

it is the high degree of putrefaction (that most subtile diffolvent 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, 1755. 51. **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-

X x 2 tempted

tempted to do this much sooner, and more effectually, by blowing showers of air up through it, I soon found it to be impracticable, by reason of its very great degree of frothing up. The ill taste must therefore be got out of the milk, before it is set for cream; which, I have been told, has been practised, and that with some benefit, by giving the milk a scalding heat, without stirring it.

53. May 22. I ventilated some ill-tasted new unheated milk of a cow, which was purposely fed with crow-garlick mixed with cut grass. After 15 minutes ventilation the taste was a little mended; in half an hour's blowing it was something better. At the hour's end it had the same taste, but was sensibly better than the unventilated milk. I was disappointed of an opportunity to repeat the experiment with crow-garlick milk, with a scalding heat: it would then probably have been soon perfectly cured; as it is reasonable to believe from the event of the following experiments, *viz.*

54. August 23, four quarts of ill-tasted new milk, from a cow, which had fed eighty-four hours on cabbage leaves only, and drank during that time very little water, were put into a leaden vessel, eight inches in diameter, and thirty inches deep. The leaden vessel was heated in a large boiler, and set into a vessel of hot water; thereby to give the milk a scalding heat, and also keep it hot. In ten minutes ventilation it was perfectly cured of its ill taste; and after standing twenty-four hours in a broad pan, there was a thick scum, which was half cream and half butter, free from any ill taste; the skimmed
milk

milk was not sheer or thin : so here is a method to make good butter from ill-tasted milk.

55. The froth of the milk was so great, by reason of a too brisk ventilation, as to make it froth over the vessel, which was thirty inches deep ; if it had not been kept down, by constantly lading and breaking the very large bubbles of froth. But when the ventilation is more gentle, the froth has risen but three inches from six quarts of milk, which was nine inches deep. The cabbage milk was but six inches deep. I repeated the like operation the same day, with the evening milk of the same cow ; but giving it only a heat, that I could bear my fingers in, for a little time ; with this degree of heat, after forty-five minutes ventilation, the milk (though much better tasted), yet was not so completely cured as the former milk. Hence we see how necessary heat is, to volatilize the rancid oil (which gives the ill taste) to such a degree as to cause it to fly off by ventilation.

56. It was observed, that what was milked from this cow a week after she had done eating the cabbage, had an ill taste.

57. I have not as yet had an opportunity to try to cure, in the same manner, the ill taste of milk, which is occasioned by cows feeding on autumnal leaves, or turnips, they having probably eaten this autumn the fewer leaves, on account of the plenty of grass, occasioned by much rain ; which has hitherto prevented turnips from being rancid, which are observed to be most so when they shoot out in the spring. As opportunities offer I purpose to make trials, which I conclude others will also do, which will probably

be attended with the same good effects as that on the cabbage milk.

58. But though the ill taste of milk from feeding on cabbage leaves was thus effectually cured by volatilizing with heat and dissipating by ventilation the rancid oil, yet the bitter taste of a strong infusion of chamomile flowers in six quarts of water was not sensibly abated by an hour's ventilation of it, while scalding hot.

59. I am informed, that, in Devonshire, they set the pans of milk on trivets, making fires under them, to give the milk, gently and gradually, a scalding, but not a boiling heat, which would disturb the rising cream; and then set it on the floor in the milk-house to cool, where in twelve hours it has a thick scum, partly butter and partly cream. The skimmed milk is very thin and sheer; and the cream in great plenty and delicious, except it gets a smoaky taste, which it is apt to do; and which might probably be prevented, by having a range of as many stoves as there are pans of milk to be used at one time; all to be warmed by one fire, either at one end, or the middle of the flue or funnel in the brick-work, which conveys the smoke and heat under the stoves. And as the pans nearest to the fire will soonest have their due heat, on their removal to bring the farthest and coolest pans nearest the fire; and instantly covering the uncovered stoves with proper covers to prevent the heat and smoke from coming out; by this means the milk would all be soon heated, with any kind of fuel, and that with much less in quantity than in the common way.

