"AIR NOT BEING IN THE MAIN, AN OBJECT OF SENSE VERY FEW CAN REASON UPON IT"

HALES, Dr. Stephen. A fine series of 5 autograph letters from Stephen Hales to Lord Barrington, all from Teddington, dated between August 13, 1752 and September 19, 1752. Also a letter from William Wallace, Assistant to the Master Shipwright at Depford, dated 22 September 1752, enclosing "a section of His Majesty's ship Sheerness on board of which is doctor Hales's Ventilator." In all over 200 lines on 12pp folio and 4to. With a drawing on one sheet folio. In excellent condition.

The first letter of Aug. 13, 1752 begins: "I have here enclosed an account of the undoubted good effect of Ventilation on board the Sheerness; which will most assuredly greatly contribute to the preserving the ships." Hales goes on to calculate the value of the whole navy, the speed at which timber decays and the substantial savings to be made if decay is halted by the use of ventilation. Discussing also the implications for health. "I was Monday last, with 3 Physicians, at the new fitting up hospital for the small pox, near Sir John Oldcastles, to consult how with a cautious hand to draw the foul Air out of the Sick Room, which we agreed on. And I am much pleased to have this tryal, which is the first of the kind, and may lead to be of benefit to mankind."

Enclosed with this letter is the much longer "Account" addressed to The Right Honourable the Lords of the Admiralty. Closely written, this covers 2 1/2 folio pages and is illustrated by a small drawing in the margin of the first page. It contains a description of "the good effect of Ventilators on board the Sheerness at Depford" communicated to Hales by "my ingenious operator on that Affair, Mr Yeoman." Hales outlines what tests he required Yeoman to carry out and gives the results obtained, at one point giving instruction for the construction and use of a makeshift pressure gauge:

"In order to find out exactly with what force the Air was crowded into the ship, I desired Mr. Yeoman to fix a glass Tube or Pipe 2 feet long into a common quart Bottle, cementing it fast at the nose of the Bottle. The Bottle was filled about one fourth full of water up to Z and in the glass tube up to a by this means the degree of the pressure of the Air in the ship on the water in the tube at a was readily known by the descent of the water in the tube at a, the Air in the Bottle above z easily yielding to that Pressure." Yeoman reports how the water in the tube at point "a" "sunk more than an inch at every stroke of the Ventilator. The conclusion to the experiment was that the ventilators created sufficient force for air to be insinuated into "every cranny where Air could reach". Hales concludes:

"There can be no doubt, but that many parts of a Ship at sea, will last much longer, for being frequently ventilated, with less than one fifth part of the Ventilation in the Sheerness. This is as certain and self evident a Truth as that Timber will not decay so fast in fresh air, as it will do in a foul, damp, hot, putrid close confined Air. This ventilation at Sea will be beneficial not only to the health and lives of men but also for the longer duration of the ship. I received not long since an account from Mr. Tucker of Bristol; how very soon Ships which bring yarn from Ireland to Bristol decay;
especially if they have a long passage by reason of the hot putrid damp Air of the Hold."

In communicating with the Admiralty Hales goes to great length to stress the financial benefits of ventilation in preserving the structure of the ships and lays less emphasis on the health benefits to the seamen. It is clear from these letters that his plans did not go unopposed and that the main grounds for objection was financial. It may be that he thought that winning the financial argument was the way to achieve the humanitarian benefits for which he also clearly hoped.

"But the chief occasion of my writing this is to inform you of the almost general contempt that the people of the Yard have for the Ventilation on Board the Sheerness...I am told that the chief objection that will be made to this important Affair will be the expense of it. But if (savings of) £16,000, the monthly waste in decay, of a fleet value £1,000,000 will preserve 75 ships many years longer; can this objection have any weight. I look upon the certainty of success in this important Affair...But I find it very difficult to make men enter into and attend to this most certain Truth; tho' confirm'd by daily experience, in innumerable instances. But the Air not being in the main, an object of sense very few can reason upon it. Should therefore ignorance, or prejudice so far prevail; to occasion an unfavourable report, to such a degree, as to have it as formerly set aside I will then soon publish a full account of it: in the second vol. to my ventilation Book. The consequences of which will be that other Nations will do the thing, and we must have the disgrace of taking it up after them. If they will venture to the shame of giving a report contrary to a self evident Truth I need not be afraid to appeal publicly to the common sense of mankind."

