

that ever befel unhappy man, to use their utmost endeavours to deliver mankind from this pest? But notwithstanding this astonishing ravage and destruction of the human species, yet the unhappy unrelenting nations of the world seem as unconcerned about it, as if only so many thousands, nay, millions of caterpillars or locusts were destroyed thereby. Was there ever a more important occasion to rouse the indignation of mankind? Can we be calm and undisturbed, when this mighty destroyer rears up its invenomed head every-where? The most zealous advocates for drams, even the unhappy besotted dramists themselves, the prolonging of whose lives, and whose real welfare both here and hereafter is hereby sincerely intended, cannot find fault with this well-meant remonstrance, in defence of them, and of all mankind, against this mighty destroyer, from one, who has long been labouring, and that not without success, in finding means to preserve multitudes of lives, by various ways.

LV. *An Account of the great Benefit of Ventilators in many Instances, in preserving the Health and Lives of People, in Slave and other Transport Ships.* By Stephen Hales, D. D. F. R. S.

Read Dec. 18, 43. ^{1755.} IT is to be hoped, that the several means here proposed for having fresh and sweet water at sea, will be of great benefit in preserving the health and lives of multitudes of that valuable

able and useful part of mankind, those, who occupy their business in great waters; whose welfare I have long had at heart, and endeavoured to promote by various ways; especially by finding means to procure them fresh salutary air, instead of the noxious, putrid, close confined pestilential air, which has destroyed millions of mankind in ships. And it is to be hoped that, by diligent researches, farther and farther useful discoveries will hereafter be made for the benefit of navigation.

44. The following, as they are strong proofs of the great benefit and usefulness of ventilators in ships, so they also fully prove, that they can most commodiously be fixed and worked in them, in contradiction to the vulgar, false, and groundless notion, that they take up too much room, and are incommodious, and in a manner impracticable to be worked, whereas the men are eager to work them; and many more persons can be with safety to their health and lives in a ventilated, than in an unventilated ship; which fully obviates the objection as to the room they take up. In new and important researches, the likeliest way to succeed, is to pursue a thought, not only by imperfect and fallacious reasonings, but, when the nature of the thing requires it, with a proper series of trials and experiments. Thus, in the present case, the principal cause of the sickness in ships is the noxious putrid air; the obvious remedy is the exchanging that foul air for fresh, by effectual means, which are seldom discovered by dwelling only on objections, but are usually the reward of repeated, diligent, experimental researches. Neither are we to be discouraged in these our pursuits by some disappointments,

ments, for I have frequently found that they lead to the thing sought for. And by the like clue of reasoning and experimenting, there is the greatest probability, that we shall succeed in another very important research, *viz.* the preserving much longer from decay the timbers of ships laid up in ordinary in harbour. For, as we are assured by daily experience, that the decay is wholly owing to damp, close, confined, putrid, corroding air; so the only remedy for this evil is the frequently changing the air among the timbers, by plentiful ventilations; which, we find, by happy experience, can be effected to such a degree, as gives reasonable hopes, enough to encourage our farther trials and researches.

45. Captain Thomson, of the Success Frigate, in his letter to me, dated London, Sept 25, 1749, says, " That, during the ventilation, the lower-deck
 " hatches were commonly kept close shut; by
 " which means the air was drawn down into the
 " hold, from between the decks, through the seams
 " of the ceiling, along the timbers of the ship; by
 " which means we found the foul air soon drawn
 " off from between decks. Our rule for ventilat-
 " ing was for half an hour every four hours: but
 " when the ventilating was sometimes neglected for
 " eight hours together, then we could perceive, espe-
 " cially in hot weather, a very sensible difference by
 " that short neglect of it; for it would then take a
 " longer time to draw off the foul air. Our general
 " rule was, to work the ventilators till we found the
 " air from them sweet. We all agreed, that they
 " were of great service; the men being so sensible
 " of the benefit of them, that they required no
 " driving

“ driving to work that, which they received so much
 “ benefit by. We found this good effect from ven-
 “ tilation, that though there were near 200 men on
 “ board, for almost a year, yet I landed them all
 “ well in Georgia, notwithstanding they were pressed
 “ men, and delivered me out of gaols, with di-
 “ stempers upon them. This is what I believe but
 “ few transports, or any other ships, can brag of;
 “ nor did I ever meet the like good-luck before;
 “ which, next to Providence, I impute to the bene-
 “ fit received by the ventilators. It is to be re-
 “ marked, that we, who lay wind-bound, for four
 “ months, with our expedition fleet, which soon
 “ after invaded France, were very healthy all the
 “ time, when they were very sickly in all the ships
 “ of that expedition.

46. “ This certainly occasioned all kind of grain
 “ provisions to keep better and longer from wee-
 “ vels than otherwise they would have done; and
 “ other kinds of provisions received benefit from the
 “ coolness and freshness in the air of the ship, which
 “ was caused by ventilation.

47. Mr. Cramond also informs me, that he found
 the good effect of ventilators on board a slave-ship
 of his with 392 slaves, twelve of which were taken
 on board just before they sailed from Guinea, ill of
 a flux, which twelve all died; but the rest, with all
 the Europeans in the ship, arrived well at Buenos
 Ayres.

The following is a Letter to me, from Captain Ellis, viz.