60. And the more effectually to prevent the smoke from coming at the milk, it may be well to have the broad outer rim of the pans turned perpendicularly downwards, three or four inches, that it may enter deep into a circular groove of sand ; and if it shall be needful, the sand may be wetted in order the more effectually to prevent the passage of the smoke. I thought of this method about fifty years since, on tasting the smoaky butter in Somersetshire. By the same means the poor might save much fuel in boiling the pot, especially in summer, when a fire is wanted only for boiling the pot.

61. When any pans are to be removed from the stoves, the ascent of the smoke through the uncovered stove may be prevented by first closing the flue near the fire, by an iron sliding-shutter or register.

62. Milk might thus most commodiously be heated to a scalding heat with little fuel, fit for ventilation, in a vessel of a proper depth, set in the same manner as the pans in a stove, to secure it from smoke, with bellows fixed properly near it: (see PLATE X. *Fig. 3.*) By this means there would be little trouble or expence in curing ill-tasted milk by ventilation.

63. May 14th, merely to see what the event would be, a gallon of new milk just from the cow was ventilated, for an hour and half, which produced six ounces of butter ; and though it was ventilated half an hour longer, yet no more butter was made ; it was whitish, wanting both the colour and taste of good fresh butter.

64. I am credibly informed, that in the places famous for making the best fresh winter butter, they set the pot of cream in warm water, so long as till it has acquired that small degree of sourness, which it very soon has in warm summer weather, which gives it its agreeable flavour. And in order to give it colour, they grate a well-coloured carrot into a little milk, which, as soon as stained, is strained from the carrot through a sieve, and then mixed with the cream.

65. It is found by experience, that the quantity of cream is increased, by putting into the milk a little warm water in winter, and cold in summer; which being thereby in some degree thinned, the cream is thereby more easily disintangled, so as more freely to ascend to the surface of the milk.

66. I ventilated three gallons of stinking Jessops-well purging water. On first blowing, the smell of the ascending vapour was very offensive, which offensiveness abated much in five minutes: In eleven minutes the smell was much better: In twenty minutes the water seemed sweet both in smell and taste; and not sweeter at the end of forty-five minutes, fifteen or twenty minutes will probably suffice.

67. July 20th, three gallons of stinking sea-water were ventilated; in five minutes it was much sweetened, and no ill smell in the ascending air, though at first it was very offensive: At the end of ten minutes it had a small degree of ill taste; after twenty minutes no ill taste or smell. It frothed near a foot high during part of the ventilation: This from the bitumen, &c.

68. Some

68. Some sea-water, which was made to stink with flesh and isinglass being put into it, was not made perfectly sweet, not even by a ventilated distillation, and an hour's more ventilation after it was distilled; so that putrefaction with animal substances is not easily completely cured by ventilation.

69. When the water was 27 inches deep in the leaden vessel, no air could be blown up through it by the force of the bellows. But at 18 inches depth the air could freely be blown up in showers, thro' the water; when therefore it is requisite to blow up through great depths of water, the bellows may be worked with a lever, as smiths bellows are worked.

70. As it is found by experience, that the milk and butter of cows, which drink stinking water, has a very bad taste, this plainly shews, that the water retains its putrid quality, when mixed with the blood. Whence it is much to be suspected, that the stinking water, which is drank in ships, by retaining its putrid quality, even when mixed with the blood, may thereby promote that putrid distemper the scurvy, as well as some other distempers. And much more does the putrid close air in ships, which is mixed with the blood from the lungs, promote putrid and other disorders. By the same means also pestilential infections are taken in: For as the salutary properties of good air are conveyed by the lungs, so are also the malignant qualities of bad air.

