

in which I cannot perfectly agree with him, I think scarce any body is better acquainted with the subject of electricity than himself.

XXXII. *A Letter to the Rev. Dr. Hales, F.R.S. from Captain Henry Ellis, F.R.S. dated Jan. 7, 1750-51, at Cape Monte Africa, Ship Earl of Halifax.*

S I R,

Read June 13. 1751. **I** MAKE use of this opportunity of writing to you, less from the vanity I have of having such a correspondent, than the desire of contributing to his satisfaction, who esteems it his greatest happiness to promote the interest of mankind. At yours and Lord Halifax's recommendation, I had your ventilators fixed on board of my ship, at Bristol. The following is a detail of the experiments, which I made to prove their utility.

1. I took a wax-candle, of eight to the pound, and drew it thro' a mold, to make it of one thickness from end to end: then weighed it exactly, and lighted it in the ship's hold; where I found it wasted 67 grains in 30 minutes; that place not being ventilated during 24 hours: but after six hours ventilation it wasted  $94 + \frac{1}{2}$  grains in the same time.

2. I carried with me into the hold a plate of silver, well polished, and a lantern and candle, all blinded, except a round hole of about two inches diameter. I placed the plate at six feet distance from it; and with

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such obliquity, that the rays from the light should fall on its surface at an angle of 45 degrees. I then fixed a white paper screen, at the same distance from the plate, and under the same angle with the lantern, so that the reflected rays might fall upon it also. This being done, I observed, that the reflection from the plate distinctly was but 17' 30" with an unventilated hold; it being turned the colour of tarnished lead; whereas, when the air was replaced by 4 hours ventilation, it continued to reflect light, and retain its brightness 4 hours 47 minutes.

3. The ship's bell, whose diameter is 14 inches, I had brought into the hold, when ventilation had been omitted 12 hours. Having hung it under the lower deck, I took out the clapper; and having suspended it also by thread, which, with its own length, made 44 inches; the angle, which the rim of the bell made, with a line let fall perpendicular from the pin, on which the clapper hung, was equal to 34' 0". I then held the clapper at the same angle, on the other side of the line, in order that the strokes at different times might be with the same force; when, letting it go, it struck the bell. In its return I caught it, and counting the vibrations, I heard them distinctly but three times; whereas, when the hold was well ventilated, it vibrated five times; but its vibrations were not so quick in the latter, as in the former case. I took all possible precautions, that these experiments might be fairly tried, to prevent deception; but always found them to produce the same effects.

We are at present very healthy, tho' our number is 130, not one being sick aboard. Our hold, which  
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in most ships is very moist, in ours is quite dry. Our cargo arms, which are kept there in upright chests, without wrappers, come out as bright as from a recent polish. Far is a ventilator from being inconvenient aboard of us; on the contrary, 'tis good exercise for our slaves, and a means of preserving our cargo and lives.

Upon the passage, I made several trials, with the bucket sea-gage, in latitude  $25^{\circ}-13''$  north; longitude  $25^{\circ}-12''$  west. I charged it, and let it down to different depths, from 360 feet to 5346 feet; when I discovered, by a small thermometer of Fahrenheit's, made by Mr. Bird, which went down in it, that the cold increased regularly, in proportion to the depths, till it descended to 3900 feet: from whence the mercury in the thermometer came up at 53 degrees; and tho' I afterwards sunk it to the depth of 5346 feet, that is a mile and 66 feet, it came up no lower. The warmth of the water upon the surface, and that of the air, was at that time by the thermometer 84 degrees. I doubt not but that the water was a degree or two colder, when it enter'd the bucket, at the greatest depth, but in coming up had acquired some warmth; for I found, that the water, which came up in the bucket, having stood 43 minutes in the air (the time of winding it up) the mercury rose above 5 degrees. When the air had render'd it equally warm with the water on the surface, I tried their weight, by weighing equal quantities very exactly, as also by the hydrometer, and found from great depths the heaviest, and consequently the saltest water.

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This experiment, which seem'd at first but mere food for curiosity, became in the interim very useful to us. By its means we supplied our cold bath, and cooled our wines or water at pleasure; which is vastly agreeable to us in this burning climate.

I intend, in our passage to the West Indies, to sound a mile deeper than I have done, having a sufficient quantity of line. But I cannot attempt your method to find the depth of the sea, for want of apparatus. My business at present affords me very little time for speculation. However, I cannot omit observing to you a phænomenon, which I saw last night, and never before, that I remember; and that was the two arches of the iris, with their colours distinct, by moon-light. Having already presumed much on your patience, and my leisure,

I am, &c.

Hen. Ellis.

*A Letter to the President, from Stephen Hales, D. D. & F. R. S.*

S I R,

Teddington, June 8, 1751.

Read June 13. 1751. **I** HAVE here inclosed, at his desire, a copy of a letter from Captain Ellis, who published an account of his voyage to Hudson's Bay.

The bucket sea-gage, which he mentions, and which I provided for him, to find the different degrees of coolness and saltness of the sea, at different

depths, was a common household pail or bucket, with two heads in it; which heads had each a round hole in the middle, near four inches diameter, which were cover'd with valves which open'd upwards; and that they might both open and shut together, there was a small iron rod fixed to the upper part of the lower valve, and at the other end to the under part of the upper valve: so that, as the bucket descended with its sinking weight into the sea, both the valves open'd by the force of the water, which had by that means a free passage thro' the bucket. But when the bucket was drawn up, then both the valves were shut by the force of the water at the upper part of the bucket: by which means the bucket was brought up full of the lowest sea-water, to which it had descended.

When the bucket was drawn up, the hole at the bottom was stopped with a cork, to keep the water in, when the valves were open'd, to come at the mercurial thermometer, which being tied to an upright stick, could readily be unfastened, by pulling out a loose nail, which went into the upper end of stick, which was fasten'd at its lower end in the same manner.

But great care must be taken to make an observation of the degree the mercury stands at, before the lower part of the thermometer is taken out of the water; else it would immediately be alter'd by the different temperature of the air.

In order to keep the bucket in a right position, there are four cords fixed to it, which reach about three feet below it, to which the sinking weight is to be fixed.

Captain

Captain Robinſon, who is lately arrived from India, ſays, he found ſo much benefit by ventilators, that he will never go a voyage without them; and that he loſt but two men in two years.

There are many other inſtances of the benefit of ventilators in ſhips, not only to the health and lives, but alſo to the proviſions, &c.

I am, Sir, with great reſpect,

Your obliged humble ſervant,

Stephen Hales.

XXXIII. *Observations on the Roman Colonies and Stations in Cheshire and Lancaſhire, by Thomas Percival Eſq; communicated by Hugh Lord Willoughby of Parham, F. R. S.*

Read June 13. <sup>1751.</sup> **I**N the ſecond iter of Antonine's Itinerary, we find, after ſeveral other ſtations mentioned Eboracum

Calcariam M. P. IX.

Camulodunum M. P. XX. Tho' with various

Mamucium M. P. XVIII. readings of the

Condate M. P. XVIII. names.

Devam M. P. XX.

It is agreed, that Deva is Cheſter, and that Mamucium or Manucium or Mancunium, is Mancheſter, by the common conſent of all antiquarians. But where Con-  
date