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OBSERVATIONS

ON THE *Researches*
Diseases of the Army.

BY

Sir JOHN PRINGLE, Baronet,
PRESIDENT of the ROYAL SOCIETY,
And Physician to Their MAJESTIES.

The SEVENTH EDITION, revised and corrected.



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ΔΟΞΑ ΜΕΝ ΑΝΘΡΩΠΟΙΣΙ ΚΑΚΟΝ ΜΕΓΑ, ΠΕΙΡΑ Δ' ΑΡΙΣΤΟΝ.

THEOGNIS.

P R E F A C E.

THE diseases of the army, as far as it appears, have been treated of by none of the ancient physicians; nor have we any information about them from the historians, unless when some uncommon or very fatal distemper attended an expedition. XENOPHON, in his account of the famous retreat of the Greeks, observes they were subject to the fumes canina, to blindness, and to mortifications of the extremities, from the snow and excessive cold to which they were exposed on their march. PLINY, the naturalist, is the first who takes notice of the stomacace, the distemper now called the scurvy, which afflicted the Roman army in Germany, after it had continued two years in that country*. We likewise find the Romans under a necessity of shifting their camps, on account of the noxious vapours from the adjacent marshes. PLUTARCH relates that DEMETRIUS, in his last expedition, lost above eight thousand men by a sickness which followed a scarcity of provisions. LIVY mentions a pestilential distemper, that seized both the Romans and the Carthaginians in Sicily.

* Ancient Germany included the northern parts of the Netherlands, and it seems to be that marshy country which PLINY means; for he subjoins these words, *trans rhenum maritimo tractu*, which agrees with the account that TACITUS gives of the expedition under GERMANICUS.

And DIODORUS of Sicily describes another pestilence, attended with a flux of blood, which almost utterly destroyed the Carthaginians at the siege of Syracuse; and though he refers the final cause of this calamity to the Gods, incensed against that people for their impiety, yet he explains the natural causes in a more satisfactory manner, than is usually done by historians on the like occasions.

But excepting in a few such instances, there remains no account of the diseases incident to the armies of the Greeks or Romans. It may seem strange that VEGETIUS should have a chapter containing directions how to preserve the health of soldiers, and yet not name any disorder to which they were peculiarly subject; and that he should mention the physicians attending a camp, without taking notice of their manner of disposing of the sick, whether in hospitals or otherwise. The silence of the ancients upon this article is the more to be regretted, since as war was their study,*

* I have found a camp-hospital but once mentioned among the ancients, and that too in a transient manner: it is in a small and mutilated treatise, *De Castrametatione*, by HYGINUS *gromaticus*, so denominated from his subject, and to distinguish him from the mythologist of the same name. This author assigns, in a Roman camp, the station and bounds of the *Valetudinarium*, into which we may suppose the sick and wounded were admitted, though he takes notice of it only as a place for the convalescents. He lived under TRAJAN and ADRIAN.

P R E F A C E.

It might be expected, that the orders relating to the care of the sick were good in proportion to their skill in the other branches of the military art. And indeed, as their troops were almost constantly in the field, and employed in different climates, their physicians were enabled to furnish posterity with many observations on the nature and causes of camp-diseases, and on the proper methods of treating them. Nor, when I was first employed, had this subject been attempted by any of the moderns whom I had read, unless by such as had either little, or not at all, attended the service, at least the hospitals of an army. So that after all, this branch of medicine, which ought long ago to have been complete, seemed to be still in a manner new: so little is a military life consistent with that state of tranquillity requisite for study and observation.

Perceiving therefore the little assistance I was to expect from books, I began to mark such observations as occurred, in hopes of finding them afterwards useful in practice. And having continued this method to the end of the former war, I was induced to put those materials into order, and, with as much clearness and conciseness as I could, to endeavour from my own experience to supply to others, in some measure, what I thought so much wanting on this subject.

P R E F A C E.

I have divided the work into three parts. In the first, after a short account of the air and diseases more peculiar to the Low-Countries (so often the seat of our wars) I give an abridgment of the medical journal which I had kept of the several campaigns. In this I mention the epidemics, that is, the more frequent diseases of our troops, in the order in which they occurred; our embarkations, marches, encampments, cantonments, winter-quarters, the seasons, the changes of the weather, and, in a word, all the circumstances that seemed to me most likely to affect the health of an army. In this part I have entered but little into the description of diseases, much less have I touched upon their cure, reserving both those subjects to be treated of afterwards. My chief intention here, was to collect materials for tracing the more evident causes of military distempers, in order that whatever depended upon the officers in command, and was consistent with the service, might be clearly stated, so as to suggest measures, either for preventing, or for lessening such causes in any future war. And I have been the more studious of exactness in this account, as I foresaw that in whatever manner the whole was to be received, this part at least would be acceptable, as being a narration of facts, by one who was present and employed all the time. My inferences are few and short, as a
full

P R E F A C E.

vii

Full discussion of those points would have too much interrupted the series of incidents, that were to be presented in this place at one view.

I have therefore thrown most of the reasonings, resulting from the first part, into the second; in which, after having divided and classed the diseases common to a military life, I inquire into the causes of them, namely, such as depend upon the air, the diet, and other circumstances, which by long custom have got the unmeaning appellation of the non-naturals. Here I have ventured to assign some sources of distempers, very differently from other writers upon this subject; and I have also shewn how little instrumental some other causes are, which have been hitherto deemed the most productive of military complaints. Nor will this liberty, I hope, be condemned, when the opportunities, which I beyond others have had to make such remarks, are attended to; and when it is considered, that, as natural knowledge is daily improving, those who write last on subjects connected with it are most likely to be in the right.

Among the chief causes of sickness and mortality in an army, the reader will little expect that I should rank the hospitals themselves, though intended for its health and preservation, and that on

P R E F A C E.

account of the bad air and other inconveniences attending them. During the former war, one considerable step was made towards their improvement. Till then it had been usual for the security of the sick (when the enemy was near) to remove them a great way from the camp; whereby many were actually lost before they came under the care of the physicians. But the Earl of STAIR, my illustrious patron, being sensible of this evil, when the army was encamped at Aschaffenburg, proposed to the Duke DE NOAILLES (of whose humanity he was well assured) that the hospitals on both sides should be considered as sanctuaries for the sick, and mutually protected. This was readily agreed to by the French General, who took the first opportunity to shew a proper regard to his engagement. For when after the battle of Dettingen, our hospital was at Feckenheim, a village upon the Maine, at a distance from the camp, the Duke DE NOAILLES having occasion to send a detachment to another village, upon the opposite bank, and apprehending that this might alarm the sick, he sent to acquaint them, that, as he knew the British hospital was there, he had given express orders to his troops not to disturb them. This agreement was strictly observed on both sides during that campaign, and though it has been since neglected, yet it is still to be hoped, that on future occasions

occasions the contending parties will make it a precedent.

After having explained the general causes of sickness in armies, I proceed to point out the means of removing some of them, and rendering others less dangerous: without this addition, the former observations could have been of little use. But it is easy to conceive, that the prevention of diseases cannot depend on the use of medicines, nor upon any thing which a soldier shall have in his power to neglect, but upon such orders as he himself shall not think unreasonable, and such as he must necessarily obey.

I conclude the second part with comparing the numbers of the sick at different seasons, that the Commander may know, with some degree of certainty, what force he may at any time rely upon for service; the effects of short or long campaigns upon the health; the difference between taking the field early, and going late into winter-quarters; with other calculations founded upon such materials as were furnished by the war. The data are perhaps too few to deduce certain consequences from them, but as I found no other which I could depend upon, I was obliged to make the best use of these, which at least will serve for a specimen of what

P R E F A C E.

what may be done in this way upon further experience.

These two parts being intended for the use of the officers as well as the physicians, I have endeavoured to relate the facts and draw my inferences in the plainest manner, and with as few scientific terms as was consistent with the nature of the subject; and, I hope, with perspicuity enough to be understood by any reader not unacquainted with the common principles of natural knowledge.

But the third part, containing the practice, is designed for those of my own profession only, as it could neither be properly explained, nor be made instructive to others. In composing this from my notes, I was long in doubt how to proceed; whether wholly to omit such things as were commonly known, or to treat all the disorders, mentioned there, in a full and regular manner: at last I determined upon the following course. I suppose the diseases, to which an army is most subject, to be divisible into two classes; one, comprehending those which are also common in Britain; and the other, such as are more peculiar to a different climate, or to the condition of a soldier. Now, as the first have been fully treated of by several learned authors, in the hands of every physician, and also occur in daily practice, I pass them

them cursorily over, being satisfied with laying down my general method of proceeding, and marking the difference, if any, to be observed in prescribing in military hospitals. But with regard to the other class, including the autumnal remitting, and intermitting fevers, and what I have called the jail- or hospital-fever, and the dysentery, as they are distempers less frequent in this country, I thought proper to handle them more at length, and indeed in so full a manner, as I hoped might instruct those who had been little conversant with them before.

My observations on the jail- or hospital-fever were first published in the year 1750. in a letter to Dr. MEAD. But as that piece was hastily written, occasioned by the jail-distemper breaking out at that time in London, some things were omitted, and some mistakes were made, which I have endeavoured to supply and rectify in this work, wherein that dissertation is included*.

* In the year 1722. a treatise was published here, intituled, *A Rational Inquiry into the Nature of the Plague, drawn from Historical Remarks*; by JOHN PRINGLE, M. D. As the subject was similar to mine, and as the author was of the same name, the writer of the Index to M. DE HALLER's edition of BOERHAAVE's *Methodus Studii Medici* has referred that piece, my Letter to Dr. MEAD, and my Inaugural Dissertation [at Leyden, in the year 1730.] *de Marcove Senili*, to one person. In justice therefore to the author of that *Inquiry*, I take this opportunity of informing the public of the mistake, which indeed it was natural for a foreigner to fall into.

To this account of the jail- or hospital-fever, as well as to that of the autumnal fevers and the dysentery, I have subjoined some conjectures about their internal and more latent causes, though I am aware that an attempt of this kind may tend rather to weaken than confirm the credit of my observations; as we too often see the judgment influenced and perverted by such speculations. But the reader may be assured, that not only the descriptions, but the treatment of these distempers, were in a good measure fixed before I thought of assigning those causes; and which indeed were sometimes first suggested by the effects of the medicines. Yet a just theory would often be useful, not only for discovering more powerful remedies, but for varying those we are already acquainted with, according to the difference of constitutions, and the degrees of the disease.

In reasoning upon the nature of these fevers and the flux, I have so much recourse to the septic principle, that the reader may imagine I have considered it as a more universal cause than I really think it; for excepting these disorders, and one or two more I have alluded to in this work, I have hitherto referred no other to that origin. But as to the reality of such a principle, though, I think, I have ascertained it in these
Sheets,

P R E F A C E.

xlii

heets, yet to some it may be satisfactory to know, that the corruption of the humours, as the cause of certain diseases, was first hinted at by HIPPOCRATES, further taken notice of by GALEN, and still more fully treated of, and applied to medicine in later times, as appears by the Aphorisms of SANCTORIUS, and other works of his age. And though it was afterwards sunk in the systems of SYLVIUS and of WILLIS, as well as in that of the first mechanic writers in our art, yet it was revived by BOERHAAVE; who, under the article of alkalis, comprehended all that he deemed septic or putrid. But as my celebrated master had not time to establish every part of his doctrine from his own experience, it was no wonder that some mistakes were made, and that the extent of this principle was not sufficiently understood.

Two circumstances induced me to prosecute this subject; the great number of putrid cases that were under my care in the hospitals abroad; and the authority of Lord BACON, who offers good reasons for considering the knowledge of what brings on, and what retards putrefaction, as most likely to account for some of the more abstruse operations of nature. My experiments on this subject having been read at several meetings of the Royal Society, the three first papers were published in

the Transactions; but while the rest were still in the hands of the Secretary, in order likewise to be inserted, I found it necessary to make frequent references to those experiments, and therefore thought proper to annex the whole of them to this work, with the addition of some notes, to explain what might not have been fully, or clearly enough expressed before, and by way of connecting those facts with the preceding Observations. Now as it is a rule with the Society, to insert in their Journal none of those papers which having been read before them, are published afterwards by the authors themselves: for that reason no more than the three first of mine had a place in the Transactions.

This work was first published in the year 1752. and reprinted in the year following with some additions. In the third edition I corrected some of my observations, from further experience in the camps which I attended in England, for three seasons in the beginning of the last war, before I quitted the service. But as I found the diseases of those hospitals similar to what had occurred during the former war; though milder, on account of the nature of the climate, and from the soldiers not suffering those hardships, to which troops are exposed in sight of an enemy; I judged it unnecessary to give any account of those easy campaigns.

In the three subsequent editions, as well as in the present, I have revised the whole, and from more mature reflection, from my private practice, and from conversing with others who had been employed in the hospitals abroad, in different climates, during the late war, I have had an opportunity of making further improvements, by expressing with more confidence some of my former remarks, and by omitting others which I had advanced without sufficient foundation. In this edition, I have been careful to avoid all denominations of fevers, communicating either no clear idea of their nature, or a false one. The terms therefore of nervous, bilious, putrid, and malignant, applied so commonly to fevers, will either not occur at all, or be so defined as to occasion no ambiguity.

I am sensible, however, that notwithstanding all my care and attention, both in making the observations and the experiments, and the repeated opportunities I have had of revising and correcting this work, several inaccuracies and mistakes may have escaped me, which those will most readily excuse, who, having themselves made researches of this kind, are not unacquainted with the difficulties attending their publication. Yet, how imperfect soever these sheets may be, I
have

P R E F A C E.

have the satisfaction to find, that they have served as a foundation for others to build upon, who have concurred with me, in attempting to draw, even from the calamities of war, some benefit to mankind.



C O N T E N T S.

P A R T I.

C H A P. I.

Of the air and diseases of the Low-Countries.

Page 1

C H A P. II.

A general account of the garrison diseases of the British troops in Flanders, and in the cantonments in Germany, in the years 1742. and 1743. 11

C H A P. III.

A general account of the diseases of the British troops, during the campaign in Germany, in the year 1743. and the ensuing winter in Flanders. 17

C H A P. IV.

A general account of the diseases of the campaign in Flanders, in the year 1744. 28

C H A P. V.

A general account of the diseases of the campaign in Flanders, in the year 1745. 34

C H A P.

CONTENTS.

C H A P. VI.

A general account of the diseases of the campaign in Great-Britain, 1745. and 1746. page 39

C H A P. VII.

A general account of the diseases of the campaign in Dutch Brabant, in the years 1746. and 1747. 52

C H A P. VIII.

A general account of the diseases of the campaign in Dutch Brabant, in the year 1748. 59

P A R T II.

C H A P. I.

OF the division of the diseases most incident to an army. 72

C H A P. II.

Of the causes of the diseases most incident to an army. 78

§. 1. *Of the diseases occasioned by heat, and by cold.* 79

§. 2. *Of the diseases occasioned by moisture.* 81

§. 3. *Of diseases arising from putrid air.* 84

§. 4. *Of diseases arising from errors in diet.* 86

§. 5. *Of diseases arising from excess of rest, and motion; of sleeping, and watching; and from want of cleanliness.* 91

C H A P.

C O N T E N T S.

xix

C H A P. III.

Of the general means of preventing diseases in an army. page 93

§. 1. *How to prevent diseases arising from heat, and cold.* 94

§. 2. *How to prevent diseases arising from moisture.* 96

§. 3. *How to prevent diseases arising from putrid air.* 99

§. 4. *How to prevent diseases arising from improper diet.* 110

§. 5. *How to prevent diseases arising from errors in exercise.* 113

C H A P. IV.

The seasons compared, with regard to the health of an army. 115

P A R T III.

C H A P. I.

Observations on colds, and inflammatory fevers in general. 123

C H A P. II.

Observations on particular inflammations. 133

§. 1. *Of the inflammation of the brain.* *ibid.*

§. 2. *Of the inflammation of the eyes.* 135

§. 3. *Of the inflammation of the throat.* 137

§. 4. *Of the pleurisy and inflammation of the lungs.* 139

§. 5. *Of the inflammation of the liver.* 145

a 2

§. 6.

- §. 6. *Of the inflammation of the stomach and intestines.* page 146
- §. 7. *Of the rheumatism.* 155

C H A P. III.

- Observations on coughs, and the phthisis pulmonalis.* 163

C H A P. IV.

- Observations on the fevers commonly called bilious, or the autumnal remitting, and intermitting, fevers of the army.* 168
- §. 1. *Of the symptoms of the autumnal remitting, and intermitting, fevers of the camp.* 169
- §. 2. *Of the symptoms of the autumnal remitting, and intermitting, fevers of low and marshy countries.* 173
- §. 3. *Of the causes of the autumnal remitting, and intermitting, fevers of the camp, and those of low and marshy countries.* 183
- §. 4. *The autumnal remitting, and intermitting, fevers of the camp, and cantonments, compared with the summer and autumnal fevers of other places.* 187
- §. 5. *Of the cure of the autumnal remitting, and intermitting, fevers of the camp, and of those of low and marshy countries.* 200

C H A P. V.

- Observations on the obstructions consequent on the autumnal remitting, and intermitting, fevers of the camp, and those of marshy countries.* 214

C O N T E N T S.

xxi

C H A P. VI.

<i>Observations on the camp-dysentery.</i>	page 217
§. 1. <i>A description of the camp-dysentery.</i>	ib.
§. 2. <i>Of the dissections.</i>	237
§. 3. <i>Of the causes of the dysentery.</i>	251
§. 4. <i>Of the cure of the dysentery.</i>	258

C H A P. VII.

<i>Observations on the jail- or hospital-fever.</i>	287
§. 1. <i>Of the rise of the jail- or hospital-fever, and the manner of the infection.</i>	ib.
§. 2. <i>Of the symptoms.</i>	290
§. 3. <i>Of the Prognostics.</i>	298
§. 4. <i>Of the dissections.</i>	300
§. 5. <i>Of the cure.</i>	305
§. 6. <i>Of the nature of the jail- or hospital-fever, and causes of pestilential fevers in general.</i>	319

C H A P. VIII.

<i>Observations on the Itch.</i>	340
----------------------------------	-----

A P P E N -

APPENDIX.

PAPER I.

Experiments shewing that putrid substances are not to be called alkaline; that neither the volatile nor fixed alkaline salts tend naturally to promote putrefaction within the body, being of themselves antiseptic. That the combination of two antiseptics may produce a third weaker than either. Experiments upon the comparative powers of some neutral salts in resisting putrefaction. And of the antiseptic qualities of myrrh, camphire, snake-root, camomile-flowers, and the Peruvian bark. p. iii

PAPER II.

A continuation of the experiments and remarks upon antiseptic substances. A table of the comparative powers of salts in resisting putrefaction. Of the antiseptic quality of several resins, gums, flowers, roots, and leaves of vegetables, compared with common salt. Attempts to sweeten corrupted animal substances by means of camomile-flowers, and the Peruvian bark. A conjecture about the cause of intermitting fevers; and about the action of the Bark in curing them. xiv

PAPER III.

Experiments on substances resisting the putrefaction of animal humours, with their use in medicine. Astringents always antiseptics, but antiseptics have not always a manifest astringent. Of the use of putrefaction in general, and particularly in the animal œconomy.

æconomy. Of the different means of inducing putrefaction. Some substances reputed septics have a contrary quality. And the real septics are some of those substances which have been the least suspected to be of that nature, viz. chalk, the testacea, and common salt. page xxvii

P A P E R IV.

A continuation of the experiments upon septics. Conjectures about the causes of the decline of putrid diseases. Of the difference between the effects of the testacea and lime-water. A power discovered in putrid animal substances of exciting a vinous fermentation in vegetables. Of what use the saliva is in that process. And the application of these experiments to the theory of digestion. xxxix

P A P E R V.

Experiments and remarks on the fermentation of vegetables, by means of putrid animal substances, continued. An austere acid produced by such fermentations. The probability that most vegetables are fermentable; not excepting the acrid, antiscorbutic or alkalescent class. Of the fermentation of milk. How far the aliment ferments in the stomach. Of the use of the saliva in alimentary fermentation. Of various causes of indigestion. Of the cause and cure of the heart-burn. And from what cause a sourness of the stomach proceeds. li

P A P E R VI.

Experiments upon substances hastening, retarding, increasing, and diminishing alimentary fermentation; with

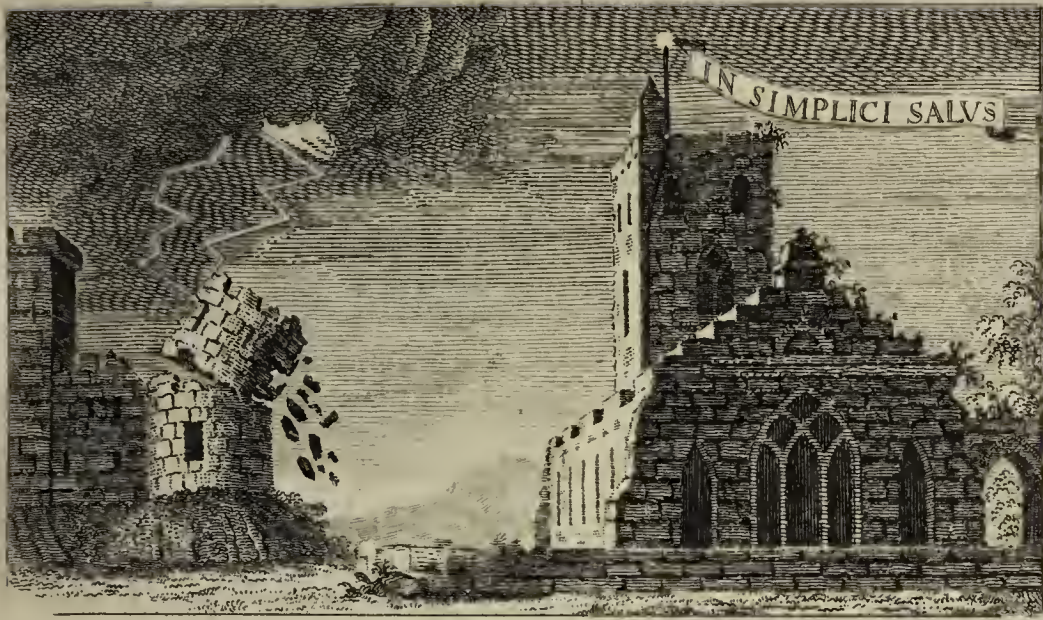
with remarks upon their use in explaining the action of digestion, and shewing how that may be occasionally assisted by acids, bitters, aromatics, wine, &c. What substances come nearest to the saliva in its digestive quality; and how these are to be varied according to the habit. Of the difference between the action of the bile and that of common bitters. Sea-salt, in different quantities, either promotes or retards alimentary fermentation; but the other septics always hasten that process. In what properties the testacea, lime-water, and the fixed alkaline salts agree, and differ. What aliments are the easiest, and what the hardest of digestion. lxiv

P A P E R VII.

Experiments and remarks upon the putrefaction of blood, and other animal substances. Of the nature of the inflammatory crust or the sily part of the blood. Of the fecal acid. Uses drawn from observing the colours of corrupted blood. Of the nature of purulent matter. The resolution of the blood, the relaxation of the fibres, and the emission of air, are the consequences of putrefaction: hence several symptoms of putrid diseases accounted for. The marrow not soon corruptible. The blood may become sensibly putrid whilst the animal lives. The different action of alkaline salts, and of putrid substances, upon the nerves. That there is but one species of the true scurvy; and that this arises from putrefaction.

An answer to the learned Professor DE HAEN, and M. GABLER, concerning some remarks made by them on the preceding work. xciv

O B S E R-



OBSERVATIONS
ON THE
DISEASES OF THE ARMY.

PART I.

CHAP. I.

Of the air and diseases of the Low Countries.

THE river Lys rises in Artois, and with the lower part of the Scheld, which it joins at Ghent, divides the high and dry part of Flanders from the low and wet. Between this line and the sea the country is flat,
B marshy

marshy and unhealthful, including several barrier towns belonging to the Dutch, the French, and the Austrians; of all which Furnes and Sluys are the most sickly. But the other part of Flanders being higher, is, as well as the rest of the Austrian Netherlands, a dry and healthful country.

Great part of the United Provinces, with Dutch Brabant, from Grave downwards along the Maes, being likewise low and wet, is subject to the same distempers with the flat part of Flanders. But the air is worst in Zealand, as that province is not only low and watery, but surrounded with the oozy beaches of the eastern and western Scheld, and the most marshy parts of the country; so that almost every wind, except from the sea, adds to its native moist and unwholesome exhalations.

All this tract of the Netherlands being little higher than the level of the sea, or the rivers that pass through it, was once so much exposed to inundations from floods and high tides, that till dykes and drains were made, it was one large morass; and even now, after incredible labour, the country is liable to be overflowed by extraordinary floods and other casual inlets of water. By the evaporation of this water, as well as by that of the numerous canals and ditches, in which various plants and insects die and rot, the atmosphere, during the latter part of summer and autumn, is filled with moisture, and with putrid and insalutary vapours.

A second, but less obvious source of humidity, is from the water under ground, which in that country lies so near the surface, that a dry ditch is seldom seen; and as the soil is light, the moisture easily transpires, and in summer loads the air with vapour even where no water is visible. This is the condition of most of Dutch Brabant, where the people are more or less subject to intermitting fevers, in proportion to the distance of this water from the surface; so that by looking into their wells, one may form a judgment of the comparative healthfulness of the several villages; for these wells being fed by the subterraneous water, with which they are on a level, and sinking in proportion to the droughts of summer, are a proof of the constant exhalation of this concealed moisture, through the pores of the earth, by the heat of the sun.

In Zealand, and upon the coasts of Flanders and Brabant opposite to that province, is observed a peculiar kind of damp, rising at low water from a beach that is covered with slime and mud, and which is perhaps the more apt to corrupt on account of the mixture of the fresh with the salt water*. In those parts the people are sickly; but at Ostend, which is situated upon the ocean, and where there are no marshy grounds very near, the inhabitants are in general healthy.

Another cause of the humidity and corruption of the atmosphere, is an imperfect ventilation,

* LANCIS. de Nox. Palud. Effluv. lib. i. p. i. c. v.

There are no hills to direct the wind in streams upon the lower grounds; hence the air is apt to stagnate, and the more by reason of the large plantations made for pleasure, inclosures, or fuel. The farms and smaller villages are crowded with trees, which not only confine but moisten the air by their transpiration. But in the towns, in which there is less of this kind of moisture, where the houses and pavement of the streets in a great measure prevent the rising of the damps, and where are continual fires, the aquatic diseases are both milder and less frequent.

To these causes of fevers in flat and marshy countries, may be added the impurity of the water in common use; for this being either collected from rains and preserved in cisterns, or drawn from shallow wells, is in hot and dry seasons soon corrupted. This being the case, the general tendency to putrefaction must be increased by the use of such water, as well as by the meats, which in a close, hot and moist air are quickly tainted. Several circumstances therefore in that country concur, in summer, not only to relax the solids, but to dispose the humours to putrefaction; and as the combination of heat and impure moisture is the great cause of the speedy corruption of animal substances, so it is observed in every place to produce remitting and intermitting fevers, and other distempers of a putrid kind, similar to those that occur in the low and marshy parts of the Netherlands.

This

This is the nature of the country. But according to the various degrees of heat and moisture of the season, the epidemic diseases begin earlier or later, are of longer or shorter duration, and are attended with milder or more alarming symptoms. When the heats come on soon, and continue throughout autumn, not moderated by winds and rains, the season proves sickly, the distempers appear early and are dangerous. But when the summer is late, or tempered by frequent showers and winds, or if the autumnal colds begin early, the diseases are few, their symptoms mild, and their cure easy*.

And here it may be proper to distinguish between the moist and the rainy seasons; for in marshy grounds, intense and continued heats, even without rain, occasion the greatest moisture, by the exhalation which they raise and support in the atmosphere; whereas frequent showers, during the hot season, cool the air, check the rise of the vapours, dilute and refresh the corrupted water, and precipitate the putrid and noxious *effluvia*. But if heavy rains fall in the beginning of summer, and are followed by great and uninterrupted heats, the water stagnating in the lower grounds, and corrupting there, furnishes matter for more exhalation, and thereby makes the season more sickly, and the diseases more fatal.

* All this is agreeable to an account of the weather and diseases published by Dr. STOCKE, physician at Middelburg in Zealand.

It ought also to be remarked, that the sickness never begins till the heats have continued long enough to give time for the putrefaction and evaporation of the water. The epidemics of this country may therefore be generally dated from the end of July, or the beginning of August, under the canicular heats; their sensible decline, about the first falling of the leaf; and their end, when the frosts begin: the rest of the year is much less disposed to produce any distemper.

Again, we are to observe, that though in the month of September the greatest heat of the season is past, yet the sickness continues from the greater variations of heat and cold; for the days are still warm, but the nights are cold and damp, and often foggy; and it is by such interchanges that either the perspiration is checked, and the more putrescent parts of the blood are retained in the body; or else, that the pores of the lungs and of the skin are more disposed to absorb some noxious particles, productive of fevers and fluxes. It is also to be remembered, that the summers are, in the same latitude, hotter on the continent than in Britain, and that in the Netherlands the heats are more stifling than in hilly countries.