71. Thus also the putrid water in marshy aguish countries, may be a cause of agues, as well as the putrid air, which they breathe; which, as well as the putrid water, may probably carry some of its putrid quality into the blood through the lungs.

This method therefore of sweetening stinking water, by blowing showers of air up through the stinking water of some aguish places, may be beneficial.

72. Live fish may well be carried several miles, by blowing now and then fresh air up through the water, without the trouble of changing the water: for this ventilation will not only keep the water sweet, but also enrich it with air, which is necessary for the life of fishes; with which air they supply their blood, by breathing the water, thin spread, between their gills; but stinking water will kill fish.

73. I have found, that much of the heating oil may be got out of tar-water, by blowing showers of air up through it when scalding-hot, for 15 or 30 minutes, the longer the better; the less volatile, and more salutary acid remaining.

Explanation of the Figures. PLATE X.

Fig. 1. (*o o p r*) a tin or copper air-box, six inches diameter, and an inch and half deep from (*o* to *p*.)

The lid of the box full of holes, one twentieth inch diameter, and about a quarter of an inch distant from each other.

(*g i k l*) a nozel foldered to the lid of the air-box, into which the tin-pipe (*a g i k l*) is fixed so as to take in and out; this pipe to be two feet long, and six tenths inch diameter.

(*a b*) a bend in the pipe five inches long, to which is fastened the leathern pipe (*c c d f*) six inches long; to which the nose of the bellows is fixed at (*d f*).

Fig. 2.



Fig. 1. p. 346.

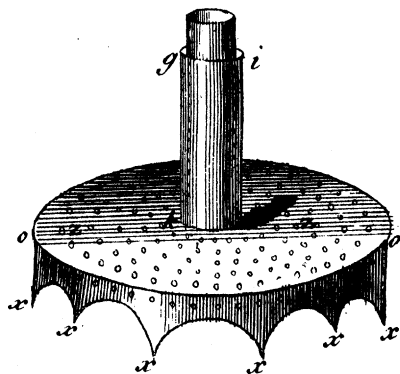


Fig. 2. p. 347.

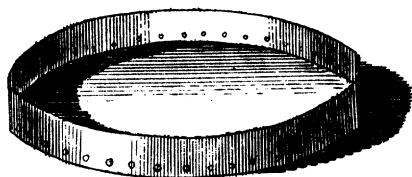


Fig. 3. p. 347.

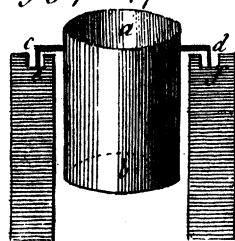


Fig. 2. (*g i k l o o x x*) the lid of the box, whose rim (*o x o x*), is a quarter of an inch deeper than the box (*o p* Fig 1), that the air-holes (*o*) may be pierced in its upper-part; and the lower-part is scolloped with wide scollops, for the air to pass through the holes (*p p* Fig. 1.)

Fig. 3. (*a b*) the milk-boiler, with the broad rim (*c d*), and perpendicular rim (*c e d f*) foldered to the horizontal rim; the perpendicular rim to enter the circular groove (*e f*) four inches deep full of sand, thereby to prevent the ascent of the smoke from the fire-stove.

LVII. *Extract of a Letter of Thomas Barker, Esq; to the Reverend James Bradley, D. D. Astronomer Royal, and F. R. S. concerning the Return of the Comet, expected in 1757, or 1758.*

S I R, Lyndon, near Uppingham, Rutland, Dec. 17, 1754.

Read March 20, 1755. A S we expect the comet of 1531, 1607, and 1682, to return in 1757 or 1758, it is proper to be aware where to look for it. But that will be very different, according to the time of the year it comes; and its period is not sufficiently known to fix the month of its next perihelion, which should be July 25, 1757, according to its last period; but the length of that before would make it Oct. 25, 1758. I have therefore, in 12 short tables, given the apparent path of the comet, supposing its perihelion any month in

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