S I R,

48. “ **C**OULD any thing increase the pleasure I
 “ have in a literary intercourse with you, it
 “ would be to find, that it answered your end in pro-
 “ moting the public good. The *Vis inertiae* of
 “ mankind is not the only difficulty you have had
 “ to encounter, but their ignorance and prejudices,
 “ which are almost insuperable. It is to your per-
 “ severance and resolution, that the little progress
 “ you have made is due: Indeed I ought not to say
 “ little; for it is a great step to have found the few,
 “ that have hearts good enough to relish your plan,
 “ and heads sufficiently clear to discern the most
 “ effectual method of advancing it. It does honour
 “ to those noble and other worthy personages, that
 “ join you in acts of such extensive humanity, as
 “ the introduction of ventilators to hospitals, prisons,
 “ ships of war and transport, &c. as they must ne-
 “ cessarily render the miseries of the first more sup-
 “ portable, and the close and constant confinement
 “ of the others less prejudicial and fatal to their health
 “ and life. It is to be lamented, that they are not
 “ more generally made use of; for, notwithstanding
 “ their advantage is apparent and incontestable, it
 “ is scarce credible how few are to be found among
 “ the vast number of ships daily employed in car-
 “ rying passengers, slaves, cattle, and other perish-
 “ able commodities. Those of your invention,
 “ which I had, were of singular service to us; they
 kept

“ kept the inside of the ship cool, sweet, dry, and
 “ healthy: The number of slaves I buried was only
 “ six, and not one white man of our crew (which
 “ was thirty-four), during a voyage of 15 months;
 “ an instance very uncommon. The 340 negroes
 “ were very sensible of the benefits of a constant
 “ ventilation, and were always displeased when it
 “ was omitted. Even the exercise had advantages
 “ not to be despised among people so much confined.
 “ I must not, however, forget, that ventilation alone
 “ is insufficient to keep disorders out of ships; for
 “ often infections are brought aboard by the slaves,
 “ or others; and frequently diseases are produced
 “ by feeding on bad or decayed food, but oftener
 “ still by infobriety; for I have ever remarked, that
 “ the immoderate use of spirituous liquors in warm
 “ climates is more pernicious and fatal even than
 “ the malignancy of the air itself. In cold Coun-
 “ tries too, where I have had experience, those sail-
 “ ors, or others, who accustomed themselves to hard
 “ drinking, especially of drams, had the scurvy in
 “ a terrible degree; whereas those, who were tem-
 “ perate or sober, either escaped it intirely, or had
 “ it but moderately. The effects of drunkenness
 “ were still more discernable among the Indians ad-
 “ joining our settlements in Hudson’s-Bay, who are
 “ a feeble, diminutive, chilly, indolent set of people.
 “ On the contrary, those, who come from the inland
 “ parts (who are unused to drink brandy), are brave,
 “ active, robust, and industrious. The same dif-
 “ ference is observable in the Africans, and perhaps
 “ among the inhabitants of most other nations,
 “ did we attend to it. It was to the unusual so-
 VOL. 49. X x briety

“briety of my crew that I ascribed, in some measure, their uncommon healthiness; for sailors breathe a purer air, and enjoy more exercise and liberty, than passengers or slaves: wherefore their ailments are owing to bad or disorderly living, as well as to unwholesome air.

“Could I but see the immoderate use of spirituous liquors less general, and the benefits of ventilators more known and experienced, I might then hope to see mankind better and happier. I am,

“S I R,

Bristol, Dec.
26, 1753.

“Your most obedient servant,

“Henry Ellis.”

49. And, by the like good conduct, in his next voyage in the year 1755, not one of 312 slaves died; and all his 36 sailors arrived alive and well at Bristol.

50. And the Earl of Halifax has often informed me of the great benefit they found by the use of ventilators, in several Nova Scotia transport-ships, twelve to one more have been found to die in unventilated than in ventilated ships. It is indeed a self-evident thing, that the changing the foul air frequently in ships, in which there are many persons, will be a means of keeping them in better health than not doing it; which makes it the more astonishing, that effectual proposals to remedy so great an evil should be received with so much coldness and indifference by mankind. They little consider, that

it is the high degree of putrefaction (that most subtle dissolvent in nature), which a foul air acquires in long stagnating, which gives it that pestilential quality, which causes what is called the gaol-distemper. And a very small quantity, or even vapour of this highly attenuated venom, like the infection or inoculation for the small-pox, soon spreads its deadly infection. Ought not men therefore, from the common natural principle of self-preservation, to use their utmost endeavours to shun this pestilent destroyer, by which millions of mankind have perished in ships?

LVI. *An Account of some Trials to cure the ill Taste of Milk, which is occasioned by the Food of Cows, either from Turnips, Cabbages, or autumnal Leaves, &c. Also to sweeten stinking Water, &c. By Stephen Hales, D. D. F. R. S.*

Read Dec. 18, 51. 1755. **T**HIS method of blowing showers of air up through liquors will be of considerable use in several other respects, as well as in distillation, as appears by the following trials, *viz.*

52. I have been informed, that it is a common practice, to cure the ill taste of cream from the food of cows, by setting it in broad pans over hot embers or charcoal, and continually stirring it, till scalding hot, and till cool again. But when I at-