The epidemic of autumn, and prevailing distemper of this and other marshy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind, which, in the dampest places, and worst seasons, appears as a
double

double tertian, a remitting, or even an ardent fever *. But however these fevers may vary in their appearance, according to the difference of constitutions and other circumstances, they are all of a similar nature. For though in the beginning of the epidemic, when the heat, or rather the putrefaction in the air is greatest, they assume a continued, or a remitting form, yet by the end of autumn they usually terminate in regular intermittents.

In Zealand, where the air is most corrupted, this fever is called the *gall-sickness*; and indeed both the redundance and depravation of the gall in this distemper appear sometimes so great, that it has been generally ascribed to the corruption and overflowing of that humour. But though I would not consider the bile as the original cause, yet the disease may be continued, and the symptoms aggravated, by an increased secretion and putrefaction of the bile, occasioned by the fever. There may be in this, as in other disorders, a first cause producing an effect, and that effect producing new symptoms.

In proportion to the coolness of the season, to the height and dryness of the grounds, this distemper is milder, remits or intermits more freely, and recedes further from the nature of a continued fever. To judge from its worst state, should we not refer most of the symptoms to a septic cause? since these fevers are commonly attended with intense heat and drought, foulness of the tongue, bitter-

* An ardent fever is defined, part iii. ch. iv. § ii.

ness in the mouth, desire of acids, *nausea*, aversion to animal food, oppression about the stomach, offensive vomitings, sometimes livid spots, and the like indications of corrupted humours. And since, with such symptoms, the disease still puts on an intermitting or a remitting form, it should seem as if even the more benign intermittents and remittents of the season were owing to some degree of putrefaction.

The *cholera* and the dysentery, though never so epidemic as the fevers, are yet the frequent diseases of the moister countries. As they appear in the same season with those fevers, they have been supposed particular determinations of the vitiated humours; to which, if the first passages gave vent, a *cholera*, or a flux ensued; but if they were retained, and carried into the blood, they produced an intermitting, or a remitting fever.

Both fevers and fluxes are often accompanied with worms, which are not to be considered as the cause of either, but as a sign of the bad state of the bowels, of the corruption of the aliment, and of a weakness of the intestines, owing to the heat, the moisture, and the putrid state of the air.

These are the acute diseases of the marshy parts of the Netherlands. The chief chronical disorder is a scurvy, incident to those chiefly who live in a moist and corrupted air, and especially if they use salted meats: this, though of a milder nature, yet agreeing so nearly with the sea-scurvy, may be
accounted

accounted the same disease. The putrid exhalations of the canals and marshes, in hot weather, act like the steams of a foul and crouded ship, and corrupt the humours. The sea air is not the cause of the scurvy; for on board a ship, on the longest voyages, cleanliness, ventilation and fresh provisions preserve from the marine scurvy; and upon the sea coast, if free from marshes, the inhabitants never suffer by that distemper, though breathing the air from the sea*.

In general, it is the higher ranks of people who are least liable to the diseases of the marshes. For such countries require dry houses, apartments raised above the ground, moderate exercise, without labour in the sun or in the evening-damps, a just quantity of fermented liquors, plenty of vegetables, and fresh meats. Without such helps, not only strangers but the natives themselves are sickly, especially after hot and close summers. The hardiest constitutions are little more exempted than others, and therefore the British soldiers have always been subject to these fevers and fluxes in the Netherlands; not always indeed to the scurvy, as their stay in the moister parts of that country, during the war, was never long enough to bring on the distemper.

Now, though in the marshy parts of Flanders and Holland, the summer and autumnal diseases

* The nature of the scurvy is more fully explained in the Appendix, Paper vii. under experiment xlvi.

are frequent and violent, yet there are few countries that are totally exempted from them. For the heats, if great, tend to relax the solids and corrupt the humours; under which circumstances, if the body is exposed to fogs and nocturnal damps, in autumn, or in that season receives improper food, the same kind of disorders, though less characterized, less frequent, and less dangerous, will be incident to dry as well as to marshy countries. Hence, even in the driest camps, after great and continued heats, these summer and autumnal fevers and fluxes are more or less common; for besides the natural moisture of a tent, the men will either by duty, or by misconduct, often suffer from wet ground, wet clothes, nocturnal damps and colds: and the danger of their then falling ill is the greater, as the variations of heat and cold are more sensible and frequent in the field than in quarters.

But a sudden stoppage of perspiration, or of the other excretions, coming upon relaxed fibres, and a putrescent state of the blood (arising from a constant exposition to the sun) if not timely remedied, will generally occasion a remitting, or an intermitting fever, a *cholera*, or a flux; so that these distempers may be considered, in some degree, as incident to a camp as to a low and marshy country.

C H A P. II.

A general account of the garrison diseases of the British troops in Flanders, and in the cantonments in Germany, in the years 1742. and 1743.

IN the beginning of June, 1742. the British troops began to embark for Flanders. There were in all, of foot and cavalry, about 16,000: the winds were favourable, the several passages short, the men landed in good health and went into their several garrisons. 1742.

The head-quarters were at Ghent, with most of the cavalry, three batallions of guards, one marching regiment, and the artillery; eight batallions were quartered at Bruges; two at Courtray; a regiment of dragoons lay at Oudenarde; and another was divided between Alost and Grammont. There was a general hospital at Ghent, but in the other garrisons the care of the sick was committed to the surgeons of their respective regiments.

During the summer and autumn the weather was good, the heats moderate, and the country in general healthy. The British officers continued well, but many of the common men sickened; and this seems to have been the reason.

Ghent is situated between the high and the low division of Flanders; one part of the town, called St. Peter's-hill, is much higher than the rest, and
in

1742. in this the barracks, having drains and free air, were quite dry; so that the soldiers who lay there enjoyed perfect health. But those who were quartered in the lower part of the town (mostly in the ground-floors of waste houses, unprovided with drains, and of course damp) were sickly. The batallion of the first regiment of guards was an instance of the effect of this difference of quarters. Two of the companies lay on St. Peter's-hill, the remaining eight in the lower part of the town, in rooms so very damp, that the men could scarce keep their shoes and belts from moulding. In the month of July, the sick of this batallion amounted to about 140; of which number only two men belonged to the companies on the hill, and the rest to those in the lower town. But about the middle of August, upon changing these unhealthful barracks, the sickness suddenly abated. The rest of the garrison suffered much less in proportion: their highest *returns* of the sick at no time exceeded 70 in a batallion of foot*, and 40 in a regiment of dragoons †. Now though the above

* A nominal batallion consisted then of 813, but after deducting the warrant-men, and the commissioned officers (who are never put into the *returns* of the sick) we should only reckon the corps, when full, at about 750 private men and non-commissioned officers, whose names, upon any indisposition unfitting them for duty, were once a week (in the military term) *returned* to the commanding officer of the regiment.

† The dragoon-regiments consisted of three squadrons, and each squadron of 158 men, not including commissioned officers.

returns were more than triple what such corps commonly have at home, yet the sickness in this garrison was accounted moderate. The highest returns were in the month of August, when the distempers were chiefly intermitting, and remitting fevers, and fluxes. 1742.

The sickness was more considerable at Bruges, a city of the lower division of Flanders, and moister than Ghent: the soldiers had likewise damper barracks. The remitting and intermitting fevers began in July; in August, the intermittents were most numerous, which they continued to be throughout September, but diminished in October, and ceased upon the setting in of the frosts in November. These fevers were not only of a worse kind than those at Ghent, but three times more numerous, and more in proportion died. Next to the fevers, fluxes were most frequent; and though not always with blood, yet were generally of the dysenteric kind. It was then observed, that such as lay in the upper stories were much more healthy than those who were below in the ground-floors, which were all very damp.

The two battalions at Courtray were differently lodged; one had dry barracks, the other damp; and this last had double the number of sick throughout the autumn; but their greatest return did not exceed 70.

1742. Oudenarde is in the higher division of Flanders; but the barracks being damp, without drains, and the situation being low, the Welsh Fuziliers, who lay there, suffered as much in proportion as the garrison of Bruges.

But at Alost and Grammont, towns in the same division, where a regiment of dragoons was billeted in private houses, that corps was so healthy, that when the army marched into Germany it left not a man behind.

The great number of sick, and our want of experience in the cure of diseases incident to a moist climate, were the reasons that at this time the fevers were less successfully treated than afterwards. Many of the remittents degenerated into continued fevers, often fatal; and the intermittents, by being stopped before the proper evacuations were made, or not secured against relapses, changed likewise into continued fevers, or ended in dangerous obstructions of the *viscera*.

After the frosts in November the intermittents never appeared, unless upon catching cold, and even then, such only as had been ill of them in autumn were seized in that manner.

The autumnal epidemics having ceased, the winter disorders began, which were colds in various forms. The most common were hard coughs, stitches, rheumatic pains, inflammations of the lungs, and the like; to all which, our soldiers, unused

unufed to garrifon duty and cold quarters, and unprovided with clothes futed to the country, and to the feafon, at this time particularly fharp, were fubject. 1742.

There was no other confiderable ailment except the itch, which indeed foon after landing was fo general, that the officers believed that either the falt provifions at fea, or the change of air, had been the caufe of fo fudden and extenfive a complaint. But it was folely owing to the contagion of a few, who having the diftemper before embarkation, communicated it to their companions either on board the fhips, or in the barracks after their arrival in Flanders.

These were the principal difeafes of our troops in garrifon. The lefs frequent were dropfies and confumptions, whereof the former were the confequences of obftinate autumnal fevers ill cured; and the latter, of neglected colds.

But the moft alarming was a fever, in the hofpital, of a particular kind, flow in its courfe, attended with a funk pulse and a constant *ftupor*: the novelty and danger, more than the number feized, made this diftemper confiderable. The caufe was at firft miftaken, but afterwards it appeared to arife from the foul air of fome of the wards crouded with fick, efpecially of one in which a man lay with a mortified limb. This fever was confined to that houfe, and as it is moftly found

either in jails or in hospitals, I shall hereafter distinguish it by the name of the *jail* or *hospital-fever*.

1743. In the beginning of February the troops moved from their winter-quarters, and marching into Germany were cantoned in the dutchy of Juliers and at Aix-la-Chapelle. Only part of the cavalry was left at Bruffels; and the sick and weak, to the amount of 600, being collected from all the garrisons, were put into the general hospital at Ghent. The weather being favourable our forces entered Germany in good condition.

Soon after, the *Influenza* * passing through a great part of Europe, was sensibly felt at Bruffels, though but little in the cantonments, excepting so far, as many, who in the preceding autumn had been seized with intermittents, then relapsed. The other disorders were the same as in Flanders, namely coughs, pleurisies, and the like, from taking cold in a rigorous season.

From the arrival of the troops at their cantonments till the beginning of May, the weather was unusually cold, with much snow, that began to fall towards the end of March, and continued for seventeen days; in the midst of which we left our cantonments and crossed the Rhine. The march was long and the roads deep, but as the soldiers came every night into warm houses, and had good pro-

* A short fever attended with a violent catarrh.

vifions, fo few fell fick by the way, that in both marches, from Ghent to the cantonments, and from thence to the place of encampment, in winter and in the worft weather, we did not lofe twenty men. 1743.

In the beginning of May the weather fuddenly changed, and the troops on the 17th encamped at Hoechft, on the banks of the Main, in an open and healthful country.

C H A P. III.

A general account of the difeafes of the Britifh troops, during the campaign in Germany, in the year 1743. and the enfuing winter in Flanders.

THE ground, though naturally good, was not yet thoroughly dry; and though the days were now warm, yet the nights were ftill cold, and condensed the vapours. Thefe interchanges of heat and cold, joined to the moifture infeparable from tents, could not but affect the health of men unufed to the field, and accordingly many were feized with inflammatory difeafes.

The flying hospital was opened at Nied, a village in the neighbourhood of the camp, which in three weeks received about 250 fick. When the number was 220, the diftempers were claffed, and ftood thus: of pleurifies and peripneumonies, 71; rheumatic pains, with more or lefs of fever, 51; inflammatory fevers, without rheumatic, or pleu-

1743. ritic pains, 25; intermittents, 30; hard coughs without fever, 9; old coughs and consumptions, 7. The rest had either fluxes, or some inflammatory symptom different from these; and several slighter cases remained in the camp. The intermitting fevers and fluxes were also accompanied with some degree of inflammation.

This, with little variation, is the first state of the camp-diseases; for the nights being yet cold, and the ground wet, it is easily conceived in what manner our men must suffer, who lie in tents without any covering. Besides, soldiers are often exposed to rain, and have not the means of drying their clothes: at other times, for want of occupation, they are apt to lie down on the grass and fall asleep in the sun, in the hottest weather.

Hence the diseases, from the first encampment till past the summer solstice, have been almost always inflammatory. Fluxes, remitting, and intermitting fevers, during this period were never general, and such as occurred were seldom without some inflammation.

The cavalry had not near their proportion of sick, and indeed never have in camps; for the care of the horses gives the men an easy but constant employment, their cloaks keep them dry in rains, and serve for bed-clothes at night. The officers enjoyed perfect health, as they always do in the first part of a campaign.

On the 22d of June, we marched to Aschaf- 1743.
fenburgh, where the army encamped on a dry and
airy field. In the hospital we left 500; so that in
five weeks the proportion of the sick to the whole,
was about 1 to 29. Before this motion of the
troops, the sickness had sensibly decreased, and it
still continued to decline in the new camp; for the
weakest were already in the hospital, and the rest
by this time were somewhat inured to the field.
Add, that the nights were now warm; and there
had been no rain to wet the clothes of the men,
or the ground on which they lay.

On the 26th, in the evening, the tents were
struck, the army marched all night, and next
morning fought at Dettingen. On the night fol-
lowing, the soldiers lay on the field of battle,
without tents, exposed to a heavy rain. Next day
we moved to Hanau, and encamped on good
ground in an open field; but it was then wet, and
for the first night or two the men wanted straw.
By these accidents, a sudden change was made in
the health of the army. For the summer had
begun early, and the weather had been constantly
warm; but the free and uninterrupted perspiration
seemed to prevent any general sickness. Now, the
pores were suddenly stopped, the body was chilled,
and the humours tending to a resolution, from the
preceding heats, were turned upon the bowels, and
produced a dysentery, which continued a consider-
able part of the campaign. In eight days after the
C 2 battle,

1743. battle, about 500 were seized with that distemper; and in a few weeks, near half the men were either ill, or had recovered of it. The disease was common, though not nearly so frequent among the officers; of whom those were seized first who lay wet at Dettingen; the rest suffered by infection.

The dysentery, the constant and fatal epidemic of camps, began sooner this season than it did in any succeeding campaign. Now, as the usual time of its appearance is not till towards the end of summer, or beginning of autumn, the cause has been unjustly imputed to eating fruit in excess. But the circumstances here contradict that notion; for this sickness began and raged before any fruit was in season (strawberries excepted, which, from their high price, the men never tasted) and ended about the time the grapes were ripe, which growing in open vineyards were freely eaten by every body that liked them.

To this, add the following incident: Three companies of HOWARD's, which had not joined us, marched with the King's baggage from Ostend to Hanau; where arriving a night or two before the battle, and having orders to stop, they encamped for the first time about half a mile from the ground that was afterwards occupied by the army. These men had never been exposed to rain, nor had lain wet; by this separation from the line, they were also removed from the contagion of the privies;
and

and having pitched close upon the river, they had the benefit of a constant stream of fresh air. By means of these favourable circumstances, it was remarkable, that while the main body thus suffered, this little camp almost entirely escaped *; though these men breathed the same air, the contagious part excepted, used the same victuals, and drank of the same water. This immunity continued for six weeks, until the whole army removed from Hanau; when these companies joining the rest, and encamping in the line, were at last infected; but they suffered little, as the flux was then much upon the decline.

The dysentery continued all the month of July and part of August, being kept up by the hot weather, and the bad air of the camp. Soon after the above-mentioned rains, which had cooled the air, the heats returned, and for some weeks were so great, that the humours, already disposed, were further prepared to receive the infection. Of this, the chief *fomes* seemed to be the foul straw and the privies; for as soon as we left that ground, on which we had so long encamped, the distemper visibly abated.

The numbers of the sick made the symptoms worse, as it happens in the small pox, plague, and every other putrid and infectious disease. But the bloody flux is particularly bad in crowded hospitals,

* I heard of only one man that was taken ill of the bloody flux.

1743. where the corrupted steams being accumulated, are raised to a high degree of virulence; of which fact, at this time, we had the following instance.

The village of Feckenheim, a league from the camp, was employed for an hospital, into which, during our stay at Hanau (besides the wounded from the field of battle) about 1500 sick were sent from the line; and of that number the greatest part ill of the dysentery. By these men, the air became so much vitiated, that not only the rest of the patients, but the apothecaries, nurses, and others employed in the hospital, with most of the inhabitants of the place, were infected. To this was added a still more alarming distemper, the jail- or hospital-fever, the common effects of foul air from crouds and animal corruption. These two combined, occasioned a great mortality in the village, among the natives as well as the soldiers; while such of ours as were seized with the dysentery, and not removed from the camp, though wanting many conveniencies others had in hospitals, yet kept free from this fever, and commonly recovered of the flux.

On the 16th of August, we decamped from Hanau, came to Wisbaden, and there were joined by four fresh batallions from England. On the 23d, we crossed the Rhine; and on the 30th of the same month, encamped at Worms, along that river, where we remained till the 25th of September.

All -

All these encampments were on dry ground, and in an open country. 1743.

The month of August was warm and dry throughout, without fogs; and during the rest of the autumn the weather continued fine, allowing for the abatement of heat, and the usual dews of that season. In the end of August, though the days were still warm, yet the nights grew cold; and in the beginning of October the fields began to be covered with hoar-frost in the morning.

From the time of our leaving Hanau, the dysentery so sensibly abated, that the change could only be ascribed to leaving the infectious privies, the foul straw, and the filth of a long encampment. When the army crossed the Rhine, this flux made but a third part of the sickness, from having been lately almost the only distemper in the line. In a month after, it was scarcely seen, unless in a few, who had been ill before, and who from imperfect cures, colds, or errors in diet, had relapsed into the disease.

About the middle of August, when the flux was on the decline, a new disease appeared, and daily increased as long as the troops kept the field. This was a remitting fever, whereof the paroxysms came on in the evening, with great heat, thirst, a violent head-ach, and often a *delirium*. These symptoms lasted most of the night, but abated

1743. in the morning with an imperfect sweat; sometimes with an hemorrhage of the nose, or a looseness. The stomach, from the beginning, was disordered with a *nausea* and sense of oppression, frequently with a bilious and offensive vomiting. If evacuations were either neglected, or too sparingly made, the patient fell into a continued fever, and sometimes grew yellow as in a jaundice. When the season was farther advanced, so that colds became frequent, this fever was attended with a cough, rheumatic pains and fizy blood. The officers being better accommodated than the common men, and the cavalry, who had cloaks to keep them warm in the night, were not so subject to it. And others, who belonged to the army, but lay in quarters, were least of all affected; and the less in proportion to their being little exposed to heats, night-damps, and the other fatigues of the service. This distemper, another common epidemic of an army, shall hereafter be distinguished by the name of the *autumnal remitting* and *intermitting fever* of the camp.

Both in the dysentery and in this fever, several voided round worms; a symptom that occurred in these disorders every campaign. But we are not to imagine that the worms were the cause of the fever, or of the flux*; but only that when joined to either, they made them worse.

* See chap. i.

On the 25th of September, the army, free from 1743. the dysentery, but with a daily increase of the remitting fever, advanced to Spiers, but came back on the 13th of October. The weather, during this march, being cold and rainy, upon the return of the troops, above 800 were sent into the hospital, and most of them ill of this disease.

Three days after, we moved to Biberic, and there breaking up camp, on the 25th of October, our troops, in different divisions, began to return to the Netherlands. The weather being favourable to the march, which continued a month, and the soldiers coming every night into good quarters, so few fell sick by the way, that we arrived at our several garrisons with scarce the loss of a man.

But three thousand sick were left in Germany; part at Feckenheim, near Hanau, and the rest at Osthoven and Bechtheim, two villages in the neighbourhood of Worms. The condition of those at Feckenheim has been already mentioned*: there the hospital-fever and dysentery continued to rage. Few escaped; for however mild or bad the flux was, for which the person was sent to the hospital, this fever almost surely supervened. The petechial spots, *vibices*, parotids, frequent mortifications, contagion, and mortality sufficiently shewed its pestilential nature. Of fourteen mates employed about the sick, five died; and excepting one or two, all the rest had been ill, and in danger. The

* Page 22.

1743.

hospital lost near half of the patients; and the inhabitants of the village having first received the flux, and afterwards this fever, by contagion, were almost intirely destroyed.

The condition of the two hospitals near Worms was better; the men had more room, they had been admitted in a cooler season, and the distempers were milder. But one general hospital being made at Newied, the sick were removed from their several quarters, and carried down the Rhine to that place; where, from the change of the air, those of Feckenheim were at first relieved; but the rest, who were mixed with them, caught the infection, which the following circumstance rendered still more general and fatal. For, orders coming soon after, to remove all the sick from Germany to Flanders, they were embarked in bilanders, to be carried to Ghent; but where they did not arrive till the middle of December. During this voyage, the fever having acquired new force by the confinement of the air, by the mortifications, and other putrid *effluvia*, it became so virulent, that above half the number died in the boats; and many of the remainder, soon after their arrival. Its resemblance to the plague was further evinced by this memorable incident. A parcel of old tents being sent on board the same bilanders with the men, were used by them for bedding; these tents, in order to be refitted, were put into the hands of a tradesman at Ghent, who
having

having employed twenty-three Flemish journeymen about the work, lost seventeen of them by the distemper, though they had no other communication with the infected.

1743.

The proportion of men left in the hospitals at the end of the campaign, to those who came safe into garrison, was about 3 to 13.

The winter quarters assigned the troops, were Bruffels, Ghent, Bruges, and Ostend: of these, Bruffels is the highest and best aired. But in winter, as there is little exhalation, and consequently no dangerous moisture in the air, the situation of the place is then of less consequence; so that the chief concern is to have warm and dry barracks, with a sufficient allowance of fuel. The best quarters were at Bruffels; and accordingly the sickness was inconsiderable there, in comparison to what it was at Ghent and Bruges, where the dampness of the barracks, concurring with some remains of the diseases of the field, occasioned frequent disorders in the beginning of winter. For though the troops returned to Flanders in apparent good health, yet, soon after their arrival, several were taken ill of the remitting fever attended with inflammatory symptoms; by which it appears, that the seeds of this fever may lie some time latent in the body, and break out upon occasion, before the frosts have restored the tone of the bowels, braced the habit, and thereby purified the blood.

In

1743.

In the beginning therefore of winter, these remittents were the prevailing disease of the garrisons; and next to them, jaundices without fever. At Bruffels, where the barracks were dry and warm, the fevers were few, and the jaundice uncommon; but at Ghent and Bruges, both were numerous. Yet the continuance of the fever was short; for it disappeared in December, and was succeeded by no other disorder than coughs and inflammations from colds, just as in the preceding winter.

No epidemic appeared in the spring. The only disease, besides colds, was the contagious fever, which came from Germany, and continued in the hospital at Ghent. Some degree of the same was likewise felt in the regimental infirmaries at Bruges, which had been crowded with sick, upon coming into quarters.

C H A P. IV.

A general account of the diseases of the campaign in Flanders, in the year 1744.

1744.

THE allies first encamped at Anderlecht, near Bruffels, on the 13th of May; on the first of June, we moved to Berleghem, and lay there till the 31st of July, when we crossed the Scheld, encamped at Anstain, in the territory of Lisle,

Lisle, and there remained almost the rest of the campaign.

1744.

This year, the British took the field with five new battalions, and at Berleghem we were reinforced with five more from England; which number, with the additionals to the dragoons, and with the recruits, made our national troops, in this campaign, exceed those of the former by upwards of ten thousand.

The first three days of the encampment were warm for the season, the succeeding ten were cold; but afterwards, the weather becoming mild, and continuing so, with moderate heats, the summer proved very favourable for the field. Before the army passed the Scheld, there being no hard duty, and the forage being at hand, the men suffered little by wet clothes, and had no fatigue; hence the sickness was so moderate, that during the first ten weeks encampment, about 600 only were sent to the hospitals (which were at Ghent and Brussels) that is, not above $\frac{1}{43}$ part of the whole.

Two thirds of these disorders were merely inflammatory, being either pleurifies, peripneumonies, quinsseys, rheumatisms with fever, or the like. The rest were mostly vernal intermittents, with a few fluxes and other casual ailments, though generally accompanied with inflammation, as in the beginning of the former campaign*.

* Page 18.

Now,

1744.

Now, as to the inflammatory diseases of a camp, it may be proper once more to observe, that though upon first taking the field, coughs and stitches, with inflammations of the lungs and sides, are the common supposed effects of catching cold, yet, towards the summer solstice, as the weather grows warmer, the breast is less liable to be affected; so that those causes are then rather productive of a continued, or a remitting fever, with sily blood, than of any of the above-mentioned inflammations. It is also to be observed, that this fever, with proper management, may generally be removed in a few days; but when neglected at first, by the omission of bleeding, by the sick continuing in camp, or being carried in waggons to distant hospitals, it is never without danger.

After the army entered the territory of Lisle, an hospital was opened at Tournay, on the 23d of August, into which at first were sent only 50 sick; and as this was the whole number that had been taken ill since we crossed the Scheld, it shewed how healthful the camp then was. But even in these men there appeared a change in the disorders from inflammatory to putrid; as most of the cases were either remitting fevers, or fluxes.

From the end of August to the middle of September, there fell a good deal of rain; so that the men, who went out on foraging parties, were often wet; and the ground whereon the foot encamped being low, retained the water. Hence, by the first
of

of October, we had above 450 ill of the dysentery, who were sent to the hospitals; besides some others, who having the same disorder in a slighter degree, were not removed from the camp. 1744.

This however was the highest number, and which, considering the augmentation of our troops, was not great, compared to what had happened in the preceding year. This seemed to be the reason: the weather in the beginning of the first campaign was so hot, that by the end of June, the humours had already acquired a morbid disposition; in this state, the rains at Dettingen, and the lying wet, either by checking the perspiration, or otherwise affecting the habit, had produced the dysentery, which was increased by infection, by the hot weather, the foul straw, and the privies of a long encampment; but, by the temperature of this summer, the distemper beginning late, could make little progress, from the coldness of the season.

The remitting fever of the camp, more regular in its appearance than the flux, began but a little later than in the preceding year, was pretty frequent in the end of September, but never so general as before. The symptoms were also milder, and there was seldom any yellowness of the skin, as in the former campaign; but when the weather grew cold, this fever was often attended with a cough, infarction of the lungs, or rheumatic pains; which symptoms, as was said above *, did not properly

* Page 24.

1744. belong to the fever, but were accessions to it from colds.

The rains were succeeded by clear weather, which continued till the beginning of October; but this being followed by heavy and cold rains, the sickness must have increased, had not the campaign ended soon after; for on the 16th, some of our troops were sent into winter quarters, and in a few days they were followed by all the rest.

On breaking up, we had about 1500 sick in the hospitals at Tournay, Ghent and Bruffels: this was only the 17th part of all that took the field. The number of those who died, during this campaign, and in the hospitals after it, did not exceed 300. The mildness of the season, the dry encampments, the frequent exercise given to the troops by foraging parties (when the camp was fixed at Anstain) and the early retreat into winter-quarters, all concurred, this year, to preserve the health of the army.

The troops returning so soon and so well into garrison, carried with them few seeds of diseases. The dysentery, having been for some time on the decline, was but a little revived by the wet weather. And as half the army had been hardened by two campaigns, the remitting fever, in quarters, was chiefly confined to the recruits and the new regiments, which had encamped this summer for the first time.

The

The British returned to the same garrisons which they had left. At Bruffels the general hospital was kept up, but at Bruges and Ghent the several regimental surgeons had orders to take care of their sick in barracks which were provided for them, and they had medicines and other necessaries at the public expence. In each of these garrisons a physician was stationed, to whom those surgeons were occasionally to apply for assistance. This scheme of separate regimental infirmaries, though only intended to save the charge of one great hospital, yet answered another purpose, which was that of preventing infection, the usual consequence (as has been remarked) of keeping great numbers of sick together.

Two batallions remained at Ostend, which having garrisoned the town during the campaign, in general enjoyed good health. The remitting fever was unknown there, and the intermittents, with some mild fluxes, were confined to a few of the common men, who by out-guards and night-duty were most exposed to cold and wet; but neither our officers, nor the people of the place, had any sickness among them.

C H A P. V.

A general account of the diseases of the campaign in Flanders, in the year 1745.

1745. **O**N the 25th of April, the army taking the field encamped again at Anderlecht, and on the 9th of May advanced to Brissoel.

