt condition, as may be ſuppoſed to increaſe the virulence of this evil, it will not be improper to add ſome conſiderations for preventing and remedying theſe inconveniencies.

Water is with difficulty preſerved ſweet at ſea *(r)*; and ſometimes cannot even be procured wholſome at places where ſhips may touch. There are two ſorts of bad water. The firſt is, putrid and ſtinking; the other, a hard heavy water that is not putrid, but which will not incorporate with ſoap, or break peas when boiled in it. Both are very unwholſome.

Water at ſea will ſooner or later putrify, according to its various contents, and the man-

(r) See Dr. *Alſton*'s excellent method of preſerving water good and wholſome at ſea by quick-lime, part 3. chap. 2. alſo Dr. *Hales*'s curious philoſophical experiments, and his directions to preſerve water and proviſions at ſea.

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ner in which it is kept. It has been experienced, that, by fuming the caſks with burning brimſtone, water will keep longer ſweet. Some add a little oil of vitriol to it; which likewiſe preſerves it a longer time from putrifying. It is a common practice, and a very good one, to throw a little ſalt into water while warming; and as it grows hot, there will ariſe a thick feculent unwholſome ſcum, which is carefully to be taken off as it caſts up. And this ſhould always be done in boiling peas and oat-meal.

When the water is become putrid and ſtinking, one manner of ſweetening it is, by taking out the bungs of the caſks, expoſing it to the air, and ſhaking, and pouring it from one veſſel into another. Another way is, by letting it quickly come to boil; taking care not to boil it too long, which would expel the moſt active parts of the water. This will ſtill be rendered ſweeter, and more wholſome, when a little of the juice or extract of lemons is added to it; which is much ſafer for common uſe, than the mineral acids of *vitriol*, or ſalt, ordered by ſome on this occaſion. The acid will likewiſe contribute to precipitate the earthy particles of the water, and the various *animalcula* with their ſloughs, now deſtroyed by the boiling.

But as this may be found troubleſome to do for a whole ſhip's company, there is another method of ſweetening putrid water. Some times,

times, as is obſerved by my learned friend Dr. *Home (s)*, by keeping ſuch water cloſe and warm in a large veſſel, it will become fit for uſe when the proceſs of putrefaction is once over; by which the noxious and putreſcent particles having been made quite volatile, will fly off of themſelves; as is often the caſe of the *Thames* water. A large caſk of ſtinking water cloſely bunged up, ſhould be put into the galley, and kept in a degree of warmth ſufficient to promote this proceſs of putrefaction: the effect of which will be, that the heterogeneous putreſcent particles rendered thus volatile, will all quickly eſcape; and the putrefaction by this means being ſtopt, the water becomes wholſome, and fit for uſe.

Beſides this putrid water, ſailors are often obliged to uſe, for want of better, a hard water, as it is called, replete with foreign, ſaline, and terreſtrial particles; which is found to be very unwholſome, though freſh and ſweet. To make this wholſome and ſalutary, the ſtone filtre uſed on board ſeveral ſhips is very proper, where the water does not abound with vitriolic or marine ſalts. But its operation is tedious, and it can never paſs a ſufficient quantity for the uſe of a ſhip's company. Sand is the fitteſt body for ſeparating theſe heterogeneous and unwholſome particles from water. Upon this occaſion I muſt again refer to

(s) In his ingenious eſſay on the *Dunſe* Spaw, p. 119.

the ingenious eſſay on the *Dunſe* Spaw *(t)*. As this method however is troubleſome and tedious; for if the ſand is ſea-ſand before it is made uſe of, it muſt be purified of all its ſalts: and it has been found that the ſand when uſed for ſome time loſt its power of ſoftening water, the Doctor has publiſhed an eaſy, cheap, and expeditious method of ſoftening all hard waters by means of potaſh or alcaline ſalts, which convert the noxious ſaline particles into ſalutary nitrous ſalts, and precipitate the earthy parts of theſe ſalts which occaſion hardneſs in water *(u)*.