A final long letter of Sept. 19 gives a detailed account of the comparative states of decay in the ventilated Sheerness and the unventilated Roebuck. The letter from the Assistant to the Master Shipwright at Depford, dated three days later, encloses a drawing of a section of the Sheerness showing "the openings between the timbers - where the air Passes from the floor to the top of the side."

Lord Barrington, to whom these letters are addressed is William Wildman, second Viscount Barrington (1717-1793). In 1746 he was appointed one of the Lords Commissioners of the Admiralty and in 1751 presented an important paper on Quarantine. In 1755 he was made Secretary of State for War, in 1761 chancellor of the Exchequer and in 1762 treasurer of the navy. These letters from Hales were consigned as part of the Barrington Family archive (including manuscripts and books owned by Shute Barrington, the Viscount's brother) to an auction house in the west of England where they have made their appearance, piecemeal, in 2002-3. In the same sale in which these letters appeared was a copy of John Harrison's Narrative of the proceedings relative to the discovery of Longitude at Sea, 1765, from the same archive. Along with the pamphlet were Barrington's manuscript notes for a speech which he made on Harrison and his work. From this and other papers included in the lot it is clear that Barrington was much involved in the implementation of the Longitude discoveries by the English Navy.

Stephen Hales (1677-1761) physiologist and inventor. In 1709 he was appointed minister of Teddington, Middlesex where Alexander Pope was a neighbour. In 1718 he became a fellow of the Royal Society. Later he was made one of the trustees for
the colony of Georgia. He was a distinguished botanist and animal physiologist and was a pioneer in the study of the nutrition of plants. His interest in animal physiology led to his best known work which was on artificial ventilation. The method of injecting air with bellows he applied to the ventilation of prisons, ships, granaries etc. He succeeded in getting his invention fitted to the French prisons in which English prisoners were confined. A similar experiment in the Savoy prison showed a considerable diminution in the annual mortality. Newgate was also fitted in the same way. Hales's work on ventilators appeared in two parts Vol. I 1743, vol. II 1758. It will be noted that in these letters of 1752 he makes reference to his intention to produce a second volume.

The necessity of ventilating ships first came to Hales when in 1740 he heard that an epidemic had broken out among troops which lay embarked off Spithead for an expedition to America. About the same time Samuel Sutton was also considering the same problem. Sutton's scheme which involved using the vacuum caused by heated air rising up a chimney to draw down clean through a pipe from the deck was much simpler than Hales's. By 1749 Sutton's ideas seemed to have triumphed. Having had his scheme rejected by the admiralty in 1743 Hales set about publishing the results of his experiments. In this, rather ungenerously, he made no mention whatsoever of Sutton's scheme. As Trustee for Georgia he managed to get his ventilators extensively adopted in the merchant service and particularly on board emigrant and slave ships. The effect on mortality of slaves and emigrants was so striking that Penn proposed that the Assembly in Pennsylvania lay a severe penalty on "every ship which has not Ventilators on-board, and does not work them frequently." The Admiralty now began to reconsider the merits of Hales's Scheme and they linked it to the issue of preserving the timbers of ships from decay and dry rot. In 1751 further trials of Hales's Windmill ventilators were ordered by the Admiralty and it is to these trials to which the present letters refer. The outcome was not as Hales would have wished; the Commissioners concluded of Hales's machine that it would "not answer the purposes intended". However, after further setbacks, Hales's system eventually triumphed and on September 4th, 1756, an order was given "to fit ventilators into all His Majesty's Ships." See A. E. Clark-Kennedy Stephen Hales, D.D., F.R.S. CUP, 1929 pp.151-169. Clark-Kennedy found that the Admiralty Records for the years 1740-1760 were "unfortunately very incomplete" as a result of which he felt he had not been able "to fathom completely the inner history of this subject." Undoubtedly these letters add detail to that story.

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My Lord,

I have been enclosed an Account of the undoubted good effect of Ventilation on board the Threshers, which will most already greatly contribute to the preserving ships, much the longer. If in the Booms the same means is used in every ship to much the better. For if I told you the thing decays in 20 years, it is worth 20,000. Then every months delay is 16,000 long enhances the ventilating every ship thus will not cost more than 20,000.

The use of Ventilators in preserving ships is coming more and more in use. The longer duration of the ships, would abundantly repay besides the benefit to most kinds of profitable goods.