The weather being mild, the sickness was moderate, and of the same kind with that of our former campaigns. Inflammatory disorders were common, and, as before, mostly in the form of a pleurisy, or peripneumony, not so often in that of an acute rheumatism, as the weather was yet too cold for tempting the men to sleep on the grass, the common cause of that distemper. The vernal intermittents were also of an inflammatory kind, as were likewise the few fluxes that appeared. The small-pox was the only new disease; it came with the recruits from England, but did not spread; and indeed we have never known it of any consequence in the field.

The battle of Fontenoy was on the 11th, on which day the weather was fair, and the following night so dry and warm, that though most of the men lay without cover, and all had been fatigued, yet no sickness ensued. Next day an hospital was opened at Ath, in the cazernes of St. Roch, which received about 600 wounded; the rest,

rest, to the amount of above 1200, were carried off 1745.
by the French and put into their hospitals.

On the 16th, the army removed from Ath, and encamped at Lessines, where we continued till the 30th of June. The greatest part of May being dry, and moderately warm, was favourable both to the wounded and to the men in camp. But June being cold and wet, the vernal agues and fluxes returned, and though little affecting the old and hardened troops, were severe on PRICE'S and MORDAUNT'S regiments, which, with the draughts, were new, and had encamped at Lessines for the first time.

From this place, the army moved to Grammont, where we lay ten days, and from thence marching to Brussels, encamped on the plain of Dieghem; which being a dry, open and elevated piece of ground, is reputed the most healthful for a camp in the Netherlands. From thence, after a month's stay, we made a small remove to Vilvorde; where the soil being also dry, the country airy, and the weather temperate, the men continued so healthy, that in the middle of September few battalions returned above 12 sick; a number as low as could be expected in the best quarters.

The mildness of the weather, the dryness of the ground, and the little fatigue which the troops then underwent, concurred in making the autumn, usually a sickly season, uncommonly healthful.

1745. The dysentery had been frequent in the new regiments only, and was easily cured; nor could the remitting fever ever be called epidemic. For though it began about the end of August, and was the most frequent disease throughout the rest of the campaign, yet it was so inconsiderable, that no battalion, at any time, returned above 7 or 8 ill of that distemper, and those with milder symptoms than had been known in the former campaign.

It was observable, that when the army made another small remove, to form a line along the great canal, the ground being low and close-planted, the effects of moisture were presently seen; but upon returning to our former camp, they soon disappeared.

On the 24th of October, the weather continuing fair and temperate, the camp broke up, and the troops went into winter-quarters. Some time before, ten battalions had been sent home; and in the beginning of November, the whole British infantry, with part of the cavalry, being recalled to suppress the rebellion, marched to Willemstad and embarked for England.

Thus far an account of the health of the main body: the state of the separate corps was as follows. In the end of August, Ostend having surrendered, the garrison, consisting of five battalions British, was conducted to Mons, where they continued

tinued about three weeks. These men had been so healthy, that when they marched out, upon the capitulation, they left only ten sick; but the same corps being put into damp barracks at Mons, whilst the town was surrounded with an inundation, the autumnal diseases so much prevailed, that in this short time 250 were taken ill, and left behind when the rest set out for Bruffels. The disorders were dysenteries, remitting, and intermitting fevers; and to these fevers, as is usual towards the end of autumn, were joined coughs and rheumatic pains, not without some mixture of the jail-fever, occasioned by the close and crowded barracks at Mons.

HANDYSIDE'S regiment, another detached corps, came over this summer for the first time, and about the middle of July was put into the citadel of Antwerp. The air of that city is moist, the fort, in particular, is exposed to the exhalations of the adjacent marshes, and the barracks were on ground-floors and damp. In consequence of this, the dysentery, with remitting and intermitting fevers of a bad kind, became general among those men. In the beginning of October, the sick of this batallion alone amounted to 183, a number five or six times greater than in any other corps at that time in the field. This disproportion seemed to be owing solely to the unwholesome moisture of the citadel; since the other new regiments, that were then in camp, suffered little; and in the town of Antwerp, fluxes, remitting, and intermitting fevers were also

1745. frequent among the inhabitants, whilst the people of Bruffels enjoyed perfect health. And when Ghent was taken, part of RICH's dragoons having escaped from thence and retreated to Antwerp, were seized with the epidemic diseases of that city; whilst the rest of the regiment, which lay in camp, continued free both from the fevers and the flux.

Upon the whole, when the campaign ended, we had in the hospitals at Antwerp, Bruffels and Mons about 1000 sick; a small number, when we consider that during this summer there had been in Flanders, besides the cavalry, 29 batallions, whereof some had never been in the field before. From the beginning to the end of the campaign, exclusive of those who were killed in battle, or died of their wounds, the deaths did not exceed 200. The moderate heats, the dryness of the grounds for encampment, the little fatigue, and small exposition to wet and damps on marches, or other duty, and our early return into winter-quarters, were circumstances concurring to make this, of the whole war, the most healthful campaign.

C H A P. VI.

A general account of the diseases of the campaign in Great-Britain, 1745 and 1746.

TOWARDS the end of the campaign 1745. 1745.
 the three batallions of foot-guards, and seven others, embarked in Holland and landed in the south of England. The passage was short, and the troops leaving the field before the nights grew cold, arrived in perfect health. But the rest of the infantry having lain longer in camp, embarked later in the season, and being kept long on board by contrary winds, came sickly to Newcastle, Holy-island and Berwick. For some of the men during the voyage having been taken ill of the remitting fever, this fever, by the crouds and the foul air of the hold, was soon converted into the jail-distemper, and became infectious.

At Newcastle, an hospital was made for the sick that landed there; and the houses taken for that purpose, receiving also those who fell ill in the army commanded by Marshal WADE, were so much crouded, that the air was soon corrupted. The fever became so contagious, that most of the nurses and medical attendants were seized with it; and three of the apothecaries of that place, with four of their apprentices and two journeymen employed in the hospital, died of it.

1745. LIGONIER'S and PRICE'S regiments landed in Holy-island. Both had embarked in good health, after leaving their sick at Antwerp; but by the time they arrived, they were in no better condition than those who came to Newcastle. Their distress was unforeseen and unprovided for. Of 97 men taken out of the ships, ill of the jail-fever, 40 died: and the people of the place receiving the infection, in a few weeks buried 50, the sixth part of the inhabitants of that island. The same fever was carried into Berwick by the soldiers who landed there; but the sick being fewer, the distemper did not spread.

In the beginning of December, a body of troops consisting of 12 batallions and 3 regiments of cavalry, under the command of his Royal Highness the Duke of CUMBERLAND, assembled at Litchfield. The Quakers had made a present of flannel under-waistcoats to the soldiers, which was a seasonable provision for a winter-campaign. The march was dry; the army encamped at Pakington for three days only; at Stone, the men lay for one night upon their arms; but at all other times lying in houses, and having plenty of straw, fuel and provisions, they were more healthy than could be expected in a campaign at that season of the year.

Towards the end of December, most of the infantry were sent into quarters, whilst the cavalry

and 1000 foot advanced to Carlisle. The few who were taken ill on the march were left in the towns on the road to the care of the country-furgeons, and were in general well treated. 1745.

But our troops having continued several days at Litchfield, a greater number of sick was left in that place than in any other. On that account the work-house was fitted up for an hospital, where too many being admitted, the air was corrupted, and the common inflammatory fever changed into one of the jail-kind, of which several died. But at all other places where the soldiers were taken ill, and where there was no common hospital, this fever was unknown.

The autumnal remitting fever, disguised with many symptoms of cold, could be traced in the troops that came over from Flanders, till the frosts in December put an end to it. But the prevailing disorders were hard coughs, stitches, pleuritic and rheumatic pains, with a few fluxes, the usual consequences of the men being exposed to colds and rains on duty, or getting wet feet on the march. There were besides some intermittents, but all with such a mixture of coughs and infarctions of the lungs, as made bleeding the most necessary remedy. In general, bleeding was so requisite, that in every town through which the troops past, and where the sick were to be left behind, I, who had been recalled to attend this service, believed the surgeons and apothecaries of the place more than half instructed

1746. instructed about the cure of the patients committed to them, when I had inculcated the necessity of large and repeated bleedings; for the men were at this time well fed, and from taking cold, their blood was easily inflamed.

Carlisle was invested in the beginning of January, and taken in a few days. The shortness of the siege, the mildness of the weather for the season, and the good cover which the troops found near the works, made the sickness so inconsiderable, that only one man died there. And during the whole expedition this body did not lose above 40 men, though there had been in all between 600 and 700 ill.

On the 10th of February, the army, under the command of his Royal Highness the Duke, marched from Edinburgh to Perth. It consisted of 14 battalions of foot and 3 regiments of cavalry, which being too large a number to be all billeted in the private houses of that town, two battalions were quartered in the churches. Provisions were in plenty, but the quarters being generally cold, many were seized with the common inflammatory disorders of winter. The hard coughs, in particular, with pleurisies and peripneumonies were the most frequent.

In the beginning of March, our troops advanced from Perth to Montrose, and from thence to Aberdeen, leaving 300 sick behind, who were well accommodated

accommodated in the corporation-halls, or in the private houses of those towns. 1746.

Till the end of March, the whole infantry was quartered in Aberdeen, but afterwards 9 batallions were cantoned at Inverurie and Strathbogie: at this time, one batallion more landed at Aberdeen and joined the army.

The weather being all this time sharp, with frost, snow, and easterly winds, the inflammatory diseases continued. But whilst the men suffered by cold beds, guards, or out-duties, or by their own misconduct, the officers having warm quarters, and being less exposed to cold, escaped: only in the beginning of March, when the weather was very cold, a few were seized with the gout.

The sick were well lodged in the town-hospital and in other large houses, where having free air, they were preserved from the hospital-fever. Including those at Inverurie and Strathbogie, about 400 were left behind when the army moved, but of this number a small proportion died.

On the 23d of April, the army first encamped at Cullen; next day, we crossed the Spey; and on the 27th, after the battle of Culloden, we advanced to Inverness and encamped on the south side of that town.

At

1746.

At Strathbogie and Inverurie, the duty had been constant to guard against a surprize, one day's march had been long and rainy, the encampment had been early, and colds had been taken by wading the rivers: these circumstances concurred to occasion some sickness. Before we reached Inverness, about 70 men having been taken ill, were left in the towns by the way. After our arrival, the inflammatory diseases still increased, and were the more severe, as the climate was cold, and the camp exposed in an open country to piercing winds. The pleurisies and peripneumonies were particularly alarming, as tending quickly to suppuration.

At Inverness, two malt-barns received the wounded: in all 270. Several had cuts of the broad-sword, which till then were uncommon wounds in our hospitals; but they were easily healed, as the openings were large in proportion to the depth, as they bled much at first, and as there were no contusions and eschars, as in gun-shot wounds, to obstruct a good digestion.

Besides these barns, two well-aired houses were prepared for the sick. The regimental surgeons had also orders to provide quarters for their men when they were taken ill, with a liberty of sending to the general hospital some of their worst cases, but in such a proportion as not to crowd it. By this dispersion of the sick, and the preservation of a
pure

pure air in the wards, it was hoped that all contagion would be moderated, if not prevented; though it was more than ever to be apprehended, from the smallness of the town, the jails filled with prisoners, many of them wounded, the prospect of a long encampment and camp diseases, the crouds and filth of a place where the markets of an army were kept; and lastly, a morbid state of the air, from the measles and small-pox which had prevailed in the town before the arrival of the army. 1746.

These circumstances concurred to put us more upon our guard, and therefore greater care was taken to divide the sick, and to keep the wards clean. An order was likewise given to clean the jails every day, to remove speedily the bodies of those who died in them; and to lessen the croud, part of the prisoners were put on board some ships that were lying in the road, with a liberty of coming upon deck for the air.

In this manner the month of May passed without any infection; and the weather, for the climate, being unusually dry and warm, the inflammatory sickness in the camp had sensibly declined, when an unforeseen accident rendered the infectious fever more general and fatal than had been at first apprehended. For about the end of that month, HOUGHTON'S regiment, which with three more had been sent as a reinforcement, landed at
Nairn

1746. Nairn and joined the army. A few days after, twelve men of that corps were sent to the hospital with fevers, and were bled largely upon admission. But next day, not observing the coughs, stiches, and rheumatic pains, the common symptoms of the fever at that time prevailing in the camp, and finding that the bleeding had sunk the pulse, and that some had an uncommon *stupor*, I soon referred this fever to the jail and contagious kind, concluding it had taken its rise from the confinement and bad air in the ships during the voyage; yet at first I could not comprehend how this batallion, and none of the rest who sailed with it, should be so sickly.

Upon further enquiry I was informed, that this fever came directly by infection from the jail-distemper itself, communicated in the following manner. Not long before, a French ship had been taken on the coast of England, on board of which some troops had been sent to assist the rebels, and among them a few English soldiers, who in Flanders had gone over to the enemy. These deserters, upon being taken, were thrown into jails in England, where they were kept till the opportunity offered of sending them by the transports, to be tried by a court-martial at Inverness. They were 36 in number, and having brought with them the jail-fever, they gave it to this batallion with which they happened to be embarked.

In three days after landing, six of the officers were seized with it, and the regiment, in the few days it was at Nairn, left about 80 sick; in the ten following days, while in camp at Inverness, it sent to the hospital about 120 ill of the same fever: and though the virulence of the distemper diminished afterwards, in their march to Fort-Augustus, and from thence to Fort-William, yet that corps continued for some time very sickly. 1746.

The symptoms of the jail-fever were in every respect so like those of the hospital-fever, that, as they were formerly only conjectured to be the same disease, they were now proved to be such. Being thus introduced, it soon spread, not only in the hospitals, but among the inhabitants of the town, whilst the ordinary camp-diseases, after the beginning of May, sensibly declined both in violence and number. The weather being all the month of May not only dry, but warm for the climate, the camp at this time was subject to no other disorders than such as usually attend the beginning of a campaign: perhaps there might be some fewer intermittents, and more diarrhœas than ordinary. For a looseness accompanied most of the complaints, but was slight, and seemed not so much the effect of colds, as of using the river-water, which comes out of Loch-Ness, and has been accounted laxative to people unaccustomed to it. This looseness either ceased without medicine, or soon yielded to astringents.

1746. On the 3d of June, 4 batallions were left at Inverness, and 9, with a regiment of horse, marched to Fort-Augustus, leaving in the hospital about 600 sick, besides the wounded.

The new encampment was close by the fort, at the end of Loch-Nefs, in a valley furrounded by mountains except where it opens upon the water. This lake is a large body of fresh water, twenty-four miles in length, somewhat more than a mile broad, lying between two parallel and straight ridges of mountains, and affording the prospect of a vast canal. It is curious on account of its great depth and its never freezing. The common soundings are from 116 to 120 fathoms, and in one place they run to 135. The water is soft and sweet, and readily bears soap, yet to some it proves laxative, and it is generally diuretic. The people of the country recommend it for the scurvy, and indeed from these qualities there is reason to believe it may be proper in some *species* of that distemper*. A great many small but heavy stones, of the marcasite kind, are found upon the beach; and it is not improbable that the bottom may be covered with the like. But whether the water is preserved from freezing by some mineral principle, by its vast depth, or by some hot springs,

* *Viz.* In scurfs, tetters, and lesser degrees of the *lepra*, which are commonly, but erroneously, supposed to proceed from a scorbutic humour. See part iii. ch. viii.

has not been determined*. As it is stored with good fish, and is without any particular taste, it should seem to be little, if at all, impregnated with any mineral. And besides being always cool, there is the less reason to suppose any hot springs at the bottom, as none of that kind are found any where else in the country. This lake is fed by several small rivers, which are all liable to have ice, and empties itself by the Ness, a large clear river, which after a course of six miles runs into the Frith of Murray at Inverness, and like its source was never known to freeze. 1746.

Fort-Augustus has always been a healthy garrison; but Fort-William, which lies towards the west coast, at the distance of twenty-eight miles

* It is probable, that the not freezing of this lake is owing to its great depth; for Count MARSILLI observes, [*Hist. Phys. de la Mer* that the sea, from 10 to 120 fathoms, is of the same degree of heat from December to the beginning of April; and he conjectures that it remains so for the rest of the year with little variation. Now, it is reasonable to believe, that the great depths in fresh water will be little more affected, than those of the sea, with the heat and coldness of the air; and therefore that the surface of Loch-Ness may be kept from freezing by the vast body of water underneath, of a degree of heat considerably greater than that of the freezing point. Another circumstance may concur: there is never any perfect calm on the lake, and the wind, blowing always from one end to the other, makes such an undulation as must much obstruct the freezing of the water. This account seems to be confirmed by an observation commonly made in the neighbourhood, which is, that when the water is taken out of the lake and kept without motion, it then freezes as soon any other.

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1746. from the other, has ever been sickly, and in particular subject to intermittents and the bloody-flux. On the west coast there are continual rains, and as the fort stands in a narrow and moist valley surrounded by mountains, there is not only a greater fall of rain, but a slower evaporation of moisture in that part than in any other of the country.

There being no straw at Fort-Augustus, the men were ordered to cut the heath for bedding; and it was observed, that such as were most careful in providing themselves with a due quantity, and renewing it often, were least sickly in the camp.

The weather, for the last half of May and beginning of June, had been uncommonly dry and warm, but afterwards it grew cold and rainy. Upon this change, the dysentery began to be more frequent; but there being constant winds, which kept the ground tolerably dry, the increase of the distemper by contagion seemed to be thereby prevented.

The flux, and the other diseases of this encampment, being attended with fizy blood, and other marks of inflammation, we found that large and repeated bleedings were more necessary here than in a warmer climate. But vomits were not so efficacious as they had been abroad, though at this time they were of more service than in the spring; as if, even in that latitude, some tendency to the autumnal disorders had already begun.

Besides

Besides the dysentery, there were fluxes of a milder kind among the soldiers, proceeding either from errors in diet, wet feet, or wet clothes, or accompanying fevers, when, from the want of sufficient covering, the sick could not freely perspire. 1746.

The inflammatory fevers, in proportion as the summer advanced, appeared with more moderate symptoms, and unless upon extraordinary expositions to cold, had not so often the form of a peripneumony, pleurisy, acute rheumatism, or the like, but were chiefly distinguishable by the siziness of the blood.

The intermittents partook of the nature of the autumnal remittent, and the inflammatory fever, and therefore required both bleeding, and evacuations of the *primæ viæ*. But they were never numerous, as the constant winds prevented any stagnation of the air, and soon dried the ground after rain.

In this camp, we had no other accommodation for the sick than a few huts in the neighbourhood; apprehending therefore bad air, we sent as many, as could be transported, to Inverness, and by this precaution the hospital-fever was retarded but not prevented. For when the sick multiplied, these infirmary-huts were crowded, the air was vitiated in them, the hospital-fever broke out and became fatal; and when this was joined to a common inflammatory disorder, a mixture of the two arose which

1746. produced some perplexing cases, from the indications of cure being so contradictory.

In the middle of August, the camp broke up, leaving at Fort-Augustus between 300 and 400 sick, who were afterwards carried to Inverness. By this time the hospital-fever was frequent among the inhabitants of that town, but was milder than usual, from the coolness of the weather and the open situation of the place.

From the middle of February, when the army crossed the Forth, to the end of the campaign, there had been in hospitals upwards of 2000 men, including the wounded; of which number near 300 died, and mostly of this contagious fever.

C H A P. VII.

A general account of the diseases of the campaign in Dutch Brabant, in the years 1746 and 1747.

1746. **T**HIS was the state of the health of the troops in Britain. In the Low-Countries, from the beginning of this campaign, there had been only 3 batallions of foot and 9 squadrons British. In August, 4 batallions were sent from Scotland to join the army, which landing at Willemstad, and remaining some time in that low and marshy ground, during the height of the sickly season, were soon afflicted

afflicted with the remitting, and intermitting fevers of the country; so that before they moved, those corps sent many sick to the general hospital then at Oosterhout near Breda. 1746.

The campaign abroad being attended with several fatiguing and wet marches, in autumn, after a hot summer, and continuing late, proved sickly. For at breaking up, exclusive of the wounded from the battle of Rocoux, about 1500 of our men were in hospitals; and this number at that time made nearly a fourth part of the whole. But there was nothing uncommon in the diseases, being such as regularly occur in the course of every campaign*.

In the ensuing spring, 1747. the army taking the field on the 23d of April, encamped first at Gilfen near Breda. Our troops consisted then of 15 batallions of foot and 14 squadrons; and some time after, 7 batallions more arrived from England; but 4 of these being employed in Zealand, and 3 in the lines of Bergen-op-Zoom, these 7 never joined the army. 1747.

The first days of the encampment were cold, then the weather grew mild, and continued so till the beginning of June, when it became hot. From taking the field, till towards the end of June,

* As the author attended the army in Scotland during this campaign, he could not give a more particular account of the diseases of the troops employed in the Low-Countries.

1747. there was little rain, and all the camp-grounds were dry.

In the first six weeks, about 250 were sent into hospitals; a moderate number, considering how early the troops had left their winter-quarters. The distempers took their usual course, that is, were mostly inflammatory.

The battle of Laffeld was on the 2d of July, and from about that time till towards the end of the month, there fell a good deal of rain, which cooled the air. About 800 wounded were brought from the field into Maestricht, where, among other places, a large church was given for an hospital, which though it contained above 100, yet by its spaciousness prevented the jail-fever, though many lay there, during the rest of the campaign, ill of fluxes and other putrid diseases.

After the battle, we crossed the Maes and encamped at Richolt. In a few days, we moved to Richel, and afterwards to Argenteau, still keeping in the neighbourhood of Maestricht. The situation of those camps was dry and airy, and there being at first no extraordinary night-duty, the diseases were few and but little inflammatory. The dysentery did not yet appear, unless among the guards, which at Richolt encamped on a low ground, then a little wet with the rains; but the cases were few and the symptoms mild.

From the 20th of July till the 10th of September, the weather was sultry, and till the middle of August the nights were nearly as hot as the days. During all that time the camp was healthy, but the wounded in the hospitals suffered; for the unusual heat either brought on slow fevers; or by relaxing the fibres, or rendering the humours acrid, sometimes kept the wounds from closing, and at other times disposed them, when healed, to break out afresh. About the middle of August, though the days were still hot, yet the nights began to grow cool, and the dews to fall; and from these interchanges, to which the men in camp were most exposed, the dysentery took its rise; as it usually does, from cold and damps, after the blood has undergone some alteration by continued hot weather.

Above half the soldiers had the distemper more or less; and it was more frequent among the officers than had been hitherto known. The contagion spread through the neighbouring villages, and was mortal among the peasants, who either wanted medicine altogether, or used what they had better been without. But Maestricht suffered little, though it had a constant intercourse with the camp; for that town standing on a large river, in an open country, is particularly well aired and healthful.

Notwithstanding the great frequency of the dysentery, few of our people died of it; for the

1747. sick were more dispersed, the hospitals were better aired than usual, and the regimental surgeons having been taught by experience, either cured the men in their field-hospitals, or made some necessary evacuations before they sent them to the general one at Maestricht.

In the beginning of October, we had much rain, and those who happened to be exposed to it were seized with the dysentery; but to the army in general, this rain was a favourable circumstance, as it cooled the air, and by that means sooner put an end to the disease.

About this time the autumnal remitting fever, which had begun in August, was frequent, but with nothing new either in the symptoms or in the cure.

In a few days after the rains, the army moved towards Breda; and as the weather began then to be cold, coughs, pleuritic stitches and rheumatic pains became common, either alone, or joined to the remitting fever.

On the 12th of November, the last of the British marched into winter-quarters.

Although there had been much sickness in the great camp during the campaign, yet there was little mortality; and at breaking up, considering how late in the season it was, the numbers sent from the main body into the hospital were moderate.

But

But in Zealand, the sickness was great among the four battalions which had continued there since the beginning of the campaign. Those men, partly in camp and partly in cantonments, lay in South-Beveland and in the island of Walcheren, two districts of that province, and both in the field and in quarters were so very sickly, that at the height of the epidemic some of those corps had but 100 men fit for duty: this was only about the seventh part of a complete battalion. The Royal, in particular, at the end of the campaign, had but four men that never had sickened. Now, the nature of the air in Zealand, and its effects in producing remitting, and intermitting fevers, and fluxes, having been already shewn, it will be sufficient to refer to that place for a general account of those distempers*; and for a more particular one, to the third part of this work †. I shall only observe here, that the epidemic fever, by reason of the great heats of this summer, not only began more early in Zealand than usual, but raged more, and was fully as fatal to the natives as to our men. Our officers there were also sickly; though by more timely and greater care, their fevers were attended with less ardent and alarming symptoms than those among the soldiers. But commodore MITCHEL'S squadron, which lay all this time at anchor in the channel between South-Beveland and the island of Walcheren, in both which places the epidemic prevailed, was neither afflicted with the fever nor the

1747.

* Chap. i.

† Chap. iv. § ii.

flux,

1747. flux, but amidst all that sickness enjoyed perfect health; a proof, that the moist and putrid air of the marshes was dissipated, or corrected, before it could reach them; and that an open situation is one of the best preservatives against the diseases of a neighbouring low and marshy country.

In proportion as the autumn grew cool, the fever abated of its ardour, and changed more easily into an intermittent, though irregular and of a bad kind. The dysentery was never general, but not uncommon; and it was observable, that those who were seized with it, usually escaped the fever; or, if any man had both, it was alternately; so that when the flux began, his fever ceased, and when the former was stopped, the other returned; hence it appeared, that though the two distempers were of a different form, yet they proceeded from a like cause.

As to the three other batallions which were sent to Bergen-op-Zoom, they encamped in the lines of that place and remained there during the rest of the campaign. The town itself stands on a small eminence, but the country around being in some parts marshy, the air, though not so moist as in Zealand, yet was less dry than about Maestricht. The sickness was in the same proportion, being, both in kind and violence, of a middle degree between what prevailed in those two places; that is, the fevers were as much below the rage of those in
Zealand,

Zealand, as they were above the mildness of the 1747.
remitting ones of the great camp. And if the
dysentery was more frequent in the lines of Bergen-
op-Zoom than in Zealand, the reason was, that the
men in the lines doing more duty, were oftner
exposed to rain, and by being in a fixed camp had
the distemper more by contagion.

At the end of the campaign, we had in hospitals,
from the main body of the British troops and all
detachments, exclusive of the wounded, above
4000, which was somewhat more than a fifth part
of our whole number. But it is to be remarked,
that the four batallions in Zealand furnished near
the half; so that when those corps went into
winter-quarters, their sick, in proportion to their
men fit for duty, were nearly as four to one.

C H A P. VIII.

*A general account of the diseases of the campaign in
Dutch Brabant, in the year 1748.*

THIS campaign, which was the last, opened 1748.
early. For upon the 8th of April, the army
encamped at Hillenraet near Roermond, with 15
batallions and 14 squadrons British. From the
time of our taking the field till the beginning of
May,

1748. May, the weather was cold, with some snow, high winds and rain; but the duty was easy, and the ground dry.

On the 12th of May, the army left Hillenraet, and in a few days came to Nistleroy, where we encamped for the last time, leaving in the hospital at Cuick about 500, and those, as usual in that season, mostly ill of inflammatory diseases. There was indeed an uncommon proportion of intermittents, which were not all recent cases, but for the most part relapses in such, as during the preceding campaign had been seized with fevers in Zealand, or in the lines of Bergen-op-Zoom. These intermittents, by reason of the coldness of the weather, were also attended with some degree of inflammation.

In this camp the British were augmented by seven battalions from England.

The weather was now warm, and the days often hot, but some seasonable rains, with thunder and lightning, seemed to prevent any sultry heats, and to purify the air of what was most insalutary. For it has been observed of thunder, that as it is most frequent in close and marshy countries, it may have for a final cause the cooling the air, and correcting the putrescency of the vapours, when the heats are most intemperate*. The ground besides

* MUSSCHENBROEK *Instit. Phys.* cap. xl,

was dry, and the camp airy; so that the sickness was inconsiderable as long as the troops kept the field. 1748.

From this good state of health, the four battalions, that had been in Zealand the last campaign, were an exception, as being subject to relapse into irregular intermittents, frequently ending in dropsies: so that their sick being numerous, and crowding the regimental infirmaries (which were in the cottages near the line) they soon bred the hospital-fever, which they carried to the general hospital at Ravenstein. But there, the wards being spacious and well aired, though several of the sick were brought in with petechial spots, yet the infection spread no further.

On the 9th of July, the camp broke up and the troops went into cantonments. The head-quarters were at Eindhoven, with the three battalions of guards; the rest of the foot were quartered in the adjacent villages, and the cavalry near Bois-le-duc.

At this time we had only about 1000 sick in all the hospitals, including such as had remained from the last winter and the preceding campaign; but in a few days after leaving the field, a fever appeared, which soon became as frequent as any that had hitherto afflicted the army. It was thus accounted for.