When the proviſions of beef and pork are putrid and rancid, it will be moſt adviſable not to eat of them; or at leaſt to correct their

(t) P. 120. The *Auſtrian* army, when incamped in *Hungary*, find no good water, unleſs when on the banks of ſome great river. So, when obliged to uſe lake-water, they purify it in this manner. A long ſmall boat is divided into ſeveral different apartments by croſs partitions. They fill them all, except the laſt, with ſand. The boat is put into the lake. A hole level with the ſurface of the water is made in the end of the boat, which lets the water into the firſt diviſion; from this it gets into the ſecond, by a hole made in the bottom of the firſt partition; from the ſecond it runs into the third, through a hole in the top of the ſecond partition; and ſo alternately above and below, that it may be obliged to paſs through all the ſand. At the top of the laſt diviſion there is a pipe, through which the water comes, at pleaſure, as pure as from a fine ſpring. And thus ſeamen when abroad meeting with ſuch water, may purify even the hardeſt kind of it. And for the ſame purpoſe in a houſe he propoſes ſome caſks divided in the middle, and filled with ſand; into the firſt of theſe diviſions the water may be thrown as into a ciſtern; the caſks ought here to be joined by pipes; and by making it thus circulate through eight or ten diviſions filled with ſand to the top, a pure ſpring may be had any where.

(u) See his Eſſay on Bleaching.

bad

bad qualities, by uſing at the ſame time plenty of vinegar, oranges, lemons, and vegetables. I am afraid any method that might be propoſed to ſweeten putrid fleſh, will be found not eaſy to be put in execution at ſea.

There are ſeveral ways generally known of recovering ſpoiled beer, wines, and other fermented liquors; and as theſe liquors are all of them antiſcorbutic, they are well worth preſerving. Yeaſt ſhould be carried to ſea for this and other purpoſes. When it has grown ſtale by keeping, a little flour, ſugar, ſalt, and warm beer, are to be mixed with it; or even hot water and ſugar only. By adding to it the grounds of ſtrong beer, and letting the mixture ſtand a little before the fire, it will ſerve either to work beer, or bake bread. In caſe there is no yeaſt on board, honey, ſugar, leaven, or moloſſes, may be uſed to renew the fermentation of liquors.

The dry proviſions, oat-meal, peas, and flour, are apt to be corrupted and ſpoiled by weevils, maggots, and by growing damp and mouldy. Theſe deſtructive vermine may be killed by the fumes of brimſtone in a cloſe place. But even then the weevils, when eaten, are found to be very unwholſome, and are ſaid to have ſuch a cauſtic quality, as, when applied to the ſkin in the form of a poultis, to raiſe bliſters like the *cantharides*. When no better proviſions can be procured, the flour, oat-meal, or peas, ſhould be put in a heap, and then theſe vermine will come to the

the top of it; ſo that a great number of them may be taken away, and ſifted out with the duſt. The parcel is to be ſtirred and heaped again, until as many of them as poſſible are removed. The groats and peas may be turned over into a wire-ſieve, which will let the duſt and weevils paſs through it.

Sound good bread is a moſt important article at ſea. The biſcuit, when mouldy and ſpoiled, ſhould be put into a warm oven, or under the fire-place, till the putrid moiſture is quite exhaled, and the *animalcula* deſtroyed. Theſe are afterwards to be well beat out of it, and then it may be eat dipt in vinegar. Cloſe caſks preſerve biſcuit and other dry proviſions beſt; and all poſſible care ſhould be taken to keep them dry, and free from dampneſs.

CHAP. V.

The cure of the diſeaſe, and its ſymptoms.

IF proper precautions were taken for the prevention of this diſeaſe, and the rules which have been laid down for that purpoſe were complied with, we ſhould ſeldom have occaſion to meet with it in a high degree either at ſea or land. It is indeed difficult to perſuade ſome to practiſe, when in health, what is neceſſary to preſerve ſo valuable a bleſſing. All mankind have not the benefit of a pure wholſome air, warm dry lodgings,