Now Monday last, with 3 Physicians &c. at the new fishing cap happened for the small Pet, near Sir John Odesshet, to consult how with a cautious hand to dress the fish out of the fish room, as we agreed on. And can most chiefly to draw this Royal, with the first of the fish, may lead to be of benefit to mankind.

I suppose Mr. Yeoman will do all as something for his trouble about the still besides what he makes out to be his prime costs. I take him to be a perfectly honest man, so I am persuaded he will not bring a false Account.

I am, my Lord,

Your Lordships,
obliged,
Humble Servant,
Stephen Stake.
To the Right Hon. the Lords of the Admiralty,

May it please your Lordships

I thought it would be acceptable to you to have an Account of
the good effect of the Gills or Ventilators on board the ships now at Deptford,
which I received yesterday from my Ingenious Opponent in that Affair, viz:

Aug. 11th he attended all the Bay on Board, and made various Experiments,
then being for 12 hours a good Wind, by which we moved all the four parts of
Ventilators. You would have seen extremely delightful to have seen a fall
in the effects of them, I can hardly think that a single Timble could escape the
powerful blasts of wind, formed in company with the ship (as matter) and
by the arrangement of the Gill cards, to the frames before &c. between
beams (in lower deck being staved) or the upper one having one hatch-
way open, and to my abundant Satisfaction I found the flame blazed
inward, in nearly not all the frames, not only among the open Timbles,
but also in the channels, where the Dead Eyes are fixed to hold the mast, in
which places there is a fire of Timble, laid as close together as possibly
of Timble before the Planche.

In order to find out exactly, what at first, the ship was crowded into
the ship, besides 12 yeastman to fill a Gill Tub in a minute, I to a common
guard boat, for a half, a half of the vessel, I did about one fourth full of water up to 2. 5 in the Gill Tub, and
up to 5 by this means to the degree of the power of the air in the ship on the
the water in the frame, that vessel was blown by the xpect of the water in the
this rate at a 6, & the air in the Bottles, above 5, vastly springing to that purpose.

And that more than twice at every stroke of the Ventilators, & regained it again
before the next stroke, this when the wind was at the Rate of 20 to 30, in a
minute, is consequently gone 60 strokes in a minute, which would carry about
15000 Tons of Air, 30 hours into the Ocean, if that part of the air in the ship
were to be compressed in the ship being equal to an inch depth of water, the force with which the Buoyant Air would
be impelled against all the inner parts of the ship was equal to 3681 of this 85 pool
high, and that of a force enough to extinguish it itself into every corner near

Some several Experiments were made with my chewing, which others


The particular of which he is ready to produce. In a case of so great importance to the Navy, in which there is now a certainty of success, it must finally hope to attend him. Another will not cost much by it, but the loss of this is so vast, that one drawback of its effect without the same difficulty of giving it to mere writers of the writers, for which the whole weight has its bearing, yet a hard bargain for time. The reason is that both these wills are made very strong, with the best of materials, and will considerably exceed. The former will be bound the threepenny salt 3d, but I think the paper a better bargain at 1s. 11d.

It will not be very acceptable to me to continue to be paid 3d.

With your forbearing application, I think it necessary to let you know of my very much the letter. There can be no doubt, that any part of so large a task, will last much longer for being frequently interrupted, with less than one eighth of the ventilation in the three days is 1s. 11d. The text is all correct, and the text was not damaged, nor did the text continue for the larger duration of the things. I received not long since an account from Mr. Tierce of the ship, from very few things and being years from Ireland to British decay, especially if they have a long passage, by noon of the last part of the 5th July.

The very great quantity of air which is conveyed into the three days by the best of conductors, makes it probable, that this quantity of ventilation will be sufficient for the larger parts of the text, and that some months hence, when the two拿到s have been made in the three, not even for the larger part of the three. That two of the letters may be removed into another.

As the fixing the said so as to move at once some large parts of the letters, etc., was happily met with much matter contrary from the ingenious Mr. Graham, so the prime cost to him last been 0s. 9½.
My Lord,

I received the favour of your note of the 12th; as I conclude you did mine of the 13th, with the account of the good effect of the ventilators on board the Shannon. As you mention the reasonable hope that the worthy Mr. Yeoman should soon be paid, such I find he wants to; I thought it proper to mention the three new sets of ventilators, which by agreement he was to make for 30 each that is, in all, for one set of which Mr. Yeoman had 35, which were not to be well made as these three.