This

1748. This part of Brabant is nearly as flat as any ground of the Netherlands; the only inequalities being some sand-hills and insensible risings, which give the advantage of a few feet in height to some of the villages. The soil is a barren sand, and so little water is seen, that at first sight the country might seem to be dry and healthful. But this appearance is deceitful; for water is every where to be found at the depth of two or three feet; and in proportion to its distance from the surface, the inhabitants are free from diseases. The country bordering upon the lower part of the Maes is not only unhealthful on this account, but by reason of floods from the smaller rivers, lies all the winter under water, and continues damp throughout the summer. The moisture and corruption of the air were much increased by the inundations (which had been made about the fortified towns since the commencement of the war) and sensibly became more noxious upon letting off part of the water, in the beginning of summer, after the preliminary articles of the peace were signed. For these grounds, which were once intirely covered, being now half drained and marshy, filled the air with moist and putrid exhalations. The States of Holland being made sensible of this, by the sickness which raged at Breda and in the neighbouring villages, gave orders to let in the water again, and to keep it up till winter.

This sickness was much greater near Breda and Bois-le-duc than at Eyndhoven, which lay at a
greater

greater distance from the inundations and from other marshy grounds. The moisture therefore in most of the cantonments arose principally from the the subterraneous water which exhaled through the sand *. There were two villages near Eyndhoven, called Lind and Zelst, the one 10 and the other 14 feet above the surface of the water (an extraordinary height in that country) and it was observable, how much better the soldiers kept their health in both those places than in any other of the cantonments. 1748.

At Eyndhoven, two batallions of the guards were quartered in the town, and the third in the peasants houses in the country; all within the compass of a mile; yet, it was remarkable, that the batalion which lay out of the town had always three times more sick in their returns, than either of the other two, though one of them had been sickly the year before in Zealand. Now, the height of the ground being alike to all, the difference in point of health could be ascribed to nothing but to the greater moisture of the cottages †; seeing in other respects those corps were equal, *viz.* as to diet, duty and exercise. A similar case occurred in the cantonment of a regiment of foot, whereof one company being quartered in houses that stood upon a heath, enjoyed a tolerable degree of health, while the rest, that dwelt in a wood, were very sickly. And, as a further proof how prejudicial it is to

* Chap. i. p. 2.

† Chap. i. p. 4.

1748. confine the air by plantations, in a moist country, it was observable that the Dutch camp at Gilsen, bordering on our cantonments, but lying upon an open heath, preserved a good share of health while we were at the worst.

Thus far an account of our situation: we shall next see how much the weather concurred in forming this epidemic.

The summer had been hitherto warm, but throughout July and August, when the sickness was greatest, we had no rain, and the air was close and sultry. Near the inundations, the nocturnal fogs were thick and fetid. The heats abated in the beginning of September, and the sickness in proportion; but till the 20th of October, the weather was never cold. About that time we had some days of rain and high winds, and towards the end of the month, some nights of hard frost; then the weather grew mild, and continued so till we left that country.

The first and worst appearance of the epidemic was in the form of an ardent fever. The men were suddenly seized with a violent head-ach, and frequently with a *delirium*. If sensible, they complained also of grievous pains in their back and loins, of intense thirst, and a burning heat, with sickness and oppression at the stomach, or with retchings, and vomiting of bile. Others had an evacuation of the bile by stool, with a *tenesmus*,
and

and pains in the bowels. This fever generally remitted from the beginning, especially upon bleeding, and evacuations of the *primæ viæ*; but if those precautions were omitted, the disease went on in almost a continued form. Such was the tendency to putrefaction, that some had spots and blotches, and even mortifications, almost always fatal.

1748.

With these and such other symptoms, most of the cases were accompanied, during the first rage of the distemper, in the cantonments next the inundations; but those who lay farther from the water, and were only annoyed with the natural moisture of the country and the heat of the season, had fewer and milder fevers.

Thus, though the sickness was general, those who were near the marshes suffered by far the most, both in the number and violence of the symptoms. The Greys, cantoned at Vucht (a village within a league of Bois-le-duc, surrounded with meadows, either then under water, or but lately drained) were the most sickly. For the first fortnight they had no sick, but after continuing five weeks in that situation, they returned about 150; after two months, 260, which was above half the regiment; and at the end of the campaign, they had in all but 30 men who never had been ill. ROTHES'S and RICH'S dragoons, who also lay near the inundation, were likewise very sickly. JOHNSON'S regiment of foot at Nieuland, where the meadows

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had

1748. had been floated all winter, and were but just drained, returned sometimes above half their number. And the Scotch Fuzileers at Dinther, though lying at a greater distance from the inundations, yet being quartered in a low and moist village, had above 300 ill at one time. But it was remarkable, that a regiment of dragoons, cantoned at Helvoirt (a village lying only half a league south-west of Vucht) were in a good measure exempted from the distress of their neighbours, having remitting and intermitting fevers of a more favourable kind, and in a much smaller number. Such was the advantage of that little distance from the marshes, of the wind blowing mostly from the dry grounds, and of a situation upon an open heath, somewhat higher than the rest of the country.

Thus the troops had scarce been a month in the cantonments, when the returns of the whole were increased by 2000, and afterwards they rose considerably higher; for the sickness continued throughout August, and only abated with the heats, in the middle of September. Then indeed the fevers began to decrease in number as well as in violence; the remissions were also more free; so that insensibly, with the coolness of the weather, this raging fever dwindled into a regular intermit- tent, and intirely ceased upon the approach of winter. It was curious to observe how these intermit- tents declined proportionally to the withering and fall of the leaf. At that time less moisture ascends, and by the trees shedding their leaves, the villages
become

become more open and perflated, and of course more dry and healthful. 1748.

Throughout all the cantonments, the officers were remarkably less sickly than the common men; an advantage they owed to good beds, dry rooms, and a better diet.

The peasants were great sufferers, particularly those near Breda and Bois-le-duc; but in the towns, there was less sickness, and few in proportion died*. In general, the fever was most frequent among the poorer sort, who lay on ground-floors, fared ill, and wanted medicine: for without artificial evacuations, Nature was able either to make no cures, or but slow and imperfect ones. This country had not known so much distress for a number of years, as two such causes had not concurred; I mean the inundations, with a hot and close summer and autumn.

All this while the dysentery was little frequent; a circumstance which seems to require some discussion, when we consider, that the humours being then corrupted, how likely they were to affect the intestines. But it may be remembered, that this flux was said to appear, when after great heats the body was affected by wet clothes, wet ground, or night-fogs and dews†; but these, though common occurrences in a camp, are rare in quarters. Add, that the spreading of the dysentery is not owing so directly

* This is accounted for, p. 4.

† P. 19 and 55.

1748. to the season, wet clothes, or other accidents; as to the contagion arising from the putrid excrements of those that happen to sicken first of that distemper. Now, in the cantonments, the men were not only less liable to have their clothes wet, but when they were actually taken ill from such a cause, they were so much dispersed, that their excrements could not spread the infection.

About the middle of November, the peace being concluded, the troops moved from their cantonments to Willemstad, and there embarked for England; but the wind being contrary, several of the ships lay above a month at anchor, and, after all, meeting with a tedious and stormy passage (during which the men kept mostly below deck) the air was corrupted, and produced the jail- or hospital-fever.

This distemper was worst in the ships which transported the sick from the general hospital, at Oosterhout, to Ipswich; for, from some seeds of the disease already among them, but chiefly from the men being crowded in the hold, where they had been confined for three weeks, most of them were seized with this fever, either on board or soon after they landed. It was observable, that the greatest number, and the worst cases, were in one of the ships, in which there happened to lie two men with mortified limbs: this accident was not only the means of spreading the infection at sea, but also in the wards in which they lay after their arrival.

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The hospital, prepared at Ipswich for the reception of the sick from Oosterhout only, was obliged to admit several more from the other transports, which by strefs of weather put in on that coast; so that in all, we had about 400 there, and most of them ill of this contagious fever. Now as so many were brought from the hospital-ships in the worst state, the infection and mortality were at first considerable; but by the largeness of the wards, and by billeting in the town every man as soon as he recovered (thereby removing him from new contagion, and gaining more room for those who were still sick) the air was daily purified, and the distemper abated sooner than could have been expected. The hospital then broke up, after it had continued about three months in England.

1748.





O B S E R V A T I O N S
O N T H E
D I S E A S E S O F T H E A R M Y.

P A R T I I.

IN the first part, I have given a general account of the more frequent diseases of the army, as they occurred in the course of the war. But for particular descriptions, for the causes, the preservatives, and the cures, since they would have too much interrupted the series of facts that were proper to be presented at one view, I reserved them for different parts of this work, and shall therefore proceed in this,

I. To divide the diseases into their several classes ;

II. To inquire into the causes, as far as they depend upon the air, diet, and other of the non-naturals ;

III. To propose some means of prevention ;

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IV. To

IV. To compare the seasons, with regard to health and sickness; in order to compute what number of men may be relied on for service, at different times of the year.

C H A P. I.

Of the division of the diseases most incident to an army.

THE circumstances of soldiers, in time of war, are different from those of other people, in their being more exposed to the injuries of the weather, and always crowded together, in camps, barracks, and hospitals: therefore the most general division of their distempers may be, into such as arise from the inclemency of the weather, from bad air, and from infection.

Military diseases, depending on the weather, are reducible to two sorts, *viz.* to those of *summer*, and to those of *winter*; or, which is the same, to those of the *camp*, and to those of *garrisons*. But as expositions to cold are unavoidable upon the first encampment, as also for some time before an army usually leaves the field, the winter-diseases, beginning about the end of autumn, do not intirely cease before the summer is well advanced; and on the other hand, as the heats of summer and the damps of autumn dispose the body to sickness, the camp-disorders do not cease intirely with the campaign,

paign, but continue for some time after the troops return into winter-quarters: so that whenever we mention diseases as belonging to summer, or winter, to the camp, or to garrisons, they are to be understood as protracted in this manner.

If the more general diseases of an army are not to be defined by the seasons, but by the state of the body that accompanies them, we may divide them into the *inflammatory*, and the *putrid*; the inflammatory being the same with those of *winter*, and of the first encampment; and the putrid, the same with those of *summer* and *autumn*, and with part of those which are carried from the field into quarters.

The most frequent winter or inflammatory diseases are coughs, pleurifies, acute rheumatisms, inflammations of the brain, of the bowels, and of other parts, attended with a fever; lesser inflammations, with little fever; and fevers of an inflammatory kind, where no part is so sensibly affected as to give a name to the disease. Hither also may be referred the chronic affections that arise from inflammations; such as old coughs, consumptions, and rheumatisms without fever. Now, all these disorders are commonly supposed to be owing to a stoppage of perspiration only, at a time when the fibres are most braced, and the pores of the skin and lungs most contracted; but it is not yet clear, whether the cause does not rather depend upon something imbibed from the air.

But

But the diseases of summer and autumn are of a different nature. During these seasons the fibres are relaxed, the fluids are more rarified, and more disposed to putrefaction; in which state, if any stoppage happen to perspiration, or to any of the excretions, designed to carry off the more volatile or putrid parts of the blood, a fever is raised, which, according to the state of the humours, their acrimony, or the vent given them, appears in the form of a remitting, or intermitting fever, a *cholera*, or a dysentery. HIPPOCRATES ascribed distempers of this nature to a redundance of the bile; and most authors, to a corruption of that humour; so that these summer and autumnal epidemics have been both early and generally called *bilious*, though perhaps *putrid* would be more proper. Indeed, in all hot countries, and in camps, where men are so much exposed to the sun, the gall, if not more abundant, is at this time more disposed to corruption than usual; and this circumstance, though probably not the first cause of the fever, yet seems to be a frequent attendant of it, and of most of the summer and autumnal disorders, and possibly may concur to make them worse.

But when the same causes operate more slowly, or when the diseases last-mentioned are but imperfectly cured, the *viscera* may be obstructed, or affected in such a manner as to give rise to various chronic complaints: so that considering not only the variety, but the frequency of disorders appearing

pearing at this time, we shall find the ancient maxim that held, “the summer and autumnal to be the most sickly seasons”*, not only verified with respect to the warmer climates, but also to a camp, where men are so much exposed to heat and moisture, the great cause of putrid and contagious diseases.

Having in general, shewn the difference, between the diseases of summer and winter, it may be proper to consider the parts of those seasons, with regard to their influence upon the health of the men in the field, and in quarters. When the winter begins, the soldiers being thinly clad, get coughs, pleurifies, peripneumonies, and other inflammatory affections, from colds. The same continue throughout the spring; but as the weather is then milder, the cases are considerably fewer; so that this season is, of all the year, the least sickly to an army. But as soon as the troops take the field, though not earlier than the first, or middle of May, by that change the winter distempers recur, with intermittents and fluxes of an inflammatory kind. In the beginning of June, most of the inflammatory or winter-diseases disappear, and what remains are of a milder nature: on this account, and because the autumnal epidemics have yet made no progress, this commonly

* Saluberrimum ver est; proxime deinde ab hoc, hyems; periculosior æstas; autumnus longe periculosissimus. CELS. (*ex* HIPPOCRATES, *Aphor.*) lib. ii. cap. i.

proves the most healthful month of the campaign, July is likewise favourable, if the summer till that month has not been too hot; and if the men have not lain in wet clothes, nor on wet ground; accidents that usually give rise to the dysentery. But in temperate years, and upon dry ground, the diseases being milder, the remitting fevers, and fluxes begin only about the middle, or end of August, at the time when the days are still hot, but when the cool nights bring on dews and fogs. The dysentery declines with autumn, but the remitting fevers continue as long as the encampment, and never intirely cease till the frosts begin. Lastly, towards the end of the campaign, the cold weather renews many of the inflammatory symptoms; which, sometimes by themselves, but oftener combined with the remitting fever, make the first diseases of winter.

Although this be the common course, yet we may observe, that neither the inflammatory nor the autumnal disorders are so strictly confined to their seasons, but that by various accidents they may sometimes be seen out of their place. In these matters, though there can be no precision, it is of use to know what ofteneft occurs. In the year 1746. when the troops encamped in the north of Scotland, the inflammatory diseases, from the coldness of the climate, continued throughout summer; and the autumnal were either not seen, or were attended with so much inflammation, that bleeding made the greatest part of the cure.

It is to be further remarked, that as the two seasons run insensibly into one another, there will be a mixture and confusion of the two kinds of diseases. Thus, in the end of June, or beginning of July, whilst the inflammatory symptoms recede, those called *bilious**, or *putrid*, are advancing; so that whatever causes bring on an illness, it may be either owing to inflammation, or corrupted humours, or may have a mixture of the two. In the same manner, towards the decline of autumn, the autumnal fevers begin to have additional coughs, stitches, rheumatic pains, or some other symptoms of the winter inflammations.

Lastly, it is to be observed, that the diseases of the winter, and those of the summer, differ considerably as to their cure. Thus, in all winter or inflammatory disorders, the principal intentions are to diminish the force of the blood, to relax the fibres, and to make a revulsion from the parts inflamed; on which account the lancet and blisters are the chief remedies. But in summer and autumn, while the humours are in a putrescent state, and the solids too much relaxed, such medicines are wanted as clear the first passages, correct, or expel the more corrupted parts of the fluids, and

* I would once more caution my Reader, that by the term *bilious* I would distinguish some diseases, more in compliance with the common notion, than according to strict pathology; since it has never been proved that either the autumnal fevers or fluxes originally proceed from a redundant, or a corrupted bile.

brace the fibres: hence vomits, purges, acids, and the Bark are at that time of most service.

Thus far we may class the diseases depending upon the seasons, or the weather. It remains to consider such as proceed from foul air, and from contagion. The most fatal are the dysentery and the hospital-fever, which, though arising from other causes, spread most by infection. As to the small-pox and measles, as they were never general, I shall not rank them among the epidemics of an army.

The *lues venerea* and the itch are infections of a different kind. The first, not being more incident to soldiers than to other men, I shall likewise pass over; but the latter, being so frequent in camps, barracks and hospitals, may be reckoned one of the military diseases; and as such shall be treated of in these Observations.

C H A P. II.

Of the causes of diseases most incident to an army.

IT appears from the first part, that the most frequent diseases of an army are owing either to the sensible changes in the air, and so have revolutions and periods like the seasons on which they depend; or to such accidents as are almost unavoidable in a military life: it will therefore be proper to have a thorough knowledge of both those causes,

causes, in order to find out the means for lessening their influence.

§ 1.

Of the diseases occasioned by heat, and by cold.

GREAT heats are never so much the immediate, as the remoter cause of a general sickness, by relaxing the fibres and disposing the humours to putrefaction, whilst the men are the whole day exposed to the sun*. This was the case in every campaign, where it was observable, that no epidemic ever appeared upon the greatest heats, till the perspiration was stopped, or the body otherwise affected, by wet clothes, wet beds, dews or fogs; and then some fever or flux ensued. In the campaign of 1743. though the weather continued long hot, yet we had no great sickness till the men lay wet after the battle of Dettingen, and then the dysentery began †. Again, in the year 1747. the summer was likewise hot, but without any bad effects till towards the end of August, when

* Soldiers in a camp suffer much from heat, by being constantly exposed to the sun, either without any shade at all, or only covered by a thin tent; and where the air being so much confined, the heat is often more insupportable than without, in the sun. This circumstance, joined to the damps of a camp, seems to be the cause that the summer and autumnal diseases of an army, even in a northern latitude, resemble so much the epidemics of southern countries, especially of those with a moist air.

† Part i. chap. iii.

the nights growing cold, the dews of that season, and the frequent fogs that then prevailed, visibly brought on the same distemper *. And in the last campaign, though the heats were great, yet they were the cause of little sickness, till the troops were cantoned in the marshes, where a considerable degree of putrefaction and moisture being joined, the ardent, remitting, and intermitting fevers, and fluxes, were only the remoter effects of that heat †.

We must allow nevertheless, that the heats have been sometimes so great as to prove the more immediate cause of particular affections; as when centinels were placed without cover, or frequent reliefs, in a scorching sun; or when the troops marched, or were exercised in the heat of the day; or when the men imprudently lay down and fell asleep in the sun: all these circumstances were apt to bring on distempers, varying according to the season. In the beginning of summer, such errors produced rheumatic and other inflammatory fevers; and in the end of it, or in the beginning of autumn, a remitting fever, or a dysentery.

But cold is oftener the more immediate cause of diseases, and is hurtful two ways; either when pure, or when attended with moisture; of which, the last is the worst. The disorders arising from cold weather are all of the inflammatory kind, *viz.* coughs,

* Part i. chap. vii.

† Part i. chap. viii.

pleurifies,

pleurifies, peripneumonies, rheumatic pains, and the like; together with consumptions, which in the army are almost always owing to neglected colds. The mildness of our winters, and the little duty of our troops in time of peace, make expositions to cold less frequent at home. But in war, it is to be remembered what a change a soldier undergoes, from warm beds, and the landlord's fire-side in England, to cold barracks, scanty fuel, and sharp winters in the Netherlands; and all this without any addition of clothes. Now, how liable our men were to take cold, was seen in the account of the first garrison-sickness, and of the diseases in the beginning and end of every campaign.

§ 2.

Of diseases occasioned by moisture.

MOISTURE is one of the most frequent causes of sickness. In the account of the diseases of the first winter, we observed how much the men suffered by damp barracks, especially at Bruges. The same remark was repeated in the next winter, and in the campaign of 1745. But soldiers are also liable to damps in their tents, where the air can never be thoroughly dry, by reason of a constant exhalation, and is often very moist from rains. These damps are common to all camps, and particularly to those in the lower and wetter parts of the Netherlands. But observe,

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that

that neither canals, nor even large inundations, where the water is deep, are nearly so dangerous, or exhale so much noxious vapours, as marshy grounds, or meadows that have been once floated and but lately drained; and that fields, though dry in appearance, may yet be moist by the transpiration of the subterraneous water.

The moisture of a season is commonly estimated by the quantity of rain, whereas it depends more on the constancy of moist winds, whether they bring great rains or none at all *; but most of all upon close weather, especially in low and woody countries. In one case, rains will cause a dangerous moisture of the air, when the water stagnates and corrupts in low grounds after land-floods; but otherwise, in the flattest countries, if provided with drains, frequent summer-showers have a salutary effect, by tempering the heat, refreshing the stagnating water, and precipitating the putrid exhalations †. It is remarkable that pestilential diseases have frequently occurred in dry and hot summers ‡;

* I made no experiments on the dryness and moisture of different winds in the Netherlands; but trusted to the accounts of others. MUSSCHENBROEK reckons all their northerly winds drying, but the East and North-East the dryest, and the West and South-West the moistest. *Institut. Physic. cap. xliii.* Compare Ld. BACON'S *Nat. Hist. cent. viii. exp. 786.*

† See part i. ch. i.

‡ I d. BACON'S *Nat. Hist. cent. iv. exp. 383.* DIEMERBR. *de est. lib. i. cap. viii.* And of this work, part iii. ch. iv. § iv.

and agreeably to this, I have observed that the most sickly seasons in the field have been attended with the greatest heat, and the least rain. But it will be proper to add, that though showers in summer may be generally conducive to health, yet they have a different effect when the men are obliged to march in them, or lie upon the ground whilst it is wet with rain.

Cold and moist air affecting the body, in winter produced many inflammatory disorders, and relapses into such distempers as the men had been first seized with in autumn; and this effect was still more manifest in the spring and beginning of summer, upon our first taking the field.

But the consequences of moist air, after great heats of the weather and rarefaction of the blood, are more dangerous. For moisture relaxes the fibres, stops perspiration, and weakens the vital powers; so that when the humours are disposed to corrupt by the heat, it is not surprizing that disorders of a putrid nature, such as the autumnal fevers and fluxes, should then ensue.

The too great dryness of the air has likewise been mentioned by some as a common cause of epidemic diseases; but, I imagine, without reason. For whether in winter-quarters, or in camps, the soldiers are generally exposed to too much moisture; and as for the great droughts in summer, we are not thence to infer an over-dryness of the air, but rather

the contrary. For the hotter the air is the more water it will dissolve, and rains clear it of much moisture; so that upon the whole, it is perhaps in the sandy deserts only, we can learn what distempers are incident to men breathing in too dry an atmosphere.

§ 3.

Of the diseases arising from putrid air.

I SHALL next consider the putrefaction of the air, which of all the causes of sickness is perhaps the most fatal and the least understood. This bad air, so hurtful to an army, may be divided into four kinds; the first, arising from the corrupted water of marshes; the second, from human excrements lying about the camp, in hot weather, when the dysentery is frequent; the third, from straw rotting in the tents; and the fourth kind, is that which is breathed in hospitals crowded with men ill of putrid distempers. Of this sort also, but in a lesser degree, is the air of full barracks not kept clean; and of transport-ships, when the men have little room, and are long on board.

As to the first kind of bad air, it may be observed, that during the late war the whole army never happened to encamp so near the marshes as from thence to receive any sensible harm; but detach-

detachments have suffered from this cause; as one did in Zealand; another in the lines of Bergen-op-Zoom *; and in the last year of the war, a great part of the troops, being cantoned near the inundation of Bois-le-duc, became extremely sickly †. Now, as the exhalations from marshes do not consist of watery vapours only, but also of putrid *effluvia*, arising from innumerable vegetables and insects that die and rot in them, it is no wonder that the distempers incident to those who breathe such air, should be of a similar nature; and that the autumnal fevers and fluxes should be so frequent, so infectious and so dangerous in those countries ‡.

Next to marshes, the worst encampments are on low grounds close beset with trees; for the air is then not only moist and hurtful in itself, but by stagnating becomes (from the filth of the camp) more susceptible of corruption.

The second and third kinds of bad air are owing to the privies of a camp, and to rotten straw. Both these are always offensive, but while the bloody flux prevails, as they contain the putrid excrements and *effluvia* of the sick, they are then more infectious and dangerous. At certain seasons, the most healthy have some disposition to the dysentery, which might go easily off, were it not for those destructive steams, that work like a ferment, and ripen the disease.

* Part i. ch. vii.
and viii.

† Part i. ch. viii.

‡ Part i. ch. vii.

The last source is from hospitals, barracks, transport-ships, and in a word from every crowded place, where the air is so confined, as either to lose some of its vital principle, by frequent respiration; or to be loaded with foul steams, and the perspirable matter, which, as it is the most volatile part of the humours, is also the most putrescent. Hence it is, that in proportion to the uncleanness of such places, to the number of dysenteries, and of foul sores, but especially of mortifications, the contagious fever is frequent and mortal*.

§ 4.

Of diseases arising from errors in diet.

IRREGULARITIES in diet are commonly, but unjustly, supposed to have the greatest share in producing military diseases. Were this the case, the changes in the weather and seasons would not so sensibly affect the health of soldiers; the soberest and most regular corps would not be so sickly; different nations in the same camp, living variously, would not be afflicted with the same distempers; nor would there be such an inequality in the numbers of the sick, in different years, were the greatest part of the diseases owing to any other causes than what have been already assigned. All therefore

* This subject *of diseases arising from putrid air* will be more fully treated in part iii. ch. vii, § 6.

that can be admitted on this article, is, that there may be rules of diet established, by which the soldiers may be made somewhat less liable to sickness; but none can be proposed that will make any considerable exemption, if the weather, the ground for encampment, and other circumstances do not concur to favour them*.

A soldier, in time of war, by the smallness of his pay, is secured against excess in eating, the most common error in diet. The danger is on the other hand; for when all are not obliged to eat in messes, some will be apt to spend their money upon strong liquors, and to squander away in one day their whole maintenance for a week. But when every man is obliged to contribute his share to a mess, we may be assured there can be no errors in diet of any consequence, whilst almost the whole pay is bestowed upon common food. For as to the abuse of spirits, and of fruit, and drinking bad water, however generally they have been accused, I will venture to affirm, that those three causes together never occasioned the tenth part of the sickness of the army, in any of our campaigns.

First, as to spirits, it may be observed, that even when drunk to excess, they tend more to

* This article upon diet is only to be understood as relating to men in health, and not to the sick, who ought to be under the strictest regulations, depending on the hospital, and not left to themselves, or to their nurses.

weaken the constitution than to produce any of the common camp-diseases; or if some actually sicken after drinking, we may be assured that many more are preserved by taking those liquors in moderation. Let us not confound the necessary use of spirits in a camp, with the vice of indulging them at home, but consider that soldiers are often to struggle with the extremes of heat and cold, with moist and bad air, long marches, wet clothes, and scanty provisions. Now, to enable them to undergo those hardships, it is proper that they should drink something stronger than water, or even than small-beer, which is commonly new and bad in camps, and even there too dear for their common use.

And as to fruit, another supposed cause of the autumnal fever and dysentery, it must be still more innocent; since these disorders being either of an inflammatory, or a putrid nature, cannot be owing to what is acid. Were the dysentery the effect of eating too much fruit, should we not find it more common among children? Nor indeed are the soldiers over-fond of it; or if they were, have they means to purchase it. We can hardly imagine that when the daily pay, after stoppages, can but just procure a pound of good meat, a man will bestow any part of it upon fruit. A few disorderly men may rob orchards; but the dysentery and fevers are diseases to which the most regular are equally subject. It may be further remarked, that
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our worst flux began in the end of June *, when there was no other fruit but strawberries, which the soldiers never tasted; and that the same disorder almost ceased about the first of October, when the grapes were ripe, and so plentiful, in open vineyards, that the men eat what quantity they pleased. To these arguments, add the authority of SYDENHAM, who never mentions fruit as the cause of the dysenteries which were epidemic in London in his time †; and DEGNER, another diligent observer, and the author of a good treatise on that disease, expressly says, that fruit had no share in producing that flux which raged some years ago at Nimeguen ‡.

This point being then so plain, it may seem strange how a contrary opinion should have so generally gained belief, if it be not thus accounted for. The bloody flux usually coincides with that season in which fruit is in the greatest plenty; and as fruit is laxative and apt to gripe, it was natural to assign no other cause for the dysentery, than eating it immoderately; and the rather as the true cause was so little obvious. - But besides that strong people are little subject to a looseness from eating fruit, we may observe how different the camp-dysentery is from a common *diarrhœa*, in symptoms, danger, and cure. It may be allowed, that eating too much fruit disposes the body to intermittents,

* Part i. ch. iii. † Op § iv. cap. iii. ‡ Hist. Dysent.
cap. ii. § xxx.

especially

especially in a moist country; but the remitting fever of the camp is not only of a more putrid nature, but is mostly attended with a sensible inflammation. But granting that fruit is capable of producing both fevers and fluxes, such as prevail in an army, yet in some hundreds which have been under my care for these distempers, as I never, upon the strictest inquiry, could discover this to be the cause, I must conclude that it so rarely takes place, that we may omit it in the account. At the same time it will be proper to observe, that whoever is actually under the cure of a flux, or but lately recovered, should be cautious with regard to fruit; for though the acid may be good for correcting the disposition to putrefaction, yet the bowels may be too much relaxed, and in too tender a state to bear any sharp, cold, or flatulent aliment. For the same reason, those who have lately recovered of intermittents must forbear eating it, or use it moderately. Nor should the most healthy person eat freely of it in close and marshy countries; because whatever is of so cooling and relaxing a nature, may too much weaken the habit, and the stomach in particular; by which means fruit, though in itself antiseptic, may yet lay the foundation of some putrid disease.

Lastly, that many disorders are owing to bad water, has been an ancient and prevailing opinion, and even HIPPOCRATES refers various affections to this cause. But without entering into an inquiry about the justness of his notions, I shall only
remark,

remark, that we are not to apply what is said of the water in the country where that author practised, to what our army commonly drank, which was plentiful and good. The only exception worth notice was in Zealand, where the water being indeed less pure, it might concur with other causes in making the sickness more general in that province*. But in most other places our water was blameless, and particularly in the two seasons during which the bloody-flux was most epidemic †.

To conclude, whoever will give attention to the account of the several campaigns, will see such an uniformity in the rise and periods of the diseases, and that so much connected with the state of the air, as will be sufficient to convince him, that neither the abuse of spirits, nor of fruit, nor drinking bad water, could have any considerable share in producing them.

§ 5.

Of diseases arising from excess of rest, and motion; of sleeping, and watching; and from want of cleanliness.

THE life of a foot-soldier is divided between the two extremes of labour and inactivity. Sometimes he is ready to sink under fatigue,

* Part i. chap. i. and vii.

† *Viz.* In the camp at Hanau, in the year 1743. and at Maestricht, 1747. See part i. chap. iii. and vii.

when

when having his arms, accoutrements and knapsack to carry, he is obliged to make long marches, especially in hot or rainy weather; though the most frequent errors of men of that rank are on the side of rest. But the cavalry lead a more uniform life, having little fatigue by marches, and a constant but easy exercise, both in the field and in quarters, in the care of their horses; one reason for their better health.

Sometimes the service requires such frequent returns of duty, that the men have not time to sleep; but such occurrences are rare, and generally when soldiers are off duty they sleep too much, which enervates the body, and renders it more subject to diseases.

It is well known how necessary it is to keep up the perspiration; and also, how much the uncleanness of the person will concur with other things to frustrate that intention. I have observed in the hospitals, that when men were brought from the camp with fevers, nothing so much promoted that discharge, as washing their feet and hands, and sometimes their whole body, with warm water and vinegar, and giving them clean linen. So that officers judge rightly with respect to the health of the men, as well as to their appearance, when they require cleanness both in their persons and clothes.

Under this head, it will be proper to mention the itch, perhaps the most general distemper among
soldiers,

foldiers. The itch spreads so easily by the contact of the foul person, or of his clothes, that one in the same tent, mess, or barrack, will often communicate it to the rest: this circumstance, joined to the little attention which men of that rank have to cleanliness, makes it difficult to keep it under, though the cure of each individual be generally easy.

C H A P. III.

Of the general means of preventing diseases in an army.

ALTHOUGH most of the causes of diseases above enumerated, *viz.* the excess of heat, of cold, or of moisture; a putrid state of the air, great fatigue, wet clothes, and other circumstances, which can hardly be avoided in times of service; yet as these only dispose men to sickness, and do not necessarily bring it on, it is incumbent on those who have the command, to make such provision, as shall better enable the soldier to encounter those hardships so incident to a military life. For it is almost needless to add, that the preservatives from the most of his diseases cannot depend on medicines, nor on any thing which he shall have in his power to neglect; but upon such orders only, as, at the time that they appear not unreasonable to him, he shall be obliged to obey.

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We shall therefore inquire into the means of preservation from sickness, in the order of its causes before-mentioned*; and as the chief depends on the air, we shall consider the proper precautions to be used in regard to it; and shall next propose some regulations about the diet, and other points that may fall under the direction of the officers.

§ 1.

How to prevent diseases arising from heat, and cold.

TO palliate the effects of intemperate heat, commanders have found it expedient so to direct the marches, that the men should come to their ground before the heat of the day; and to give orders, that none of them sleep out of their tents, which in fixed encampments may be covered with boughs, to shade them from the sun †. It is a rule of some importance, to have the soldiers early out, and exercised before the cool of the morning is over; for by that means not only the sultry heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the heat of the day. Lastly, in hot weather, it will be found proper to shorten the centinel-duty, whenever the men are to stand without any shade.

* Chap. ii.

† Ne aridis, et sine opacitate arborum, campis aut collibus, ne sine tentoriis, æstate, milites commorentur. *VEGET. de Re Milit. lib. iii. cap. ii.*

The preservatives from cold consist of clothes, bedding, and fuel. The experience which we have had of the use of under-waistcoats, during the winter-campaign in Great-Britain *, should teach us to make the same provision for the whole army in any future war. None of the foreign foldiers are without this necessary part of clothing; and indeed no man of the meanest condition abroad. Under-waistcoats would not only be useful in winter-quarters, but greatly so, on first taking the field, and towards the end of the campaign. How much likewise watch-coats were wanted for centinel-duty, appeared from the general account of the diseases during the first winter. Another article is, to provide strong shoes; for it is well known how easily men catch cold by wet feet.

The second means of preservation mentioned was bedding, by which is understood a blanket for every tent of the infantry. This provision, attended to by other nations, has generally been neglected both by the French and us. We have observed of what service the cloaks were to the cavalry; how useful therefore blankets must be for preserving the health of the foot, in the beginning and end of a campaign, is obvious. The only point to be considered, is, whether the expence, and impediment of so much baggage, will over-balance that advantage †.

* Part i. chap. vi.

† Since the first edition of this work, all our foot upon service have been provided with blankets.

The last preservative was fuel. Of this our soldiers might require a greater supply, as being at home so little inured to cold; but, as bearing some degree of it in winter-quarters may tend to harden them against an early campaign, all that is required, is a proper quantity for dressing their victuals, correcting the dampness of their barracks, and the rigour of winter; trusting rather to their warmer clothes, and to exercise, than to fire, for preventing diseases arising from cold. We find these two articles of clothes and fuel expressly recommended to the care of commanding officers by VEGETIUS, an author who has preserved the fullest account of the ancient Roman discipline*.

§ 2.

How to prevent diseases arising from moisture.

WHEN troops are to go into garrison, it is the business of the quarter-masters to examine the barracks offered by the magistrates of the place, and to refuse the ground-floors in houses, which either have been uninhabited, or have any signs of moisture. We had an instance of the comparative dryness of upper stories †, which are

* Non lignorum patiantur (milites) inopiam, aut minor illis vestium suppetat copia; nec sanitati enim nec expeditioni idoneus miles est, qui algere compellitur. VEGET. *de Re Milit.* lib. iii. cap. ii.

† Part i. chap. ii.

always preferable; and particularly in the Netherlands, where the houses are without drains. But if dry habitations cannot be procured, the chief prevention of sickness, from moisture, will then depend upon fuel.

In the field, the best security is by making trenches around the tents; by which means not only the natural moisture of the earth is lessened, but the rain-water is intercepted and carried off without wetting the straw. This is necessary even though the camp be to remain but for a few days on the same ground.

It is of much importance to allow soldiers plenty of straw, and to have it often renewed; for a dry and fresh bedding is not only comfortable, but a preservative against diseases; and one reason of the better health which an army enjoys upon shifting ground, as the damp, or rotten straw, is then left behind. But in fixed camps, when the straw is not often enough changed, it will be proper to have the tents opened every day, for some hours; and once in a few days, to have all the straw taken out and well aired: without this precaution it will not only grow damp, but soon rot and prove unwholesome.

It is also necessary for the officers to air their tents daily; if this be not attended to, every thing will contract moisture. They are further to be admonished, not to lay their matras upon the grass,

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but to raise their bedding from the ground, or to use a bedstead. Oil-cloths spread on the ground of the tent, and kept dry, intercept much of the rising vapour. Towards the end of the season, when the weather grows cold and damp, it will be found useful to burn spirits in the evening, in order to warm and correct the air in their tents. But at no time are the officers to confine the air too much, not even in cold weather, and especially when sick; holding it for a rule, that there is more danger in lying in a moist atmosphere, loaded with their own *effluvia*, than with the curtains of the tent open, as the marquise is sufficiently close.

Soldiers are unavoidably exposed to rain on marches and out-duty, and upon getting wet clothes are liable to fall sick, unless they be allowed to cut down wood to burn in the rear of the camp; an indulgence which I have observed to be necessary on those occasions.

Where the grounds are equally dry, the camps are most healthful on the banks of large rivers; because in the hot season, those situations have the advantage of fresh air from the water, to carry off the putrid exhalations. And in cantonments, we are not only to seek villages removed from marshy grounds, but such as are least shut up with trees, and stand highest above the subterraneous water. In moist countries, towns are preferable to villages, and to single dwellings, for the reasons already given*.

* Part i. chap. i. and viii.

§ 3.

How to prevent diseases arising from putrid air.

HAVING in the last chapter enumerated the common sources of putrid air which affect an army, I shall now offer a few considerations upon the means for removing, or lessening each in particular.

First, with regard to the putrid air of marshes and other stagnating water, the preservatives mentioned under the article of moist air are in a good measure applicable here. If the military operations shall oblige an army to continue long upon such ground, the best expedient will be to make frequent removes*; for by shifting, the straw will be changed, the men will have more exercise, and the old privies will be left behind, which in camps are particularly noxious, on account of the frequency of the dysentery.

As to cantonments in marshy grounds, if the troops must remain there in the dangerous season, it will be less hurtful to float the fields intirely, than

* Si autumnali æstivoque tempore diutius in iisdem locis militum multitudo consistat, ex contagione aquarum et odoris ipsius fœditate, vitiatis haustibus, et aëre corrupto, perniciosissimus nascitur morbus, qui prohiberi aliter non potest nisi frequenti mutatione castrorum. VEGET. *de Re Milit. lib. iii. cap. ii.*

to leave them half dry; for the shallower the water is, the more it will corrupt, and the evaporation will be greater in proportion. The regiment at Helvoirt, which lay off the inundation about half a league only, was an instance how near troops may be to marshes without any remarkable sickness*; at least if the wind should carry the vapours a different way. Commodore MITCHEL'S squadron in Zealand, and the healthy cantonments at Eyndhoven, Lind and Zelst; in a sickly neighbourhood, afford more instances of the same nature †. Nay, it has been observed that in Rome, the sphere of noxious vapours, from the adjacent marshes, has extended to those streets only which lay nearest them, occasioning bad fevers there, whilst the rest of the city was healthful ‡. Thus, sometimes a small remove from the marshes may prevent a general sickness. But if moving be inconsistent with the service, as it happened in the campaign 1747. when some battalions were sent to Zealand, and in the summer following, when our troops were cantoned among the inundations, we must be content to lessen those evils which cannot wholly be avoided. As this is chiefly to be done by diet and exercise, we shall propose the rules when we come to treat of those articles.

Whenever the dysentery begins to spread, the best means of preserving health are to leave the

* Part i. chap. viii.

† Part i. chap. vii. and chap. viii.

‡ LANCIS. de Nox. Palud. Effluv. lib. ii. epid. i. cap. iii.

ground,

ground, with the privies, foul straw and other filth of the camp; which method is to be repeated once or twice more, or oftner, if consistent with the operations; or at least till the middle of September, when the danger is in a great measure at an end. The first campaign furnished a good argument for this practice; for the long continuance on the same ground, at Hanau, kept up the rage of the dysentery, which, upon decamping, suddenly abated*. And in the year 1745. the flux was milder than ever we have known it, which we ascribed not only to the coolness of the season, but also to the frequent removes of the camp, during the time that the army was most liable to the disease †. But if any circumstance should make it improper to change the ground when the dysentery begins to spread, other methods must be taken to check its progress.

In order therefore to preserve a purity of air in the dysenteric season, let there be some slight penalty, but strictly inflicted, upon every man that shall ease himself any where about the camp, but in the privies. Further, from the middle of July, or upon the appearance of a spreading flux, let the privies be made deeper than usual, and once a day a layer of earth thrown into them, till the pits are full, which are then to be well covered, and others to be dug. It may also be proper to order the pits to be made either in the front or rear, as

* Part i. chap. iii.

† Part i. chap. v.

the reigning wind of the season may best carry off their *effluvia* from the camp. Moreover, it will be necessary, frequently to change the straw, it being not only apt to rot, but to retain the infectious steams of those who have fallen ill of the disease. But if fresh straw cannot be procured, more care must be taken in airing the tents and the old straw, as before directed.

Lastly, when the dysentery begins to be frequent, the sick should not be sent to one common hospital; at least not in such numbers as may vitiate the air, so as not only to communicate the infection to others, but to keep it up among themselves. This rule will be enforced by attending to the facts mentioned in the account of the German campaign*, compared with what passed in the summer 1747 †. Therefore when the dysentery prevails, the regimental surgeons are to treat the slighter cases in the camp itself; and as many of the rest as they can conveniently attend or accommodate, in the regimental-hospitals, which are then particularly to be chosen spacious and airy. Barns, granaries, and the like places, will allow the steams to disperse, without any danger from cold, as the weather is usually warm during that time. As to the general hospital, let it receive such only as the regimental hospitals cannot accommodate, and the sick that cannot be moved with the army. Without this dispersion of the men, the great hospital may,

* Part i. chap. iii.

† Ibid. chap. vii.

in sickly times, be charged with some thousands, who cannot be well attended, but by a greater number of physicians than has hitherto been employed by the public. But were this objection removed, it would be still unadvisable to have but one general hospital, on account of the mortality that always ensues upon crowding together a number of putrid and contagious diseases.

Having, in the account of almost every campaign, mentioned the frequency of the hospital-fever, I need not now urge the necessity of using precautions against it. Without entering upon a particular account of its nature, which is reserved for the third part of this work, I shall at present only propose the means by which this disease may be kept either from appearing at all, or, at least, with so much contagion and danger. These means shall be considered under two heads; one, relating to the choice of hospitals; and the other, to the management of the air in them.

In treating of the bloody-flux, the most airy and spacious houses, to be procured in the neighbourhood of the camp, were recommended, for the better recovery of the sick, and for guarding against infection. Now the same means will also tend to prevent the hospital-fever, as the dysentery is so apt to breed it*. On these occasions, it is common

* The putrid *effluvia* of the dysenteric *fæces* are not only apt to propagate the flux, but likewise to breed the jail or hospital-fever, with, or without bloody stools.

to look out for close and warm houses, and therefore to prefer a peasant's house to his barn; but experience has convinced us, that air more than warmth is requisite. For this reason, not only barns, stables, granaries and other out-houses, but, above all, churches make the best hospitals, from the beginning of June till October. Of this there was an instance in the campaign of 1747. when a large church at Maestricht was applied to that use; and where, notwithstanding above 100 lay in it, with foul sores, fluxes, and other putrid diseases, for three months together (during the greatest part of which time the weather was hot) this fever never appeared*. It may therefore be received as a maxim, that the more fresh air we let into hospitals, the less danger there will be of breeding this contagious distemper.

Another point to be observed in a fixed camp, is to have the regimental hospitals scattered, and not crowded into one village. And for the same reason, if it should be necessary for the general hospital to admit a great number at a time (which must frequently be the case, upon the motion of an army after a long encampment) it will be proper to have the sick dispersed into two or three villages, rather than kept in one; though a narrower compass may be more for the œconomy of the hospital, and the easier attendance on the men. The want of pure and wholesome air cannot be com-

* Part i. chap. vii.

penfated by diet or medicine: hence appears the expediency of carrying, at all times, as many of the fick along with their regiments as can eafily be transported.

It may be proper however to make the following diftinction. In the firft part of a campaign, when inflammatory diftempers prevail, thofe who are taken ill are to be left behind; as fuch cafes leaft admit of motion, and at the fame time are not infectious. But thofe who fall ill from the end of fummer to the decline of autumn, as having difeafes of a putrid kind, but which bear motion, and generally mend upon a change of air, ought rather to be carried with their regiments and difperfed, than collected into one place, to breed and propagate the infection.

As thefe regimental hospitals are of fuch confequence, it would be advifeable to fupply them with blankets and medicines from the public ftore, with an allowance alfo for nurfes and other neceffaries. Nor is this care requifite in the field only, but alfo in winter-quarters; as there will generally be more fick, on the camp breaking up, than can be well attended by the phyficians upon the eftablifhment. In the campaign 1743. about 3000 were left in the general hospitals; and in the year 1747. upon going into winter-quarters, the returns of the fick amounted to 4000. In the courfe of the former war, one phyfician has had the charge of 700 at a time; in which cafe, though
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the hospital might be said to have a physician, it could reap little advantage from his attendance. But suppose that a sufficient number were employed, yet the crowds of the sick, by corrupting the air, would render most of their care ineffectual. This may be easily conceived from what has really happened; for passing over the pestilential mortality in the hospitals of the first campaign, and taking the rest since at a medium, there has been commonly such a degree of bad air in them; as to render the practice but little successful; insomuch, that upon the most favourable computation, I have found that 1 in 10 died of all that were admitted. Besides the better chance for good air, there is a further advantage attending the regimental infirmaries, which is, that the several surgeons are best acquainted with the constitution and disposition of their patients, as well as with all the circumstances of their distempers. And as the physician is still to be resorted to in any case of difficulty, or is to make regular visits, there can be no objection made to this method of treating the sick; which, as often as it has been tried, I have observed to have been more successful than that in the large and general hospitals. To enable the surgeons the better to do their duty to their own regiments, it will be necessary, in time of war, to give each an additional mate; as it must often happen, that the sick will be too numerous to be properly attended by themselves and one mate

mate only: besides, in sickly times, one of them may fall ill, or possibly both.

We shall next consider the general hospitals, which are of two kinds, *viz.* the flying-hospital, attending the camp at some convenient distance, and the stationary hospital, which is fixed to a place. In the choice of both, those who have the direction should take care to provide large and airy wards, remembering that warmth is not wanting in summer, and that in winter it is chiefly to be procured by fires. It would also be proper to have those places in towns rather than in villages, as in the former we are likely to find larger rooms, besides other conveniencies.

As to the disposition of hospitals, with regard to preserving the purity of the air, the best rule is, to admit so few patients into each ward, that to those unacquainted with the danger of bad air, there may appear room to take in double or triple the number. It will also be found a good expedient, when the ceilings are low, to remove some part of them, and to open the garret-story to the tiles. Constant experience evinces, that in a few days the air will be corrupted in close and crowded wards; and what makes it hard to remedy the evil, is the difficulty of convincing either the nurses, or the sick themselves, of the necessity of opening the doors or windows at any time for air. I have generally found those rooms the most healthful, where, by broken windows and other defects, the air could not be excluded.

It

It is therefore probable, that when fire-places are wanting, a preservative would be found in the use of the ventilators of my late worthy friend the reverend Dr. HALEs, of which some might be made for the hospitals small enough to be easily carried about. By such an invention we might hope for a considerable purification of the air in every ward; and the working them might be a good exercise for the convalescents. As these ventilators must be of a smaller size, for the convenience of carriage, the same might be likewise used on board the transport ships *.

In winter-hospitals, chimneys only should be used, and stoves never; for though the latter may warm a large ward better and at less expence, yet
by

* I was favoured with the following paper of directions from the celebrated inventor, whom I consulted on this occasion, but his method was never put in practice.

“ Some considerations about means to draw the foul air
“ out of the sick-rooms of occasional army-hospitals, in private
“ houses in towns.

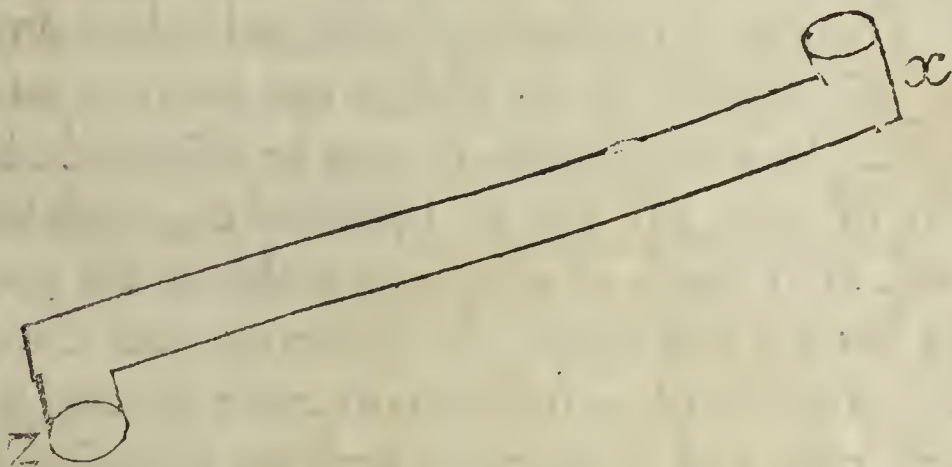
“ As it seems improper to draw the air out of these rooms,
“ by small moveable ventilators placed in the passages be-
“ tween the rooms, because the foul air that is drawn out will
“ soon return from those passages into the sick rooms; so the
“ most likely means that occur to me for doing it, is to have
“ a board screwed fast, and not nailed, because of the noise,
“ to the upper part of a window on the outside of each room.
“ This board is to have a round hole in it, and also the glass
“ opposite to it, of a size to receive a trunk of a sufficient
“ length to reach from the window to a small ventilator on
“ the ground through which the foul air is to be drawn out of
“ each room, the fresh air entering in at the door: this is to be
“ repeated as often in a day as shall be thought proper.

“ It

by scarce making any draught of air, they will be apt to promote its corruption; whereas a fire in a chimney acts like a constant ventilator.

If ventilators are used, other precautions will be the less necessary; but if they are not, we must have recourse to such other means as may help to purify the air. Among these, the most common is burning of frankincense, the wood or berries of

“ It will be requisite to have the holes both in the board
 “ fixed over the windows, and in the side of the ventilator,
 “ made round, to receive the corresponding round orifices of
 “ the trunk; by which means the same trunk may serve for
 “ windows of different heights, by being placed more or less
 “ obliquely, thus: *viz.* x, the end at the window; z, the
 “ end fixed to the ventilator.



“ There may be trunks of different lengths, and made to
 “ join into each other, for the higher windows. As these
 “ trunks are to be made of thin fir-boards, about five inches
 “ broad, they need not be nailed together in the form of a
 “ trunk till they are to be used, and may therefore lie in a
 “ small compass.

“ A very small ventilator will be sufficient for this purpose;
 “ about five feet long, and twenty inches wide and deep, such
 “ as described in my ventilator-book, fig. 6.”

juniper, or some other resinous or antiseptic vegetable. The steams of vinegar have been recommended on these occasions, and would probably best answer the purpose; but being not so commodiously diffused as other things that burn, they have hitherto been less tried. The burning of sulphur, or gun-powder, is also mentioned by authors as proper in such cases; and from the acidity of their steams they seem likely to succeed.

§ 4.

How to prevent diseases arising from improper diet.

WE are to observe, that no orders will be able to restrain soldiers from eating and drinking what they like, if they have money to purchase it. Therefore a fundamental rule, and indeed almost the only needful, is to oblige the men to eat in messes; by which means, we may be assured the best part of their pay will be bestowed on wholesome food, in as much as what is agreeable to the majority has the best chance for answering that character. And it will be sufficient to leave the choice to their taste and experience, without searching too scrupulously into the nature of particular aliments, which even with more delicate people seldom offend so much in kind as in quantity. The greatest impediments to messing are the wives and children, who must often be maintained on the pay of the men: in such circumstances, it is not improper food, but the want of it, that may endanger a soldier's health. The messing being established, it remains

remains only to take care that the men be supplied with good bread; that the markets be so regulated, that the traders have encouragement to come to the camp; and that the messes have good provisions at a moderate price; vegetables in particular, which during the hot weather ought to make the greatest part of their diet. Although the pay of a British soldier is better than that of other troops abroad, yet his œconomy is less; so that after paying his proportion to the mess, there is little danger of his having wherewithal to make a debauch. How far some quantity of strong liquors is useful, has been already shewn*.

As the heats of summer tend to produce diseases in autumn, by disposing the humours to corruption, it were to be wished that during the hot season, the diet were so ordered that this tendency might in some measure be corrected. It may deserve our notice, that the Romans considered vinegar as one of the most necessary provisions of an army †. Now, whether this was only used by way of seasoning to their victuals, or mixed with water, and drunk whilst they were hot or feverish, it must have had a good effect in correcting the too great putrescency of the blood during the summer. Vinegar-whey, already known in the hospital, is a

* Part ii. chap. ii. § 4.

† Hyeme lignorum et pabuli, æstate aquarum vitanda est difficultas. Frumenti vero, vini, aceti, nec non etiam falis omni tempore vitanda necessitas. VEGET. *de Re Milit. lib. iii. cap. iii.*

cooling medicine in inflammatory fevers, and was liked by the patients. But the surest way of making soldiers take vinegar, or any other acid by way of preservative, is by mixing it with such a proportion of spirits as may be thought a proper quantity for each man; and especially when troops are sent into Zealand, or the more marshy parts of Brabant or Flanders, during the sickly season in those countries.

Pork has sometimes been forbidden in camps; being considered as unwholesome. SANCTORIUS observes that it checks perspiration; and as it corrupts sooner than beef or mutton, it may be presumed to afford a less proper nourishment than either, when there is danger from putrefaction. It is also believed, that in camps the meat in general being too little bled, and thereby becoming sooner tainted, concurs with the other causes in breeding putrid diseases.

In establishing the messes, some regulations might be made with regard to an allowance of spirits, whether by stoppages on the pay, or otherwise. This is already practised in the navy, and probably for the same reason for which it might sometimes be proper here; since, in ships, the men are also liable to distempers arising from moist and corrupted air.

The officers, whether in camp, or in cantonments, in a moist country, are exposed, though in
a less

a less degree than the common men, to the same diseases of the season and climate. Their chief rule in diet, in sickly times, is to eat moderately, avoiding surfeits and indigestion *. Wine is necessary; but excess in every thing is at this time dangerous. I shall conclude with that prudent rule of CELSUS, for preserving men against distempers arising from a moist and corrupted state of the air: *Tum vitare oportet fatigationem, cruditatem, frigus, calorem, libidinem †.*

§ 5.

How to prevent diseases arising from errors in exercise.

THE greatest fatigue which a soldier undergoes, is in making long marches, especially in hot or rainy weather. When the service requires it, such hardships must be endured; but they will be attended with less sickness, if care be taken to supply good provisions and plenty of dry straw. At other times, when dispatch is not necessary, short marches before the heat of the day, with proper halts, are so far from harassing the troops, that nothing can be more conducive to the preservation of their health. In fixed camps, as there is always more sickness from inactivity than from fatigue, it would not be amiss to make proper regulations about the exercise at such times, and the rather,

* Si qua intemperantia subest, tutior est in potione quam in esca. CELSUS *de Med. lib. i. cap. ii.*

† Lib. i. cap. x.

as our foldiers left to themfelves are naturally too indolent to ufe what is fit for them.

The exercife of a foldier may be confidered under three heads; the firft relates to his duty; the fecond, to his living more commodioufly; and the third, to his diverfions.

The firft, confifting chiefly in the exercife of his arms, will be no lefs the means of preferving his health than of making him expert in his duty*; and frequent returns of this, early and before the fun grows hot, will be more advantageous than repeating it feldom, and ftaying too long out at a time; for a camp affording little convenience for refreshment, all unneceffary fatigue is to be avoided.

As to the fecond article, cutting boughs for fhading their tents, making trenches around them for carrying off the water, airing the ftraw, cleaning their clothes and accoutrements, and affifting in the bufinefs of the mefs, are all duties which, as they muft be ftrictly executed by orders, ought to be no difagreeable exercife to the men for fome part of the day.

* *Rei militaris periti, plus quotidiana armorum exercitia ad fanitatem militum putaverunt prodeffe, quam medicos.—ex quo intelligitur quanto studiosius armorum artem docendus fit femper exercitus, cum ei laboris confuetudo et in castris fanitatem, et in conflictu possit præstare victoriam. VEGET. de Re Milit. lib. iii. cap. ii.*

Laftly,

Lastly, as to diversions, since nothing of that sort can be enforced by orders, the men must be encouraged to them, either by the example of their officers; or by small premiums to those who shall excel in any kind of sports, which shall be judged most proper for answering this purpose. But herein some caution is necessary with regard to excess; because our common people generally observe no medium between their love of ease, and pursuing the most violent exercise. And however necessary motion may be to troops in fixed camps, we are to beware, on the other hand, of giving them too much fatigue, especially in hot weather, and in times of sickness; and above all, of exposing them to wet clothes, which, as has been fully set forth, is one of the most frequent causes of camp-diseases.

C H A P. IV.

The seasons compared, with regard to the health of an army.

IN the beginning of every campaign we are to expect, for the first month at least, that the returns will be considerably higher than if the men had remained in quarters. The earliest encampment began on the 8th of April*, and produced such a number of sick, that in a month's time the returns amounted to $\frac{1}{27}$ th part of the whole. In the year 1745. the campaign was opened on the 25th of April, and in 1747. on the 23d of the

* Part i. chap. viii.

same month; both in the Low-Countries: but in the year 1746. the troops encamped on the 23d of April, in the north of Scotland, which, considering the latitude, may be reckoned the earliest campaign during the war. And from all these instances there is reason to believe, that the proportion first mentioned will generally hold, when the army takes the field in Flanders, in the first or second week of April.