But the chief occasion of my writing this, is to inform you of the absolute general contempt that the people of the good house for the ventilation on board the Shannon, so that there is a necessity to have a miller or a propeller on board for some time, while the thing is in a state of progress. And if that is approved of, Mr. Lewis, son of Mr. Yeoman, known of a proper person, is to live at Mr. Bannister, at the three miles as Mr. Bannister, at 2 Bows near Bosworth. Mr. Yeoman is gone to Northampton.

I am told that the chief objection that will be made to this important affair will be the expense of it. But if 12,000 a month, the price of decay of a thatch value 1,000,000 will preserve 75 ships many years longer, this objection to my mind will have any weight. This estimate is founded on a supposed that each ship, one another, what with ventilators, windmills, proper culling and opening from off, we will cost 200.

I look upon the probability of success in this important affair, with to clear a full view, that I will continue to affirm, that the delivered good effect it is uncertain as to how timber will not decay near to home in fresh Air, which will in a foul damp outside Air. For the satisfaction being the most healthful distil vat in nature, never seen heart of oak for prices, but I find it very difficult to make men enter into so anathema to this most certain truth, as confirmed by daily experience, in innumerable instances. But the Air not being in the main, an object of taste very few can reason upon it.

Should therefore ignorance, or prejudice so far prevail, to occasion an unfavourable report to such a degree, as to have it of formerly for spite. I will then turn publish a full account of it, in the second book of my ventilator book. The consequence of which will be that other things.
will do the thing; you must have the disagrease of taking it up after how if they will venture the shame of giving a report contrary to a self resident truth I need not then be afraid to appeal publicly to the common sense mankind.

I am my lord
your lordships
obliged humble servant
Stephen Toler.
Basington Feb 10, 1752

My Lord

As you will receive the enclosed before you go into the country, I have directed it to you. The more I think of the effect of the ventilation in the sweating, the more fully satisfied am I, that it will most undoubtedly preserve ship from decaying many years the longer, and if done in the right, then, the sooner all the ships in ordinary as thus ventilated, so much the greater will the saving to the public be; so that in a very important affair

I am, my Lord

Your Lordship's obliged humble servant

Stephen Hales
To the Right Honble
The Lord Barrington
at the Admiralty Office
Whitehall
Supporting the Rockbuck is the sheerness to be equally dry within it, as appears to the eye. Yet the Timbers of the Rockbuck are in a state of decaying much faster than those of the Venetia's, viz: for this plain reason viz: that in the Rockbuck, the air among the ribs between the inner sheeters Planck'd in a fragrant damp putrifying state, whereas in the sheerness, it is continually changing to us not to have time to putrify; for therefore there is full proof that the air intimates its self decaying ventilation among the ribs we; so we may be assured that the fresh air, not having time to putrify, it will not rot the Timbers. This may be inferred from the case of timber houses where out the Timbers that lasted for 200 years by every day & Rain, are notwithstanding sound because they enjoy fresh air. And the same may be observed of every ship that has been built some years, viz: that the Timbers which are surrounded with decaying close confined putrifying, decay much sooner than those which enjoy a sufficient supply of fresh Air. This is a certain evidence that that year must give up, but the purpose in heavily affecting it before all the world. We may therefore be infallibly assured that new ever fresh Air can by ventilation be conveyed among the Timbers between the Planck's; the same ship is put to their decaying in much that were a ship in ordinary thus ventilated for 200 years, it would be as sound as the outside timber of a triple house, when ever the fresh Air can intimidate. This, to tell evident a truth, that I am well assured it will become a general practice thus to preserve ships.

I have here invited the particulars of my Geoman Bill relating to the windsmill, all the which I am at prime cost.

He observed in his letter to me, that he has his partner the Henry's charge, but 8-6 p.d. the common wages of every master midwright, and that they do not barely superintend the work but labour as much as the journey men.

To my Lord,

Your faithful,

Oblige yourself humbly,

Stephen Hales.
My Lord

In obedience to your Lordship's command, I have
drawn and brought your Lordship a section of
his Majesty's ship the Thorney, on board of which
is Doctor Hall's ventilators, and am

My Lord

your Lordship's most dutiful
and most obedient servant

W. Wallis
2nd Assistant
to the Master Shipwright at
Deptford

Admiralty Office the 22 of Sept
d
1752

Between the keel and the floor line 1/8: i.e. is all filled in and caulked;
and the spaces through which are the openings between the timbers
where the air passes from the floor beams to the top of the side.
To the Right Honble. Lord Barrington at the Admiralty Office