But if the troops continue in quarters till the middle of May, the sickness of the first month will be considerably less, though perhaps not so much as might be expected. Thus, in the first campaign, the British encamping on the 17th of May*, had in the hospital, after the first month, about $\frac{1}{32}$ part of the whole number; a proportion, however, which we cannot offer as a general one, because the men had then made a long march, and it was their first campaign. The next year, when the troops marched out on the 13th of May, there was found, after a month's encampment, in the hospitals about $\frac{1}{40}$ th part only; but as the weather was then mild, and other circumstances favourable, the proportion may perhaps be reduced in common years to $\frac{1}{60}$ th; so that, *cæteris paribus*, the number of the sick will, after the first month, be about $\frac{1}{4}$ th greater, when the army encamps in the middle of April, than when it takes the field a month later.

* Part i. chap. iii.

After the first fortnight or three weeks of the encampment, the sickness daily decreases; as the most infirm are already in the hospital, the rest more hardened, and as the weather is growing daily warmer. This healthy state continues throughout the summer*, unless by some extraordinary exposition to rain, the men get wet clothes, or lie wet; in which case, in proportion to the preceding heats, the dysentery will be more or less frequent.

The great sickness commonly begins about the middle or end of August, whilst the days are still hot, but the nights cool and damp, with fogs and dews; then, if not sooner, the dysentery prevails; and though its violence abates by the beginning of October, yet the remitting fever gaining ground continues throughout the rest of the campaign, and never intirely ceases, even in quarters, till the frosts begin.

The sickness in the beginning of every campaign is so uniform, that the number may be nearly predicted; but for the rest of the season, as the diseases are then of a contagious nature, and depend so much upon the heats of the summer, we cannot foresee how many will sicken from the beginning of autumn to the end of that season. At the end of the campaign in Germany, the number in the hospitals was to the men in health as 3 to 13. In 1747. when the troops left the field, the sick made about $\frac{1}{5}$ th part of the whole number; but if we

* That is, until the middle of August.

consider by itself the detachment sent that year into Zealand, this proportion was nearly inverted; for the men in health were to the diseased, only as 1 to 4. Upon closing the campaign in 1744. though half of the army were new men, we had but one in 17 sick; and in the year following, which was remarkable for health, there was not above 1 in 26 ill; but in both these years the troops returned into winter-quarters sooner than usual.

I have observed, that the last fortnight of a campaign, if continued till the beginning of November, is attended with more sickness than the first two months of the encampment. If campaigns are therefore to last six months, it imports much as to health, whether they begin early, or late. For though it may be thought safer for troops, to delay encamping till the beginning of May, and to stay out till the end of October, yet experience shews it is better to go out a fortnight sooner, in order to return so much the earlier into winter-quarters.

We have already observed, that the remitting fever does not always terminate with the campaign, but continues in quarters till the frosts begin; and that there are no other acute distempers, excepting such as are occasioned by great colds *, from that period till the next encampment. But of chronic diseases, since the autumn has laid so large a foundation for them, a variety will always occur,

* Part ii. chap. i. and ii.

and those generally arising from obstructed *viscera*. Yet, upon the whole, the returns of the sick will so much decrease, that if the troops are but tolerably accommodated, and the foregoing autumn has not been unusually bad, they will probably next spring take the field, without leaving above one man in 40 behind.

Winter-expeditions, though severe in appearance, are attended with little sickness, if the men have good shoes, quarters, fuel, and provisions. Of this, we had one proof in the march into Germany; and another, in that to the North in the year of the rebellion. But long marches in summer are not without danger, unless they are made in the night, or so early in the morning as to be finished before the heat of the day.

Those who sicken in the camp (especially in the decline of summer) so as to be confined for some time to the hospital, are during that season not to be relied upon for service; for being weakened by their illness, and lying warm while under cure, they will be liable to relapse as soon as they return to the field. It would therefore be proper to employ the convalescents in garrison, for the remainder of the campaign, or at least till they have full time to recover; for which end hospitals have neither accommodation nor air. It would also tend much to prevent diseases, if the sickly, or unseasoned corps, were sent a fortnight earlier than the

rest into winter-quarters, whenever that is consistent with the service.

Having mentioned the seasoning of troops, it may be proper to add the following caution, as a mistake here may be made so easily. By well-seasoned troops, are commonly understood, such as having gone through much fatigue, are therefore supposed best qualified to bear more. But in this we may be deceived; because such corps as have been rendered sickly by service, will never afterwards be strong, or fit for new labour, till all the infirm are dead or dismissed. For as soldiers in time of war are not only subject to violent disorders, but have little time or convenience for recovery, if once they fall ill, it is odds but their constitution will be so weakened, as to make them ever after more liable to sickness. I shall mention two instances. In the year before the war, our troops having encamped on Lexden-heath, near Colchester, and staid out late, returned sickly into quarters. Now, it was observable, that those who recovered and went to Flanders, were the first sick in the garrisons; and that the same men, with others who were taken ill in the Low-Countries, were also the most ailing in the cantonments, and afterwards in the camps in Germany. So that these corps were never healthy till they lost all their weak men, which indeed in a great measure happened during the course of the first campaign. The second instance were those detachments in Zealand, and at Bergen-op-Zoom, which suffering
much

much by the bad air of the country, the same battalions, in the beginning of the next campaign, were remarkably more sickly than any of the rest *. But as the first campaign in Flanders (though succeeding the sickly one in Germany) was healthful †, and the next was still more so ‡, some may thence infer, that troops are only liable to suffer in the first year, and being then seasoned will afterwards undergo the usual military fatigues unhurt. But besides that the weather was most favourable during the second and third campaigns, and that the camp broke up early in both, it must be remembered, that all the corps, which had been in Germany, had lost almost all their sickly men there; so that those who took the field, in the next year, were either old soldiers, who had never been ill, or recruits, additional, or regiments which had come fresh from England: these therefore holding out well, were rather a proof of what is advanced above. And if the third campaign was still more healthful than the second, it is to be observed, that the army happened then to be in its best state, consisting chiefly of fresh soldiers, or of men who never had been ill, or of those who were properly seasoned, by having made a short campaign in moderate weather. As a further proof that the health and hardiness of troops are not to be measured by the time they have served, in the two last years of the war, the sick were in proportion as numerous

* Part i. chap. vii. and viii. † Part i. chap. iv. ‡ Chap. v.

as they had been in the two first; and that which happened in the cantonments in Dutch-Brabant, during the last campaign, shews that no seasoning can avail against the influence of the moist and corrupted air of marshes.

The whole amounts to this: Considering all the hardships, and expositions to colds attending the easiest service, those troops will be best seasoned to undergo the fatigues of a second campaign, whose constitution has been least weakened in the first.



OBSERVATIONS
ON THE
DISEASES OF THE ARMY.

PART III.

CHAP. I.

*Observations on colds, and inflammatory fevers
in general.*

HAVING laid down the division of the diseases most incident to an army, with the remoter causes and means of prevention, I shall proceed in this part to offer some practical observations upon each distemper, in the order in which they were proposed*, and therefore shall begin with such as depend upon inflammation only.

But as inflammatory disorders are every where common, and are treated of by so many authors, I shall not enter into a particular account of any, but make a few remarks on such as most frequently occur in military hospitals.

Upon first taking the field, as well as during the winter, pleurifies and peripneumonies are the

* Part ii. chap. i.

most

most common forms of the inflammatory fever; and next to them, fevers attended with rheumatic pains. The inflammation turns also upon the brain, liver, stomach, and other *viscera*. Universally, the fever, taking its rise from a stoppage of perspiration (or from whatever is the primary effect of cold) by first inflaming any of those parts, seems afterwards to be kept up by that inflammation.

Sometimes we can perceive no part more affected than another, and only some general inflammatory symptoms. The distemper is then called simply an *inflammatory fever*, though probably some of the more indolent parts may at this time be affected with inflammation. This fever is most common after the weather begins to be warm. But inflammatory fevers are seldom seen single in the end of summer, or in autumn; for at such times expositions to cold, or moisture, produce fevers and fluxes of a putrid kind, where the inflammation seems to be often the least part of the disease.

For after the summer solstice, the fevers tend mostly to remit, and are attended with less fizy and more putrescent blood. But towards the end of the campaign, when the weather grows cold, more inflammatory symptoms are joined; so that the fevers may be said, at that time, to depend on two different causes.

Among the mixed inflammatory fevers may be likewise reckoned the vernal intermittents, which
upon

upon the first encampment not only seize those who have had such fevers in the preceding autumn, but others who never had any. These are the more carefully to be distinguished from true intermittents, as they are to be treated chiefly by bleeding and other antiphlogistic remedies. When the Bark has been given whilst the blood was inflamed, or before there was a proper intermission, I have observed that the distemper was apt either to change into a continued fever, or to stop for a while, and then recur with worse symptoms.

The inflammatory fevers of an army differ from others, only in being more violent, and perhaps more frequently attended with a *diarrhœa*. The severities of the weather, to which a soldier is so much exposed, his backwardness to complain of the first symptoms, his rough lying when first taken ill, or his being carried to an hospital at a distance in a waggon, when already in a fever, account for the first; and the stoppage of perspiration by lying cold, or by drinking improper liquors, when first seized with the distemper, is probably the cause of the looseness.

As bleeding is the principal remedy in the cure of inflammatory affections, the delaying it too long, or not repeating it often enough, in the beginning of bad colds, is the chief cause of their ending in dangerous inflammatory fevers, in rheumatisms, or consumptions; and as a soldier applies first to the surgeon of his regiment, on him it chiefly depends to prevent many deaths, by the timely use

of the lancet. In general, young practitioners are too sparing in letting blood, and delay it too long. But the surgeon may be assured, that soldiers will seldom complain of a cough, or pains with inflammatory symptoms, wherein immediate bleeding is not proper; and from the continuance of the complaints, he is to judge of the necessity of repeating the evacuation, which, in the case of a stitch or difficult breathing, is never to be omitted in some quantity, even in the advanced state of the fever. I have generally ordered from twelve to sixteen ounces, to be let at the first or second bleeding, but less at all the rest. Here it may be proper to follow CELSUS's rule, in observing the colour and consistence of the blood whilst it flows; that is, when it is thickish and of a dark cast (which it is in difficult breathing and great inflammations) to take it away more freely *. When large quantities are necessary, it is best to bleed the patient lying, in order to prevent his fainting before enough be drawn; otherwise, in all inflammatory pains, the *animi deliquium*, upon the loss of blood, is accounted a favourable circumstance.

Another prevention consists in an early sweat, for which one of the best medicines is a draught of vinegar-whey with some spirits of hartshorn, at bed-time †. It has been usual to give the *theriaca*

* De Med. lib. ii. cap. x.

† Or give at bed-time two scruples of the salt of hartshorn, saturated with about three spoonfuls of common vinegar, in one draught, and promote the *diaphoresis* with some warm diluting liquor.

for this purpose; but all such drugs increase the fever if they do not procure a sweat, whereas this saline mixture operates without heating. The *theriaca* is rendered more sudorific by adding to half a drachm some grains of the salt of hartshorn, and by encouraging the sweat with vinegar-whey, or thin water-gruel acidulated with vinegar. But as to preventing fevers, that falls more in the way of the regimental surgeons, than of the physician attending the hospital, who rarely sees the patient till either the fever be quite formed, or at least so far advanced as not to be removed by sweating.

If therefore the feverish disorder, or cold, has been of two or three days standing, it is to be treated by bleeding, and such medicines as, without heating, tend to remove the inflammatory obstruction, and promote perspiration. Some have thought nothing so efficacious for this intention as the *spiritus Mindereri**; the internal use of which was first mentioned by the celebrated BOERHAAVE, and afterwards introduced into practice, at Edinburgh, by the late Dr. JOHN CLERK, a physician of eminence in that city †. But during the former

* *Pharmacop. Edinburg.* But it is to be observed, that as to the names and compositions of medicines, unless where it is expressed otherwise, as here, I follow the last edition of the London Dispensatory, *viz.* that of the year 1746.

† As it may give satisfaction to the reader, to have Doctor CLERK's observations upon the effects of this medicine in various cases, I shall subjoin his own account, in the following extract of a letter which he favoured me with on this subject.

“ In

mer war I followed the common method of joining the *testacea* to nitre, without any particular attention at first to the effects of the former; but as I have

“ In relation to the *spiritus Mindereri*, I never gave above
 “ half an ounce for a dose. When I intend to promote a *diu-*
 “ *resis*, I give that quantity twice a day, mixed with an equal
 “ proportion of *syrupus de althæa*, and find it seldom fail.
 “ But in a dropfy, I more commonly make use of the *jula-*
 “ *pium diureticum Pharmacopœiæ Pauperum Edinburgenfis*.
 “ I have sometimes added the *sal succini*, when I was sure
 “ of its being genuine; but that is rarely to be found. For
 “ that reason it is left out of the *Pharmacopœia Pauperum*,
 “ and the spirit put in its place; which has the same *ratio*
 “ to the salt, that the spirit of hartshorn has to its salt; though
 “ formerly not being in use, it was thrown away as of no value.
 “ When I give the *spiritus Mindereri* to promote a *diaphoresis*,
 “ I always add a small quantity of *sal cornu cervi* to give it the
 “ alkaline cast, as in the *haustus diaphoreticus Pharmacopœiæ*
 “ *Pauperum*. When I design to bring on a plentiful sweating,
 “ as in rheumatic diseases, I use the *julapium diaphoreticum*
 “ (*Pharmacop. Pauper.*) two spoonfuls every hour, or hour and
 “ a half, till the sweat breaks out; repeating it *pro re nata*,
 “ when warm diluting liquors are not sufficient to keep it up.
 “ I have given of the spirit in this manner about two ounces,
 “ and ten grains of the *sal cornu cervi*, in the space of four and
 “ twenty hours. In topical inflammations, I give the acid
 “ cast by mixing with it an equal quantity of *acetum scil-*
 “ *liticum*. I have often given it so in pleurifies and perip-
 “ neumonies. I understand that some of my brethren use
 “ this form only. Of all neutrals, I take the *sal Ammo-*
 “ *niacum crudum* to come nearest the *spiritus Mindereri*.
 “ I use sometimes the *bolus diaphoreticus Pharmacopœiæ Pau-*
 “ *perum*, but I do not find it nearly so efficacious as the
 “ julep.” Some doubts arising, since Dr. CLERK’s death,
 about the dose of his squill-mixture, I consulted his son
 Dr. DAVID CLERK, one of the physicians to the Royal
 Infirmary

have since discovered a septic quality in those substances by experiments out of the body, it seems natural to conclude that they exert a like power when taken by way of medicine *. And this perhaps would be more frequently seen, were it not for the quantity of acids usually given in acute diseases, by which means not only the septic nature of the *testacea* is destroyed, but some of the acid neutralized, and thereby rendered more diaphoretic. The putrefying quality of those powders was also corrected by the *contrayerva*-root, and by the camphire which was added to them. The common dose was a scruple of the *pulvis contrayervæ compositus*, with ten grains of nitre, and three grains of camphire, given four times a day in a little barley-water.

Infirmary at Edinburgh, who informed me, that he believed there was a mistake in his father's letter, of *acetum scilliticum* for *syrupus scilliticus*, and that his father did not give the *spiritus Mindereri*-mixture in the same quantity with, and without, the *syrupus scilliticus*. He added, that he had found in the *liber memorialis* of his father the following receipt: *R Aqua hyssopi (vel cinnamomi sine vino) spiritus Mindereri, syrupi scillitici aa ℥ij. misce. Dentur cochlearia ij. bis die.* That this was his common dose of all his *julapia scillitica*; but when the stomach could not bear so much in the morning, he then gave but one spoonful. That he himself did not particularly remember, how much of this mixture his father gave in the pleurisy and peripneumony, but believed that the quantity did not exceed four or five spoonfuls in the day. He concluded with remarking, that considering the different manner of making the vinegar of squills at London, and at Edinburgh, the London-preparation was likely to be much stronger than the other.

* Append. Paper iii. exp. xxiii.

These powders were given partly to promote a *diaphoresis*, when nature seemed to be pointing that way, and partly to abate spasms, as the head was so apt to be affected: upon the whole, as it was a medicine which had little sensible effect, I laid the less stress upon it. We may observe that in fevers, in different countries, and in different ages, besides those remedies which have a manifest action, physicians have used others, which, though operating imperceptibly, have yet been imagined to be of considerable efficacy towards conquering the disease. But as their practice was founded on the theory then prevailing, when that changed, so did the medicine; and this will probably be the case till the nature of a fever be better understood, or till chance discover more remedies that visibly abate its violence.

My first practice in every inflammatory fever was to blister, and especially in the advanced state, when I believed that the patient could not bear any further loss of blood. But afterwards, when I found that a solution of the fever was not to be procured by that means, I confined the use of blisters to those states of the disease in which I could be the most assured of their efficacy. Such was that of a headach, when not removed by the first bleeding, or by opening the body; in this case a blister between the shoulders seldom failed of giving ease.

To the same place, though not with equal certainty of relief, a blister was applied when the patient

tient had a cough (which he generally had) or any other sign of inflammation in the lungs: but when he complained of a stitch in his side, the plaster was laid on the part affected. In these circumstances I likewise ordered some pectoral drink, and an oily mixture which shall be mentioned when I come to the pleurisy. In a *delirium*, I also blistered, and followed that course which shall be laid down in the next chapter.

If the body was bound, it was opened (after the first bleeding) by some gentle laxative; but throughout the course of the fever I found it sufficient to prevent costiveness by almost daily clysters*, if the patient had not otherwise regular stools. After recovery, some mild purge was often requisite, in order to prevent the too hasty repletion of the convalescents, upon indulging their appetite: cathartics at that time seemed otherwise unnecessary. But if the fever in the beginning was attended with gripes and a looseness, after bleeding I gave some rhubarb; and if the purging still continued, I endeavoured to check it by the chalk-julep, ordering four spoonfuls after every loose stool, and afterwards I proceeded as above.

Towards the *crisis*, or in the decline of the fever, a little wine was added to the panada, or given in some other shape, as the best cordial; and in great

* A motion or two daily, procured in this way, I have since observed to be one of the best, and most general, remedies in fevers.

sinkings, I preferred some drops of spirit of hartshorn, in a tea-cup-full of white-wine whey, to every other medicine of that intention.

After shewing that so much depends on early and repeated bleedings, in the beginning of these fevers, and on blisters, I can offer no remark more useful than what relates to opiates, which otherwise a young practitioner might be too apt to use, amidst so many complaints of pain, looseness and want of rest. With regard to the two first, I have already proposed what I found sufficient for the cure; but as to watchfulness, I have observed that opiates were only to be given in the advanced state of the disease, when the inflammatory symptoms were much abated, when the head was not affected, and when the patient, after long watching, believed he should be well enough if he could but sleep. At such times, and especially about the crisis, I have usually ordered two scruples of the *confectio Damocratis* at bed-time, and with good effects. If the paregoric was continued, costiveness was prevented by clysters, or some laxative.

In these, as in other fevers, the thirst was moderated by barley-water acidulated with vinegar, or by balm-tea with lemon-juice. And as to diet, the patient was always kept upon the lowest, such as panada, water-gruel, and the like, without allowing any broth till after a breaking and a sediment in the urine: when that happened, a decoction of the Bark, or the elixir of vitriol, completed the cure.

C H A P.

C H A P. II.

Observations on particular inflammations.

§ I.

Of the inflammation of the brain.

THE *phrenitis* or inflammation of the brain, considered as an original inflammation, is properly a summer disease, when men are exposed to the ardour of the sun, and especially whilst asleep and in liquor. But a symptomatic *phrenitis* or *delirium* is a common occurrence, is confined to no season, and happens indifferently in the autumnal remittents, the hospital-fever, or inflammatory fever. It is perhaps more frequent in the army than elsewhere, on account of the violence done to all fevers, when the sick are carried in waggons from the camp to an hospital, where the very noise, or light alone, would be sufficient with more delicate natures to raise a phrenzy.

An original inflammation of the brain requires immediate, large and repeated bleedings; and the relief is thought to be the more certain if the blood is taken from the jugular. I have never advised cutting the temporal artery, finding so much relief from applying three or four leeches to each temple,

after bleeding in the arm*. The benefit thence arising may be compared to the effects of an hemorrhage by the nose. The rest of the cure consisted in the medicines common to all inflammatory fevers.

The symptomatic *phrenitis* was also treated by opening a vein, if the pulse could bear it; but if that could not be done by reason of lowness, the cure was attempted by leeches and blisters. It is usual in blistering to begin with the head, but in military hospitals I found it more convenient to leave that to the last; because the barbers were careless, and in cutting the skin exposed the patient more to a strangury †. The common internal medicine was the diaphoretic powder mentioned in the last chapter.

A *phrenitis* is often brought on, or increased, in the hospitals of an army, by the want of due

* I have sometimes, since, applied six to each temple.

† Upon reading this passage in the first edition, the late Dr. WHYTT, professor of medicine in the university of Edinburgh, wrote to me, that he had observed, by shaving the head twelve or fifteen hours before the application of the blister, a strangury was generally prevented. Sometimes I have found the brain sensibly relieved by cutting off the hair and shaving the head, though no plaster was applied; and since the first edition, I have in such cases, out of the hospital, given the *sal sedativum* of HOMBERG, to the quantity of 25 grains every four hours, and, as I have imagined, with good effect; but as I never trusted to that medicine singly, I cannot speak of its virtue with any certainty.

perspiration,

perspiration, and of warmth in the extremities. Therefore as soon as a soldier is brought into the hospital with feverish symptoms, his hands and feet should be washed with warm vinegar and water. And I would likewise recommend for the hospitals, what I have sometimes, since, in a *phrenitis* successfully used in my private practice, a fomentation to the feet and lower part of the legs with double flannels wrung out of water (with a seventh of vinegar) made agreeably warm, and often repeated, for an hour or two at a time.

§ 2.

Of the inflammation of the eyes.

SOLDIERS are subject to an *ophthalmia* or inflammation of the eyes, not only from catching cold in winter, but from their frequent exposition to the sun and dust during the campaign. The slighter cases were cured without bleeding; but if any degree of fever was joined, or the inflammation was considerable, this evacuation was not omitted. The greater inflammations are not to be cured without the loss of much blood, unless we can make a derivation from the affected part without draining the whole body. For this purpose, blisters are usefully applied behind the ears, especially if they are continued for two or three

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days,

days, and if the fores are afterwards kept running. This part of the cure is sufficiently known. But what I have observed to be sometimes more efficacious, though less generally practised, is bleeding by leeches, when two or more are applied to the lower part of the orbit, or near the external angle of the eye, and the wounds allowed to ooze till they stop of themselves. Therefore in all greater inflammations, after bleeding in the arm or jugular, I have used this method, and repeated it more than once if required. The practice is no less proper in an inflammation of the eyes from a hurt or blow: only in great fluxions upon the eyes, some blood is to be first taken from the arm, and immediately after, a revulsion is to be made by a brisk purge.

In all cases we are to look often and narrowly into sore eyes, since the inflammation may either be occasioned, or kept up, by moats, or by hairs of the *cilia* falling in, or growing inwards.

The slighter inflammations from the dust, or the sun, were removed by fomenting with warm milk and water, adding a small proportion of brandy; and by anointing the borders of the eye-lids with the *unguentum tutiæ*, or the like, at night, and especially when those parts were excoriated and sore. But in bad cases, after the inflammation had yielded a little to evacuations, I found the *coagulum aluminosum* of the London Dispensatory, spread on lint and applied at bed-time, the best external remedy. Till then the patient used a solution of white vitriol:

vitriol *. In violent pains, I foment frequently with a decoction of white-poppy heads.

§ 3.

Of the inflammation of the throat.

THE inflammatory *angina* is most frequent and dangerous upon the first encampment. Its tendency to bring on a suffocation requires a speedy and large bleeding, a repetition next day, if the inflammation is not lessened; in all cases a lenient purge, and afterwards daily clysters to open the body. A large blister on the night after the first bleeding, in great pain or swelling of the tonsils, is likewise a necessary part of the cure †. But the method of using all these being so well laid down by

* In my later practice, I have likewise successfully used for a *collyrium*, a mixture of one drachm of *acetum lithargyrites*, two of French brandy, and eight ounces of soft water, in the manner of M. GOULARD; and instead of the tutty-ointment, a liniment, made of one part of *lapis calaminaris*, finely levigated, and two parts of *axungia viperina*. Such compositions as this last, I find the more necessary when the borders of the eyelids are the parts principally affected. In this case, I have likewise known the best effects of the ointment mentioned by BOERHAAVE, in his lectures *de Morbis Oculorum*, printed at Gottingen, in the year 1750. p. 50.

† In later practice, besides a blister to the back, in bad cases I have laid one across the throat. At other times, when the inflammation has been obstinate, I have directed the veins under the tongue, called the *raninæ*, to be opened, and as much blood taken

by SYDENHAM, I shall not be more particular, and only mention another remedy which I have sometimes found useful. Let a piece of thick flannel, moistened with two parts of common sweet oil and one of spirit of hartshorn (or in a larger proportion if the skin will bear it) be applied to the throat, and renewed once in four or five hours. By this means the neck, and sometimes the whole body, is put into a sweat, which, after bleeding, either carries off or lessens the inflammation. The *formula* is new but not the whole intention; for the ancients applied warm oil with a sponge, and warm bags with salt*; and some later writers have recommended poultices made of the dung of animals †, which seems to be only a coarse and an offensive way of using the volatiles.

taken from them as would come. From both these means I have seen good effects. This method of bleeding under the tongue is not mentioned by SYDENHAM himself, in the *Processus Integri*, but is by his son, in that small work called *Compendium Praxeos Medicæ SYDENHAMII*; whether it was that the father had inadvertently omitted it, or that the son had believed it to be too material a part of the cure not to be added. Instead of the diaphoretic powders, mentioned in the general treatment of inflammatory fevers, as they are swallowed with difficulty, I now order a mixture with 2 or 3 ounces of the *emulsio camphorata Pharm. Edinb.* thrice the quantity of spring water, and two scruples of nitre; of which the patient takes 3 spoonfuls every 3 hours: and if he is unwilling to use a laxative clyster daily, I leave out the nitre, and substitute 2 drachms of the *sal catharticus amarus*, or the like, to keep the body open.

* CELS. lib. iv. cap. iv.

† ETMULLER. cap. de Angina.

In the inflammatory quinsy, I have never touched the inflamed parts with a mineral acid, as Sydenham directs; but I have observed little benefit from any gargle, except when a suppuration is forming; in that case I make the patient use one of milk and water, in which figs have been boiled, and keep a bit of one of the figs as near as he can to the parts affected.

But in what is called the *angina maligna* or *ulcerous sore throat* (which indeed is no disease of the army) I lay the greatest stress on gargles, injected with a syringe, by which means the patient bringing away much tough and offensive phlegm, is generally relieved, and the spreading of the ulcers prevented. The composition I use, is thirteen ounces of barley-water (or sage-tea) two ounces of *mel rosarum*, and one of vinegar. To make it more antiseptic, I sometimes add one ounce of the tincture of myrrh. Of this I direct four or five syringefuls (each containing about three spoonfuls) to be injected, one after another, and the same remedy to be repeated three or four times a day.

§ 4.

Of the pleurisy and inflammation of the lungs.

THE pleurisy and peripneumony are the most frequent forms of our inflammatory fever. It is to be remembered, that in those affections the pain may be felt in any part of the chest, behind

or

or before, as well as in the sides; and sometimes so low down, as to be mistaken for an inflammation of some of the abdominal *viscera*, such as the liver, spleen, or kidneys.

Without entering scrupulously into the distinction, which most authors have made, between a pleurisy and peripneumony, I shall mention those remedies, which I used with most success in such pains of the breast, sharp or obtuse, as were attended with a difficulty in breathing, almost always with a cough, and never were without some fever. For we are not to confound these inflammatory pains and difficulties in breathing with some spasmodic stitches (which seizing the muscles of respiration are not accompanied with a fever, and may be removed by externals only) nor with certain flatulent pains of the side, if I may so call them, to which hypochondriacal and hysterical persons are most subject. Such cases indeed came seldom into our hospitals. But to the same kind of flatulent stitches, every person is liable, when brought low by sickness, and especially by any disorder of the bowels. These pains may be owing to wind confined, or to excrements pent up in that part of the *colon* next the diaphragm. They generally strike from the breast to the back, or from side to side, affect the breathing, and are sometimes attended with a short and frequent cough. But the fever, and the siziness of the blood, with other marks of a true pleurisy are wanting. Bleeding may do

harm, but laxatives, with warm applications to the part, give ease. A blister perhaps is the only remedy common to both.

Although we cannot admit the critical days, yet we must observe with the ancients certain states of those inflammations of the chest, which are attended with different symptoms, and require a different method of cure. The sick are often brought into the hospital when the inflammation has spread upon the lungs, and gone too far to yield to the lancet. Now, however improper it would be at this time to commit the whole to nature, yet if the *sputum* appears, as described by HIPPOCRATES, we are to consider it as the chief remedy, and are not to divert it by bleeding or purging, as I have found upon trial.

With these cautions we are to proceed, letting blood freely for the first three or four days of the disease; but, if in that time the spitting begins, the bleeding must either be wholly omitted, or so moderated as to relieve the breast, without impairing the strength, or checking the expectoration.

With regard to the quantity, and repetitions of bleeding, no precise rule can be given. SYDENHAM has specified forty ounces for the whole which men may, at a medium, lose in a pleurisy; but this, in our circumstances, would have been too little, had it not been for blisters, which not only shortened

tened the cure, but prevented the loss of a great deal of blood.

A pleurisy, taken in the beginning, will often be cured by one large bleeding, and a blister laid upon the side affected. The objection to this practice is founded on the stimulating quality of the *cantharides*; but the relief is so certain, that theory here ought only to be employed in accounting for the resolution of a spasm, or obstruction, by such a stimulus upon the skin.

This method of blistering the side is ancient, and was performed by *sinapisms**; but now *cantharides* only are used, and the practice is become common in Britain. Some difficulty remains about the time of application, whether it be best to apply the blister in the beginning, or to wait till the pulse be softened by frequent bleeding. The experience which I have had leads me to prefer the former; because in treating great numbers in this disease, I found no inconvenience from using the blister immediately after the first bleeding, but, on the contrary, a more sudden and certain relief. Nay frequently, when the surgeon was not at hand, I have had the plaster put directly to the side, and the patient bled afterwards, being satisfied if the vein was opened before the flies had time to stimulate. These lateral blisters, as well as those for the back, were made as large as the palm of the hand

* CELS. lib. iv. cap. vi.

with the fingers; a size unufual any where but in this country.

Although the fymptoms may vanifh upon bliftering, yet it will be more fecure to bleed again, unlefs a fweat comes on, with a relief from pain, and renders this and other remedies unneceffary. But if the lungs are much inflamed, the cure cannot be fo speedy; for though the firft bleeding and blifter fhould give eafe, yet repetitions of both will be needful. Sometimes the ftitch returns and fixes in the other fide; but this being treated as the firft, will alfo give way.

A diftinction has commonly been made between the pleurify and peripneumony, which I likewise followed in the firft editions of this work; but having fince read the diffections and remarks of thofe celebrated authors *de HALLER* * and *MORGAGNI* †, relating to this fubject, I am convinced that we ought to confider thefe two diftempers as one, in which the lungs are always inflamed, and often without the *pleura*; but the *pleura* never, without the lungs. Wherever the pain is, I apply a large blifter to the part; and if there is no particular ftitch, but only a general oppreffion, I lay the plafter between the fhoulders; and afterwards, if the difeafe is obftinate, firft to one fide and then to the other. Blifters, not only when applied to the

* Opufcul. Pathol. obf. xiii. xiv.
Morb. ep. xx. et xxi.

† De Sed. & Cauf.

chest, but also, as others have observed, to the extremities, tend to relieve the breast, and to promote expectoration; whereas bleeding must be cautiously, if at all, used after the *sputum* appears.

Not only during the height of the inflammation, but throughout the state of expectoration, I give the patient from hour to hour a small tea-cupful of a pectoral infusion warm*; and once in five or six hours, four spoonfuls of an oily mixture †. But when the expectoration flags, instead of this last medicine, I order as much of the *oxymel scilliticum* as the patient can take without sickness, or purging. Or, what I have often found more effectual, four spoonfuls once in six or eight hours of a solution of gum *Ammoniacum* ‡. I have likewise observed good effects from making the patient breathe over the steam of hot water; a practice recommended by BOERHAAVE and the Baron van SWIETEN, and confirmed to me by the repeated trials of Dr. HUCK, who found it more beneficial when the phlegm was viscid, as well as more grateful to the patient, by adding a small proportion of vinegar.

* *Viz.* An infusion made of the ingredients of the *decoctum pectorale*; to a quart of which, I add an ounce of the simple *Oxymel*.

† R^x Mellis (vel syrupi ex althæa) ℥vi. gummi Arabici in pulverem contriti ℥i. aquæ rosarum ℥ii. accurate subactis admisce in vicem olei amygdalarum dulcium ℥i℥. et aquæ puræ ℥vi.

‡ R^x Spermatis ceti (ex vitello ovi quantum satis est soluti) ℥ij. lactis Ammoniaci ℥vii. syrupi croci ℥vi. misce.

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If notwithstanding this discharge, the patient complains much of a stitch, or of labour in breathing, it is still necessary to bleed. But in this case there is danger of falling into one of these extremes; either of suffering the lungs to be overpowered, by omitting to bleed; or, of hazarding the suppression of the *sputum*, by bleeding too freely. TRILLERUS, HUXHAM, and the Baron van SWIETEN have delivered the rules how to proceed here. But, with regard to blisters, there need be no caution at such a juncture, as they are always seasonable, whether for raising the pulse, or relieving the breast.

In the course of expectoration, a vomit has sometimes contributed to discharge the viscid phlegm. Sometimes opiates were given, but with caution; for, as long as the pulse was hard, or the breathing difficult, or when watchfulness was owing to the fever, they did harm. But when the fever had ceased, and sleep was prevented by only a thin rheum falling on the *fauces*, or lungs, opiates, and especially if joined to squills, both gave rest and promoted expectoration.

I shall only add, that during my practice abroad I was not acquainted with the use of the Bark in the advanced state of these Inflammations, having only had occasion to see its effects since, when the patient was brought low by bleeding, whilst some difficulty of breathing and cough remained, as well as a sensible increase of fever at night, and with

a remission in the day, and a breaking in the water. In such cases, I have successfully given once in three hours, except in the height of the paroxysms, two ounces of the decoction of the Bark, to which I added some liquorice, but no other pectoral.

§ 5.

Of the inflammation of the liver.

THE liver is a part not only liable to original inflammations, but also to suffer by translations of matter. I have found, by several dissections, that this *viscus*, next to the lungs, is most subject to suppuration; but I have known one case only cured after an abscess. In this, the matter pointing was let out, and the patient soon after recovered.

Another case occurred, remarkable for the situation of the abscess, which was intirely on the left side of the *linea alba*. The incision was nevertheless made, and a large quantity of *pus* was evacuated. The patient was relieved, but the operation having been delayed too long, he died soon after. Upon opening the body, the incision was found to have passed into the liver, but to have been too small for discharging all the matter.

A third case was singular for the flatness of the tumour, and an unusual difficulty in breathing; for the

the man could not lie extended, but for the most part rested in a prone posture upon his hands and knees. He had frequent retchings to vomit, with a constant uncommon pain at his stomach and sickness; and two days before his death he grew yellow, and was seized with a hiccup. The body being opened, the liver was found wholly scirrhous, or purulent. The thick and posterior lobe was suppurated; and another large abscess rose from the concave part, which thrust the stomach outwards, in such a manner, that had an incision been made before death, as in the former case, it must have passed through the stomach before it came to the bag.

As to the cure of an inflammation of the liver, I have made no remark that deserves notice; unless that with plentiful bleeding, one of the best remedies is a large blister laid over the part affected.

§ 6.

Of the inflammation of the stomach and intestines.

THE same method has been practised in the inflammation of the stomach and intestines; nor have I known these local blisters attended with any bad consequences, if after largely bleeding they were applied early in the disease. In particular, they were useful in the *ileus* or inflammatory colic; and sometimes answered in fixed pains of the

bowels from spasms, without evident marks of inflammation.

To this observation, relating to the effects of blisters in pains of the *abdomen*, I shall subjoin a few remarks upon the inflammation of the bowels, which have occurred to me upon further reflection and more experience in practice.

The *ἰλεὸς*, *ileus*, (the *tenuioris intestini morbus* of CELSUS) according to a book ascribed to GALLEN, “ is an inflammation of the intestines attended with violent gripes, and such a constriction as to allow no passage for either the *fæces* or flatulence*.” This definition, where vomiting is not named, is nevertheless agreeable to the description of the *ileus* by HIPPOCRATES, who mentions both a bilious and a stercoraceous vomiting, but which he considers as additional symptoms when the distemper rises to a height. For in the Aphorisms, HIPPOCRATES observes, that “ in the *ileus*, vomiting is a bad sign †;” which seems to imply, that there may be an *ileus* without any vomiting at all. And ARETÆUS §, who of all the ancients has given us the fullest and most satisfactory account of this affection, takes notice of three degrees of it; one, in which the stomach is oppressed without vomiting; another, in which the patient brings up phlegm and gall; and the third and fatal one, when he voids his excrements by the

* Definit.

† Sect. vii. aph. x.

§ Acut. Morb. lib. ii. cap. vi.

mouth. From this it appears, that whenever there are acute pains of the bowels, attended with an oppression at the stomach, obstinate costiveness, and (if I may add from HIPPOCRATES) a tension of the belly, of all perhaps the most constant symptom, without regarding whether there is vomiting or not, we may freely determine the case to be the *ileus* of the ancients, and from them draw what lights they can furnish with regard to the cure. But if, in conformity with some of the best of the moderns, we should only call that an *iliac passion*, in which the peristaltic motion is wholly inverted, our practice can receive no assistance from the Greeks, who supposed that state of the *ileus* to be incurable.

Thus SYDENHAM, when to the above symptoms even a vomiting of the food was joined, allowed no other name to the disorder than that of the *passio iliaca notha**, as supposing in that case only a partial inversion of the peristaltic motion; and he considered the rendering of clysters by the mouth as the mark of a total inversion, and therefore a pathognomonic symptom of the true iliac passion: *quando liquet ex clysteribus per os ejetis et aliis signis verum esse ileum, &c.* † This *ileus verus* of SYDENHAM I never saw but once (the patient died) and I should imagine, that it has been but rarely seen in our times by those in the greatest practice, and seldom or never cured: so that it may seem extraordinary that in his days it should occur so often, as to satisfy

* Sect. i. cap. vi.

† Ibid.

him about the certainty of his method of cure; and the more, as the remedies which he used would now appear inadequate to much milder degrees of the disease. But that candid author appears to have been afterwards sensible of the insufficiency of his former practice, since in the *Processus Integri* (his posthumous work) he omits part of it, and adds some more powerful remedies, which still perhaps, in other hands, would prove ineffectual.

As to all the lesser degrees of the *ileus*, we must look into SYDENHAM, for their description and cure, under the title of *colica biliosa*; and which we may be the more certain is the same distemper with the *ileus*, as the author himself says, “that if
“ that colic was not timely remedied, it terminated
“ in the *iliac passion* *.” But it is to be wished that SYDENHAM had not given the name of *bilious colic* to the *ileus*, nor considered it in the light he has done; because upon his authority many have attempted to correct, or to evacuate the bile (perhaps faultless) without sufficiently attending to the inflammation, as he does not mention it. SYDENHAM bleeds but once; from which circumstance alone we may judge, that he had never inquired how the bowels of those who died of the distemper appeared after death, nor apprehended any danger from a mortification, which from numerous dissections we are now assured is always threatened.

* Sect. iv. cap. vii.

Having had these reasons to depart from SYDENHAM's practice, I followed the more ancient one, of bleeding largely and often, as long as the violence of the symptoms remained, or whilst the strength permitted. If after the first bleeding, the patient was not sensibly better, in a few hours the vein was opened a second time, and immediately after, a blister (as large as the palm of the hand with the fingers) was applied over that part of the belly which was most affected. As I have more than once known the patient relieved in his bowels as soon as he felt the burning of his skin, and at the same time have stools by a purge or clyster, which had been given before without effect, we have reason to believe that the blister acts more as an antispasmodic than an evacuant. This was my common method in the hospital; and if since that time I have made less use of those blisters, it is not from having seen bad consequences from them, but from finding, in private practice, a greater reluctance in the patient to have them upon a part where they are not commonly applied; and also, from their somewhat interfering with the warm bath, which though a material article in the cure, was generally wanting in the hospitals of the army.

Next to bleeding, the principal part of the cure depends upon opening the body, which formerly I attempted by clysters, and by giving every hour a pill of aloes, soap and calomel; but afterwards I changed that practice for the more lenient purges. In this intention, I have given every hour, the size

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of a nutmeg of an electuary compounded of half an ounce of the *electarium lenitivum*, two drachms of the flowers of sulphur, and one drachm of the creme of tartar, with some fyrap. But of late I have kept more to the use of the *sal catharticus amarus*, recommended to me by Dr. HEBERDEN, who had seen several instances of its good effects in small but repeated doses. Two ounces of this salt being therefore dissolved in a pint of water, I give two spoonfuls every half hour, or one spoonful at shorter intervals, as long as the patient's stomach will bear it, or till he has had two motions. Although this medicine has a disagreeable taste, yet as Dr. HEBERDEN remarked, the stomach will often retain it when more grateful liquors are rejected; a circumstance which might incline one to believe, what has been said of other neutral salts, that they possess some degree of a sedative, as well as a laxative quality. Whether I direct the electuary or this solution to be given, I order a clyster, purely loosening, to assist the operation. For I never could understand, how parts, lying in the center of animal heat, and naturally in a moist state, should be fomented by any fluid, in a clyster, no warmer than themselves. When I suspect that the obstruction is owing to hardened *feces*, at first I use clysters of oil only, but at all other times, the following:

℞ *Decocti communis pro clystere* ℥x. *electarii lenitivi*, *olei olivarum*, *singulorum* ℥ii, *misce*,

But

But when the stomach is so much disordered as to throw up either of the above laxatives, I then join some opium to a stimulating purge; a practice which has been long in use here, and followed by Dr. MEAD*.

℞ *Extracti cathartici gr. xxv. extracti Thebaici gr. iß. mercurii dulcis sublimati gr. v. misce: fiant pilulæ x.*

These are for one dose, to be given after vomiting, when the patient complains least of sickness. The smaller the pills are, they will have the better chance for being retained. About twelve hours afterwards, or when the force of the opium begins to go off, I endeavour to promote the operation of the purge, by the solution of the salt, as before; and in a few hours more, still continuing the solution, I repeat the clyster.

After procuring stools, most of the danger being over, I follow pretty nearly SYDENHAM'S method, in regard to the rest of the disease, giving laudanum at bed-time; and in the mornings, as much of the solution, or of some other laxative, as is sufficient to open the body freely till the hazard of a relapse is past.

SYDENHAM, in the *ileus* (as he defines it) recommends for the vomiting a scruple of salt of wormwood in a spoonful of lemon-juice, to be given in the act of effervescence; which practice I remember to have tried more than once successfully in

* *Monit. et Præcept. Medic. p. 114.*

iliacal cafes, where the patient vomited bile; but with this difference, that instead of giving the draught twice a day, as he directs, I gave it every hour.

With regard to the causes of the *ileus*, it is well known that those who have ruptures are most liable to it; but such cafes are not common in the army. As to the other causes, there were too few instances to satisfy me about the most frequent. Not but that among soldiers the bowels are often inflamed; but every inflammation there does not tend to an *ileus*; for by falling upon the larger intestines it generally occasions a flux, as will appear by the dissections of those who died of the dysentery. A few examples may be found of the *ileus* from an inflammation of the *colon*; but I imagine that in most of them, some hardened *faeces*, or some tumour, have concurred to straiten the passage and prevent stools. Upon the whole, I have met with this disease more in my practice at home, than abroad in the army. Children and those who are delicate are perhaps more liable to it than men in the vigour of life; besides such as are known to have ruptures are not included. A gouty humour may often be the cause among people of higher rank, but seldom among soldiers. I remember to have had two patients in the *ileus* attended with vomiting; one a young gentleman of two and twenty (who had lived intemperately) whose disorder went off with a fit of the gout; and the other a man of fifty, who, in a few days after a second attack,

attack, was likewise seized with the gout, and afterwards had no complaint in his bowels. Neither of these persons had been troubled with the gout before. But whoever desires to pursue this inquiry farther, may consult the *Sepulchretum Anatomicum*, RUYCH's Anatomical and Chirurgical Observations *, and the late excellent work of MORGAGNI, *de Sedibus et Causis Morborum* †.

I shall conclude with one remark, which though it has been made before, yet has not been so generally received as to render any further testimony unnecessary. The *ileus* is for the most part attended with a sensible degree of fever, and with all the other symptoms related above; but, besides that there are cases, in which there is no vomiting (as shewn from the ancients) there are others in which the fever is scarcely perceptible, when the patient feels little pain, and is not altogether costive. I say there are such cases of inflammation; because, when with symptoms so little alarming, the patient has died, the bowels have been found not less mortified, than after the most distinguishing marks of the disease. This, so far as I know, was first taken notice of by Dr. SIMSON, whose observation is quoted and confirmed by the Baron van SWIETEN ‡; and lately by MORGAGNI §, who observes, that in such circumstances, the only presages of danger are

* Obs. xci. † Ep. xxxiv. & xxxv.

‡ Comm. in BOERH. Aphor. § 371.

§ De Sed. et Caus. Morb. ep. xxxv. 22.

to be taken from the tension of the belly, and a dull pain upon pressing it, from the lowness and inequality of the pulse, and from a change in the countenance. What he says upon this subject well deserves attention.

§ 7.

Of the rheumatism.

THE ancients seem to have imperfectly distinguished the gout from the distemper now called the *rheumatism*, by giving the name of *arthritis* to the affection of all the joints, whether the pain arose from a rheumatic inflammation, or a gouty humour. If not all, but some particular joint suffered, the distemper was denominated from the part; hence the terms *chiragra*, *podagra*, *ischias*, &c. all which they considered as species of the *arthritis*. But as some arthritic pains were observed to be of a different nature from others, they distinguished them according to the particular humour which they supposed to be the cause of the disease. Thus, one kind they believed depended on the blood; therefore in that case bleeding was recommended as the chief remedy; and in plethoric habits they bled more than once.

Although by making this distinction, the ancients might sometimes treat in a proper manner that distemper now called a *rheumatism*, yet as words are
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fo apt to impofe upon the underftanding, it is to be imagined that the different kinds of the *arthritis* were often confounded, and confequently often unskilfully managed. Accordingly we find, that in later times the phyficians came to confider all pains of the joints as the effects of a catarrh, that is, of a humour running down from the head. But this change of theory had a worfe confequence; for all catarrhous humours being fupposed of a cold nature, bleeding was forbidden, and the cure of an acute rheumatifm, as well as that of the gout, was then attempted without opening a vein. BOTTALLUS feems to have been among the firft who oppofed both that opinion and practice, and diftinguifhing the inflammatory fpecies of the catarrh (or what we now call a *rheumatifm*) from the reft, contended that repeated bleeding was neceffary for its cure*.

But BALLONIUS is the firft whom I find appropriating the term *ῥευματιςμὸς* (for he almoft constantly uſes the Greek word) to this inflammatory fpecies of the *arthritis*, which he afferted to be a humour different from that of the gout, though a-kin to it †.

* De Curat. per Sang. Miſſ. cap. xii.

† We meet with the word *ῥευματιςμὸς* among the ancients, but only in the general ſenſe of *rheum* or *fluxion*, and not, fo far as I know, to denominate any particular diſtemper. BALLONIUS begins his treatiſe upon the rheumatifm, by calling it *affectus ἀνώνυμος* *pæne apud antiquos*, but does not appear to have been the very firft among the moderns who gave the name; for he ſays, in the ſame treatiſe, *affectio quæ falſo catarrhus dicitur, aliis melius ῥευματιςμὸς dici videtur*. Lib. de Rheumat.

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The same author is also the first who has described the disease in a proper manner, and has likewise recommended repeated bleeding for the cure. This method, at least in acute cases was afterwards followed by the best practical writers, and in particular by RIVERIUS and SYDENHAM.

How often rheumatisms occurred, and from what causes, has been already seen; but we must add, that though this distemper sometimes appeared with all the severity mentioned by those authors, yet it was generally of a milder kind; as its causes could not operate so powerfully on men whose blood in general was little disposed to inflammation, either by high living or by a full habit. In the more acute rheumatisms, not only some of the joints are considerably swelled and inflamed, but all of them are so affected, that the patient cannot in the least move himself, or be moved by others without some excruciating pain. In such circumstances some degree of fever always attends it, and therefore it may seem strange that BALLONIUS, who otherwise so well describes the disease, should say, that the pulse is little altered by it, since we commonly find it so much quickened in this species, that were we to judge by that sign alone, we should often imagine that the patient laboured under a high fever.

In treating the rheumatism with fever, I followed the practice of the authors above mentioned, with regard to repeated bleedings, which were my chief remedy.

remedy. It is to be remembered, that my patients were men in the prime of life, and of that class that is little subject to arthritic pains, which may so readily be confounded with the rheumatic. But I must add, that in my private practice since that time, among people whose manner of living disposed them more to attacks of the gout than to a true rheumatism, in every ambiguous case, if there was fever, I have bled freely, not only once, but a second and a third time, if the blood was fizy, and the patient not too weak but relieved by the evacuation. For this we have likewise the authority of BALLONIUS. In the acute rheumatism frequent bleedings weaken the body less, perhaps, than in any other distemper, as RIVERIUS justly remarks*; and I believe we may safely subjoin, that, in young people, when the gout is disguised under a rheumatic form, we cannot much err if we treat the case as if it were purely rheumatic.

If the patients were not loose, I joined the almost daily use of clysters, or of some mild laxative, to cool and to prevent costiveness. And they were all the time kept on the lowest diet, to which they could be prevailed on to submit: for food, panada, water-gruel, and the like; for drink, barley-water; or when milk could be procured, a whey made with vinegar instead of runnet, which they drank with pleasure.

* Cap. de Rheum.

In cases where either the lungs were immediately affected, or at any rate when the patient complained of a difficulty in breathing, or of a head-ach, not relieved by bleeding, I applied a blister between the shoulders, and seldom failed of removing or lessening those symptoms. It has been observed, that blistering, in general, does good in those universal rheumatisms; and I can testify that when the pain is confined to one part, it is among the most efficacious applications. But in the acute rheumatisms attended with swelling of the joints, I preferred leeches to all other local remedies, applying four or more upon that part of the articulation where the inflammation and tumour were the greatest. After the leeches fell off, I let the blood ooze till it stopped of itself. As the relief obtained was considerable, and the loss of blood but small, I made frequent repetitions. I have sometimes since, in my private practice, successfully ordered twelve leeches at once for one patient, dividing them between two or more joints affected, renewing the application for three days successively, and afterwards using a smaller number, at longer intervals, as there was occasion. By this means, I am satisfied, that as I generally gave some immediate ease, I likewise shortened the distemper, and saved the loss of a much greater quantity of blood by the arm. BALLONIUS just hints at the use of leeches in the rheumatism, but rather as a remedy that might be tried, than what he had experienced; for he transiently says, *cornicula frequentia*

quentia et hirudines copiosæ habitui corporis applicatæ conferrent *.

The general bleedings, and these local evacuations of blood, with occasional blisters, the low diet, and the mildest laxatives, were sufficient, for the most part, to conquer, or at least considerably to abate the acute rheumatism of the army. It is true that I commonly added the diaphoretic powders mentioned in the cure of inflammatory fevers in general, but without having any confidence in them, and at no rate with a view to promote any sensible discharge by the skin. For though in my first practice I attempted, by means of the *spiritus Mindereri*, and other medicines of that nature, to force a sweat, yet I was afterwards convinced that this was not the proper manner of treating a rheumatism with fever. Indeed, whenever the fever was lessened by taking away much blood, and especially when the men were brought low by such evacuations, I gave them thrice a day about 40 drops of the spirit of hartshorn, as a cordial, and not as a sudorific; and observing that this medicine not only sufficiently answered that intention, but even abated the pains, I continued to give it daily as long as they remained, whether the patients were confined to their beds, or walked about; so that the volatile alkali, recommended by SYDENHAM in chronic cases only, was likewise generally used in the acute rheumatism as soon as the fever began to give way.

* *Loc. cit.*

In this manner I treated the acute rheumatism of the army, and for the most part with success. But the chronic rheumatism I found one of the more obstinate diseases of the hospital, being either the remains of a rheumatic fever ill cured, or pains that had at first been owing to colds, and were rivetted through want of timely care. In complaints of that kind, when the blood was not fizy, I suspected that either the pains were venereal, or that the soldier pretended indisposition; and in this last suspicion I believe I was seldom mistaken; though I must acknowledge that I have since seen persons of better condition, with the same complaints, and under no temptation to disguise their case, without any secret taint, or any visible alteration in their blood.

SYDENHAM having well distinguished this kind of rheumatism from the other, which BALLONIUS had not done, I likewise followed the practice of the former in regard to bleeding in it. Whenever therefore I found the blood inflamed, I made the patient lose, once in eight or ten days, about eight ounces, as long as it continued fizy, or his complaints remained. Between whiles I opened his body with a draught of gum *guaiacum* dissolved, and on the intermediate days gave the spirit of hartshorn. At that time I considered the *guaiacum*, as others had done before me, as a specific purge in those slow rheumatisms; and from later experience I have had so much reason to be confirmed

confirmed in my favourable opinion of its qualities, that in such cases after bleeding with the lancet, or with leeches if the parts are swelled and inflamed, I still usually prescribe a draught of half a drachm of that substance, dissolved in the yolk of an egg, two ounces of water and some sugar, to be taken every night at bed-time, in order to procure two or three motions next day. In this course I proceed till either the pains cease, or till the patient finds himself too much weakened by these evacuations to continue them longer. In either case, and especially if the water breaks, or the patient complains of night-sweats, I endeavour to finish the cure with the Bark, which I give to a drachm and a half, in substance, in the day. During both the use of the *guaiacum* and the Bark, I still order the spirit of hartshorn, as above directed; and whenever any joint is attacked with a swelling and pain, I have recourse to the application of leeches, which have little less effect here, than in the rheumatism attended with fever.

In the acute rheumatism, I never used any external application with success. I except cupping, leeches, and blisters. And in pains without fever, though I have known some relief, at times, procured by BATES'S anodyne balsam, embrocations of volatile alkaline spirits by themselves, or in the *linimentum volatile*, to which one-fourth of oil of turpentine was added, yet at other times I have known all these rather aggravate the symptoms. Perhaps

flannel alone is the most generally useful application, and yet I have known some rheumatic patients complain of that also, and obliged to lay it aside, as too heating.

BALLONIUS admits of paregorics for palliating the symptoms, but without defining the kind, or the times most proper for administering them. SYDENHAM condemns all opiates, as fixing the disease; how justly may be a question. During my practice in the army, relying upon his authority, I likewise abstained from them in the rheumatism, both acute and chronical. But since that time, being moved by the testimony of others, I have altered my method in that respect, and in sharp nocturnal pains preventing all rest, I have sometimes successfully given from 20 to 25 drops of the *tinctura Thebaica*, joined to 30 drops of the *vinum antimoniale*; but in other cases, I have imagined, with SYDENHAM, that it was better to omit all such medicines.

The *sciatica* is commonly distinguished into the gouty and the rheumatic kind; but if by that term is understood a pain or soreness of the hip-joint, attended with a lameness from the affection of the part, we must admit at least one other species of this disease, arising from a deposition of matter, either upon the *psoas*, or *iliacus internus* muscle, of one side; or upon the articulation itself, rendering the bones at last carious. The common *sciatica*,

if recent, was treated with bleeding, blistering upon the part, purges of *guaiacum*, and volatiles: in a word, with such remedies as were given in the common rheumatism, according as it was attended with fever or not. Nor did I find it unconquerable by such means, though for the most part more obstinate than other rheumatic pains. But when the pain and lameness were of an old standing, I was then, and have been since, so little successful in treating the disease, that I think it unnecessary to propose to others the fruitless means which I have used on that occasion. In the first edition of this work I mentioned two cases that occurred in the former war, in both which the pain was great and constant, so that nothing giving relief, those men, after becoming hectic, died in agony. They were not opened, but I question not but there was matter gathered about the joint, and that some of it being absorbed occasioned the slow fever. For since that time, I have noted down six cases in which the pain and lameness were plainly owing to suppuration. In three of these, the matter making its way by an abscess in the upper part of the thigh, was discharged in a large quantity, and the patients recovered. In the other three, the matter never appeared till after death, when upon examination, it was found in one body lodged on the *psoas* muscle of the lame side, and no where else; in another, it was seen all about the articulation, whilst both the *acetabulum* and head of the *os femoris* were carious; and in the third, the joint was likewise carious, and

matter surrounded both it and the bladder: some was also found in the kidney of the same side. The late Dr. John Clerk, after the former peace, acquainted me, that he had removed obstinate sciatic and other arthritic pains, by soap, given from half an ounce to an ounce a day, for some months together.

C H A P. III.

Observations on coughs, and the phthisis pulmonalis.

COUGHS and consumptions are properly annexed to inflammatory diseases. For a recent cough from cold may be considered as the lowest degree of a peripneumony, and an old and neglected cough as the beginning of a consumption.

Obstructions of the lungs are succeeded by tubercles and ulcerations. In several bodies which I examined of those who died of the *phthisis pulmonalis*, I found the lungs adhering to the *pleura*, and full both of tubercles and ulcers.

We ought therefore to be careful in removing colds in the beginning. But this part belongs to the regimental surgeon, who is first applied to, and who may be assured that a cough is bad indeed when a soldier complains of it. The disease being of an inflammatory nature, bleeding is the chief remedy, which with a low diet will frequently cure bad colds, whilst all other medicines may be ineffectual without it. Recent coughs, after bleeding,

are softened by a mucilage of linseed, by *spermaceti*, or by any common sweet oil, and especially when to the daily quantity we add about a drachm of the *syrupus e meconio*, to abate the irritation. But when the cough is of a long standing, oily medicines do harm by their relaxing quality. The patient besides, if disturbed by his cough in the night, took an opiate. In the beginning of the war, I usually ordered 6 or 7 grains of the *pilulæ Matthæi* at bed-time; but since that time I have preferred a draught with from 15 to 20 drops of the *tinctura Thebaica*, and a drachm and a half, or two drachms, of the *oxymel Scilliticum*.

In older and more stubborn coughs, or in the first stage of a consumption, when the patient complains of pains in his side, constriction at the breast, or of hot and restless nights, I have trusted most to small but repeated bleedings, to setons, and to a low and cooling diet.

I have found these small bleedings not only beneficial in old coughs threatening consumptions, but also after hectic symptoms have appeared. The quantity taken away was from four to seven ounces, once in eight or ten days, and sometimes a vein was opened after shorter intervals. It was observed, that the patients seldom found themselves so much relieved on the first, as on the second, or third night after bleeding. The blood was constantly sily; but if it had been found in a resolved state,

to have insisted upon taking more would have been improper. Nor would I recommend this method for common practice, without making great allowance for the strength of soldiers, nor without proportioning the quantity of blood, to be taken away, to the condition of weaker patients. In habits naturally weak, or scrofulous, or when the patient has been long in a decay, the bleedings, like other means, will be ineffectual.

But I can more freely, from repeated experience, in all constitutions, recommend the use of issues, and a seton in particular, put into the side, upon the part most affected.

In thirst, heat, and other symptoms, the signs of an inflammatory state of the humours, the ptisan is to be acidulated, and the aliments ought then to be all of the acid or acescent kind. In these circumstances, whenever I could, I confined the patient to a total milk and vegetable diet. I found nothing so much diminish the hectic heats as small bleedings, with the above regimen. Colliquative sweats were sometimes checked by lime-water, and sometimes by the acid elixir of vitriol.

In the advanced state of a consumption, we may distinguish two sorts of coughs; one from the lungs themselves, and the other caused by a thin rheum falling upon the *fauces* and *trachea*; which parts being then deprived of their *mucus* become sensible
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of every irritation: this last kind is perhaps the most painful and teasing to the patient. The same medicines are not proper for both. For the first sort, balsamics have been generally used, but, so far as I have tried them, with little success. Nature can sometimes in that state make a cure, which we have not yet learned to imitate. We can do little more than to endeavour to keep the patient cool and free from fever, whilst she exerts her powers. But as to the other kind of cough, we can at least palliate it, and that by incrassants. For this purpose I have commonly given the conserve of roses, and opium. The former is always safe, but of weak virtues; the latter is the most efficacious, but is to be taken with caution, considering how apt it is to affect the head, to bind the body, and to obstruct expectoration. However, as these bad qualities are in some measure to be corrected by squills, as soon as the patient began to complain of restless nights from coughing, I usually prescribed such an opiate and scillitic draughts as was mentioned above, increasing or diminishing the dose of each ingredient when there seemed to be occasion for it.

I never in the hospitals of the army gave the Bark in any stage of the consumption, or, at most, it was in the convalescent state, when the lungs seemed to be free from obstruction. But I have frequently, since, given three or four spoonfuls twice a day of a decoction or an infusion
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of the Bark, without observing it to heat or obstruct the breathing; but on the contrary, to have a good effect when the patient has complained of low spirits and weakness, and has not been in the last stage of the distemper.

Riding and asses milk, the two common resources, are wanting in military hospitals: what is still worse, the air of such places, or of full barracks, is contrary to the cure. Hence it happens, that though these means may often succeed with patients better accommodated, yet they will generally be frustrated by the foul steams which the sick breathe there; and though a soldier may chance to escape their bad effects and recover, it is odds but he relapses, by being exposed to colds as soon as he returns to his duty.

In this manner I have treated the *phthisis pulmonalis*. I have likewise observed much benefit to arise from small, but frequently repeated bleedings in the cure of wounds, when matter has been absorbed and a hectic fever brought on.

C H A P. IV.

Observations on the fevers commonly called bilious, or the autumnal remitting, and intermitting, fevers of the army.

I COME now to consider those diseases, commonly, though perhaps improperly, called *bilious**, which being the most common and fatal to an army, and least known, shall therefore be treated of in a more full and regular manner than the preceding.

These disorders begin about the decline of summer and become epidemic in autumn, appearing earlier, more general, and with worse symptoms, in proportion to the heat of the season, and to the moisture of the ground and climate. Although of different forms, yet they proceed from the same causes, and may be reduced to two heads, *viz. fevers, and fluxes.*

Beginning with the fevers, I shall first describe that which is frequent in every camp; next, that which seems more peculiar to the marshes; in the third place, I shall inquire into the cause of both; and then compare them with those of other places in the like circumstances; lastly, I shall propose that method of cure which I followed, both in the fevers of the camp, and in those which occurred in the marshy parts of the Netherlands. In the next

* See part ii. ch. i. part iii. chap. iv. § 3.

chapter I shall mention such remedies as I found most successful in removing the disorders occasioned by those original diseases.

§ 1.

Of the symptoms of the autumnal remitting, and intermitting, fevers of the camp.

IN the month of June, the fevers in the camp are fewer and less inflammatory than upon first taking the field, and as the season advances they are attended with still less inflammation, but with more disorder of the stomach and bowels, and with pains in the head, and they have all a sensible remission. This change, just perceptible after the solstice, becomes manifest by the end of summer, or the beginning of autumn.

This epidemic varies according to the nature of the ground, and therefore I shall distinguish it into two species; one, incident to an army on dry ground; and the other, infesting it in damp and marshy countries. I shall first describe the former.

The autumnal remitting fever of the camp begins with chilliness, lassitude, pains of the head and bones, and a disorder at the stomach. At night the fever runs high, the heat and thirst are great, the tongue is parched, the head aches violently,

lently, the patient gets no rest, and often becomes delirious; but generally in the morning, an imperfect sweat brings on a remission of all the symptoms. In the evening, the paroxysm returns, but without any cold fit, and is commonly worse than the former: next morning it remits as before. These periods go on daily till the fever, if neglected, insensibly changes into a continued form. Sometimes loose stools carry off the fit and supply the place of sweats.

Although this fever in many particulars resembles an intermittent, yet it is somewhat of a different nature, as shall be more fully shewn when we come to the cure. In the camp, we seldom meet with a regular intermittent, either in a tertian or quartan form, unless in the case of those who have had the distemper in the preceding autumn, or some time before they took the field.

The remissions usually appear from the beginning, and especially if the patient is bled on the first attack: sometimes they are little perceptible for the first two or three days. Hemorrhages of the nose, at the height of the paroxysm, generally bring on the remission sooner and make it more complete. Vomiting or purging have the like effects. But I remember of no natural evacuation making a cure at once, unless when a *cholera* supervened, that is, a violent discharge both ways of the corrupted humours which seemed to be the cause of the disease.

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The fits are seldom preceded by shiverings; or any sense of cold, after the first attack. The pulse is full and quick during the paroxysms, and in the remissions it still indicates some degree of fever. The blood is florid, the *crassamentum* is firm, in a large quantity, and sinks in the *serum*. The blood shews no great sign of inflammation in the beginning of the epidemic, but towards the end of the campaign it acquires a fizy crust; for by that time to the other symptoms are joined either stiches, rheumatic pains, or a cough.

Whilst the weather continues warm, the marks of a foulness in the *primæ viæ* are most frequent; but as winter approaches, the inflammatory symptoms prevail.

The urine is high coloured and crude till some evacuations have been made, and then it begins to break. What is voided by vomiting, or by stool, is generally of a bilious and corrupted nature. Costiveness not only often precedes but accompanies the disease, and when that happens the belly feels hard, and the patient complains of wind. Although all do not vomit, yet every one feels a disorder at the stomach, especially during the hot weather.

Worms come away frequently by stool, sometimes by vomiting. They are of the round kind, and those who are troubled with them have more obstinate gripings, or sickness at the stomach. In
such

such cases, stitches are frequent; but these being often of the flatulent kind are not always relieved by bleeding.

Some grow yellow as in the jaundice. This colour was observed to be more frequent during the first campaign than afterwards: it was an unfavourable but not a mortal sign. One of the regimental surgeons told me, that he had opened the body of one of his men who died with this symptom, but had discovered no *calculus*, nor any kind of obstruction in the gall-bladder or in the biliary ducts.

The infantry were more subject to the fever than the cavalry; and these last, more than the officers: this seemed to be owing to the difference of clothing and accommodation*.

I perceived no critical days, nor any certain period of the distemper, which was longer or shorter, according to the manner of treating it. It would not be dangerous, if timely and proper means were always used; but this fever is often fatal to an army, when so many are seized at once, that all cannot be properly attended; or when it changes into a continued form, either by neglect at first, or by crowding too many of the sick into one hospital.

This remitting fever attended every campaign, and was most frequent and fatal after the hot sum-

* Part i. chap. iii.

mers of the years 1743. and 1747. but in the campaigns 1744. and 1745. the seasons being temperate, fewer were seized, and the cases were milder.

§. 2.

Of the symptoms of the autumnal remitting, and intermitting, fevers of low and marshy countries.

THIS *species* of fever was mentioned in the general account of the diseases most incident to the Netherlands *, and also in the account of those which occurred during the two last campaigns †; but the full description was reserved for this place.

We are first to observe, that though all moist countries are subject to intermittents, yet if the moisture is pure, and the summers are not too close and hot, the fevers will mostly appear in a regular tertian form and be easily cured. But if the moisture arises from stagnating water, in which plants, fish, and insects die and rot, then the damps, being of a putrid nature, not only occasion more frequent but more dangerous fevers, which oftener appear in the form of quotidians, or double tertians, than in that of single ones. These marsh-fevers are not only apt to begin with little remission, but after intermitting for some days, to change into conti-

* Part i. ch. i.

† Part i. ch. vii. and viii.

nued fevers of a dangerous nature. It is remarkable how much they vary with the season; for however frequent, violent, or dangerous they have been in the decline of summer, or beginning of autumn, when the putrefaction is at the height, yet before winter they are reduced to a small number, become mild, and generally assume a regular tertian form.

The first kind were observed to prevail near the inundations in Dutch Brabant*; the next, were those of Zealand†; of the third degree, were those in the lines of Bergen-op-Zoom‡; and the mildest sort, were such as were frequent in the cantonments around Eyndhoven§, in villages rendered moist by plantations, and subterraneous but not putrid water. I shall describe the first and worst kind, from which it will be easy to judge of the nature of the rest.

In the end of July, 1748. when our troops had been a fortnight or three weeks in the cantonments, whilst the days were sultry, but the nights cool and foggy ||, several of the men (of those regiments which lay nearest the inundations) were seized at once with a burning heat and a violent head-ach; some feeling a short and slight chilliness before the attack, others mentioning no preceding

* Part i. ch. viii.

† Ibid. ch. vii.

‡ Ibid. ch. vii.

§ Ibid. ch. viii.

|| Ibid. ch. viii.

disorder. They all complained of intense thirst, aching of the bones, a pain of the back, great lassitude and inquietude, frequently of a *nausea*, sickness, or a pain about the pit of the stomach, and sometimes they vomited green or yellow bile of an offensive smell. The pulse upon the first attack was generally depressed, but rose upon bleeding. There were some instances of the head being so suddenly and violently affected, that without any previous complaint the men ran about in a wild manner, and were believed to be mad, till the solution of the fit by a sweat, and its periodic returns, discovered the true nature of their *delirium*.

Some time after, Dr. STEDMAN, then surgeon to the Greys, acquainted me, “ That two of the
 “ men who were first taken ill, were seized at once
 “ with symptoms of an ardent fever, and though
 “ they were speedily and plentifully bled, yet in
 “ an hour after, both were in a high *delirium*,
 “ which continued for some hours, and then went
 “ off with a profuse sweat, under which all the
 “ other symptoms either abated or vanished.
 “ That next day about the same hour the paroxysm
 “ returned, and in six or seven hours ran the same
 “ course. That in this manner the fever affected
 “ many of that corps, whilst some of them had
 “ less distinct paroxysms, the hot fits longer, and
 “ those followed by imperfect sweats with little
 “ relief. That sometimes the remissions were so
 “ imperceptible,

“ imperceptible, that the disease appeared almost
“ in a continued form. That the nearer it ap-
“ proached to this last state, it was the more in-
“ tractable; but that when the paroxysms were
“ distinct, with an intermission of some hours be-
“ tween them, the patients for the most part did
“ well, however great the *delirium* was during the
“ fever. That a few returns of the paroxysms
“ reduced their strongest men to so low a condition,
“ as to disable them from standing. That some
“ became at once delirious without any previous
“ complaint, and would have thrown themselves
“ out of the windows, or into the water, if not
“ prevented; that their phrenzy continued for
“ some hours, after which falling into a profound
“ sleep, they awaked quite sensible, but with a
“ violent head-ach. That others, whose fever
“ appeared in a continued or remitting form, had
“ critical sweats about the ninth day, and after-
“ wards regular paroxysms and intermissions. That
“ a few had a crisis by stool or urine. That there
“ were some who had been ill about three weeks
“ without any sensible remission, after which the
“ fever ended with some quotidian paroxysms;
“ and that these men during their illness had gen-
“ tle sweats, or rather a continual moisture upon
“ the skin. That many upon being first taken ill
“ had bilious vomitings; and that several voided
“ round worms both ways. That the profuse
“ sweats had always a putrid smell; and that the
“ discharge from the blisters was so offensive,

“ that the nurfes declined dressing them. What
 “ was moft remarkable, a few of thofe who died
 “ were obferved to have a regular pulfe, though
 “ very near their end. That all thofe who died
 “ had a cadaverous fmell for fome days before
 “ death, and immediately after, livid fpoths and
 “ other figns of a mortification.” Dr. STEDMAN
 concluded with obferving, “ that the fame diftem-
 “ per was alfo common among the peafants of
 “ the cantonments, and that a great number of
 “ them died.”

This account of the beginning of the epidemic
 being fo full and diftinct, I need only add, that it
 agreed with the obfervations of all the other regi-
 mental furgeons in the like fituation, allowing for
 fome variation according to the different circum-
 ftances of thofe corps. Thus Mr. LAUDER, fur-
 geon to the Inskilling regiment, then Lord RO-
 THES's, informed me, “ That moft of the men were
 “ firft taken ill upon their return from forage;
 “ for the regiment being cantoned upon the
 “ right and left of St. Michel's Geftel (their prin-
 “ cipal quarters) clofe upon the inundations *, and
 “ many of the quarters being above two leagues
 “ from Bois-le-duc, where the magazines were kept,
 “ the men were obliged to fet out about four in
 “ the morning, in order to get back before the
 “ greateft heat of the day. That at this early
 “ hour, the meadows and marfhes on each fide of
 “ the road were covered with a thick fog of an

* Part i, ch. viii.

“ offensive

“ offensive smell, which he considered as the chief
“ cause of the sickness. For though the party ge-
“ nerally returned before noon, yet he observed,
“ that several among them were already in a fever,
“ and some actually delirious; nay, that two on
“ their way home were so suddenly taken with a
“ phrenzy, as to throw themselves from their trusses
“ into the water, imagining they were to swim to
“ their quarters. That from the first attack, as
“ many of them as were sensible complained of a
“ violent head-ach, thirst, and burning heat; and
“ that all of them, attempting to sit up, were ready
“ to faint away with a giddiness, sickness at sto-
“ mach, and retching to vomit. That these fevers
“ were for some days of a continued form, or at
“ most had slight remissions; after which they
“ either remitted more plainly, or thoroughly in-
“ termitted. That at first the pulse was small and
“ depressed (though the patient was then delirious)
“ but that it always rose upon bleeding.” Mr.
LAUDER acquainted me, about three years after this
sickness, that two of those men, who were so sud-
denly taken with a phrenzy on their return from
foraging, though they recovered of their fever, yet
had ever since been epileptic; and that all the rest,
who had been ill, were still liable to returns of an
intermitting fever.

The condition of the Foot was somewhat diffe-
rent; for few of them being cantoned near the in-
undations, their fevers, though frequent, yet were
generally of a milder nature; nevertheless some of

those corps had the sickness also in a high degree, occasioned by the moist and corrupted air of their quarters. The village of Dinther * lay low, and was surrounded with ditches and thick plantations. Mr. TOUGH, surgeon to the batallion there, observed, “ That the meadows were every evening
 “ overspread with a fog, which continued till next
 “ morning after sun-rise, and which had the offensive
 “ smell of a foul ditch newly drained. That
 “ the men were commonly taken ill in the night-
 “ time with a shuddering or sense of cold, which
 “ was soon followed by a violent head-ach, intense
 “ heat, and other feverish symptoms †. That at
 “ this time the pulse was so small and depressed,
 “ that if a vein was opened, the blood at first would
 “ scarce run out, but that after some vent it flowed
 “ briskly, and then the pulse rose. That the heat
 “ was succeeded by a profuse sweat, which brought
 “ on the remission, or intermission of the fever.
 “ That the paroxysms returned every evening, and
 “ if care were not soon taken to stop the fever, it
 “ was apt to change into a continued form with
 “ alarming symptoms. That in three cases he
 “ observed petechial spots; and in a fourth, a mor-
 “ tification under the left breast, which however
 “ was cured by the Bark. Lastly, that there was

* Part i ch. viii.

† It is to be remarked, that the dragoons having better pay generally hired beds of their landlords, or at least lay warm in their cloaks; but that the foot-soldiers wanting these advantages, lay in barns and other damp places without any covering.

“ one instance of a man, who being suddenly seized
 “ with the usual head-ach, and not immediately
 “ bled, got out of his quarters and ran about the
 “ fields like one distracted.”

In the greatest heat of the weather and rage of the distemper, most of these fevers answered the description of the *καύσος* or *ardent fever* of the ancients, which HIPPOCRATES does not rank with the inflammatory diseases of the winter and spring, but with the epidemics of summer and autumn*, though later writers have applied this term to all fevers attended with great inflammation.

But it was observable, that even in the worst parts of that country, as soon as the weather cooled in the decline of autumn, the fevers began to assume a milder form; and in the end of the season, differed little from the common intermittents of other places.

There were but few quartans, and those did not appear till late, nor were they hard to cure unless

* Aphor. lib. iii. Aphor. xxi.

The ardent fever of the ancients was either continued, or remittent; of which last GORRHÆUS gives the following description: “ *Est ὁ καύσος tertianæ febr̄i ὁμογενής, ut qui ab iisdem causis, eodem anni tempore & iisdem corporibus provenit, a quibus & tertianæ febres excitari solent. In tertiana intermittente primum rigor, deinde ἀποεξίς ἐστὶν: verum ardentis exacerbationes nullo cum rigore sunt, nec unquam integre solvuntur, sed modice tantum remittuntur.*” Definit. in voce *Καύσος*.

when they succeeded to some other form of this fever, which had already produced obstructions in the *viscera*.

When the sickness was at the worst, many voided round worms, which were not the cause of the fevers, but, as we observed before, concurred with other circumstances to retard the cure.

At the height of the epidemic it appeared, that both intermittents and remittents, by extending or doubling their paroxysms, frequently changed into a continued, and dangerous form, and that most of those whom we lost died in this way. These men, as we remarked, had a corrupted smell for a day or two before their death, and soon after their bodies putrefied. Some had petechial spots, though the place where they lay was neither crowded with sick, nor too close; and to these spots were added some other symptoms, the same with those of the hospital-fever.

But in general, the mortality was not in proportion to the number of the sick, nor to the alarming nature of the symptoms. Although the distemper was violent, yet it yielded to medicine, and no kind of acute disorder required it more; for a great number of the country people perished for want of assistance, whilst most of our men recovered by the care of their regimental surgeons. Of the Greys and ROTHES'S dragoons, who were the most sickly, 31 died in all; which will not appear a great number, if we reflect on the many bad cases

(and those much dispersed) and how few there were to attend them*.

One of the most unfavourable circumstances was the proneness to a relapse, of which the danger was greatest during the hot weather, less in the decline of autumn, and least of all after the frosts began. But in the following spring, relapses were so frequent, that those regiments which had served in Zealand in the preceding autumn, had in the next campaign above four times more sick than any other corps in the line.

Frequent relapses brought on visceral obstructions, which made the intermittents more obstinate and irregular, and to terminate in a dropsy, or jaundice. In this bad state of the *viscera*, a hard tumour was frequently felt on the left side of the belly, lower than the false ribs, called by the common men the *ague-cake*. But as none of those who died with this tumour were opened, the part affected could not be ascertained. I conjectured it to be the spleen. It was often accompanied with swelled legs, a distension of the whole belly, or with some other hydropical symptom; and whilst it remained, the fits could not be safely stopped by the Bark. It was a bad, but not a mortal sign, since many who had it recovered.

I likewise met with a few cases of the *tympanites*, a distemper which I suspected to be chiefly owing

* Part i, chap. viii.

to a premature use of the Bark before proper evacuations. But as to other obstructions, and in particular those which brought on the *ascites*, I observed, that they happened as often without, as with the Bark, and therefore seemed generally to depend on the long continuance and obstinacy of the intermittent.

It was remarkable, that whilst the sickness raged among the common men, it appeared in a milder degree among the officers, who seldom had the fever in a continued form, or attended with bad symptoms, but in the shape of single and double tertians, or of quotidian remittents. The reason seemed to be, that they were less exposed to the sun and fogs, that they had drier quarters, better diet, and the use of wine.

§ 3.

Of the causes of the autumnal remitting, and intermittent fevers of the camp, and those of low and marshy countries.

THE heat and moisture of the air appear to be the chief remote and external cause of these fevers; and this cause is most prevalent not only in proportion to the warmth and closeness of the weather, but to the quantity of vapour with which the air is loaded in the drought of summer. Rains in general lessen the moisture of the air by drain-

ing

ing it of so much water: and by descending from a colder region, they not only refresh the atmosphere, but the earth also, and thereby check immoderate exhalations. The most healthful campaigns have therefore been those in which the heat and moisture of the air were moderated by frequent showers. But if the air in its greatest heat receives not only the aqueous, but the putrid *effluvia* from marshy grounds, or from any large surface of corrupted water, the remote and external cause of sickness will be aggravated, the diseases will be more numerous and attended with more alarming symptoms.

The relaxation of the fibres and greater tendency in the humours to putrefy, consequent on this state of the atmosphere, may be considered as the internal and predisposing cause of these fevers: for a hot and moist air unbraces the solids, resolves the blood, and obstructs perspiration. When the air is filled with vapour, it admits the perspirable matter with difficulty; and when part of that is retained, the blood not only thereby receives a septic ferment, but is more heated by having less evaporation. Nor can the want of a free perspiration be supplied by sweating, as that evacuation tends rather to weaken the body and render it more subject to disorders.

Although these two causes may be sufficient of themselves to produce this fever, yet for the most part a third is wanting to bring on the disease: this
is

is called the *exciting* or *occasional cause*, which arises from some error in the non-naturals; such as heating the blood by fatigue, intemperance, or insolation; or by suddenly checking the perspiration by wet clothes, lying on wet ground; or by absorbing some noxious vapours, &c.

To these last errors in regimen SANCTORIUS must allude, when he refers the causes of the autumnal tertian fevers to a stoppage of perspiration; and we can scarcely doubt of the justness of that observation, though from KEIL's Tables it would seem, that this excretion may not only be diminished, but for some time wholly suppressed without any injury to the health. But we are not to compare the ordinary checks given to perspiration in this country (where the weather is seldom close and hot for any considerable time) with what happens in other climates subject to such intemperature; where the inhabitants having in summer and autumn long and uninterrupted heats (and by that means blood of a more putrescent nature) require a more constant evacuation of what is recrementitious. SANCTORIUS himself says, "that such a stoppage of perspiration as in summer might occasion a malignant fever, will in winter scarce affect the health*."

† Adiapneustia, quæ æstate malignam febrem, hyeme vix minimam alterationem efficere potest: corpora enim acriori perspirabili æstate referta sunt quam hyeme. *Med. Stat. sect. ii. aphor. xxxv.*

Thus

Thus far we have endeavoured to trace the remote, the predisposing, and the occasional causes of these fevers; and it were to be wished that with the same probability we could explain their *causa proxima* or immediate cause; that is, could shew how these vitiated humours act upon the vital principle, so as to excite a fever of a remitting, or intermitting form, accompanied with such symptoms as were mentioned above. But in these researches, as so much depends upon the action of parts which have laws peculiar to themselves and are imperfectly known, it seems better not to form any hypothesis at present, but to wait till further discoveries be made in the animal machine.

These fevers have been long called *putrid*, and not without foundation; since, from what we have observed, there seems at this time to be such a disposition in the humours to putrefaction. They have still more anciently been distinguished by the name of *bilious*, but with a more disputable propriety; as the first authors did not confine that term to the appearances only, but extended it likewise to the cause of the disease. Yet it was no wonder that the ancients should believe that these fevers arose from bile, when they observed that nature cured them by a *cholera* or violent discharge of the gall both ways; and that physicians could also succeed, in the same manner, by vomiting and purging. But after all, the bile seems to be more the effect than the cause; for whenever these fevers
come

come to fair intermissions they give way to the Bark, a medicine which so far as we know has no direct influence upon that humour. All therefore that can be said in favour of the ancient doctrine is, that though the bile be not the first cause, yet, from its redundance and depravation, owing perhaps to the fever, it frequently becomes a secondary cause of irritation, and supports the disease.

I should now proceed to the cure, but as it may be proper to examine these principles, by considering what form the summer and autumnal disorders assume in other places, under the influence of a warm, moist and putrid air, I shall produce a few instances for this purpose from such authors as seem to have made the proper observations.

§ 4.

The autumnal remitting, and intermitting fever of the camp, and cantonments, compared with the summer and autumnal fevers of other places.

I SHALL begin with the *morbis Hungaricus*, a disease frequently mentioned by authors, but, as I imagine, not thoroughly known. It is described as a fever, attended with sickness at the stomach, a pain and hardness about the epigastric region, great thirst, a parched tongue, and a constant head-ach ending in a *delirium*. These were the common symptoms, to which were generally added petechial spots, or blotches. This distemper

was contagious and mortal, though it usually run out from 14 to 20 days. It was first taken notice of in the year 1566. in the Imperial army in Hungary, and from thence it spread over a great part of Europe. As I have read no author who was an eye-witness, I shall take the liberty to infer from this account, which we have from SENNERTUS *, that the Hungarian disease was a compound of our autumnal, and hospital-fever; taking its rise in the camp, but acquiring that pestilential nature from the foul air of the places in which the sick were crowded. It appears that the climate in Hungary is one of the worst for an army in the field; which is easily understood, from the cold and damp nights that succeed the sultry days in a marshy country †. And since the autumnal fevers and fluxes are more frequent and worse there than elsewhere, in order therefore to account for the

* De morbo Hungarico.

† The moisture of that country is to be understood only of such low parts of it as lying upon the great rivers, particularly the Danube and Drave, are exposed to frequent inundations. For the land floods form marshes, and these corrupting, begin to infect the air about the end of summer. The rest of Hungary is said to be dry and healthful: but the campaigns being always made near those rivers, the troops on that account have been generally sickly.

Dr. BRADY, physician-general to the Austrian army, who had served three campaigns in Hungary, informed me, that upon the drying up of the inundations, he has seen large tracts of those grounds swarming with aquatic insects; and he confirmed the above account of the moisture of the air, and of the remarkable difference between its temperature by day and by

the mortality, and pestilential nature of this epidemic, we need only suppose that the weather in that year was more than usually disposed to promote contagion; that the sick were crowded together, and that the dead frequently lay unburied*. But these reflections will be better understood after considering the nature of the jail or hospital-fever, to which this disease may in part be referred. We shall therefore proceed to examine some other epidemics of a less doubtful nature.

At Copenhagen, in the year 1652. a fever began in autumn, after an unusually hot and dry summer †.

by night. Now, the sudden changes from heat to cold are not only to be ascribed to the damps (the air after sun-set being always colder in proportion to its moisture) but, according to that gentleman, to the winds blowing from the Carpathian mountains, which are some of the highest in Europe, and are constantly covered with snow. Those lying at so great a distance, he supposed, that the stream of air from that quarter was in the day-time thoroughly heated before it could reach the camp, but not after sun-set.

Dr. BRADY also told me, that the description here given of the fevers of the marshes agreed with the observations which he had made of the autumnal fever incident to the Queen's troops in Hungary, not only with regard to the symptoms, but to its cure by the Bark; which he, the first of any physician in the Austrian service, had given in that distemper. He added, that the course of the other military diseases, both in Hungary and in Bohemia, had been similar to what he found (by reading the first edition of these Observations) had occurred in our campaigns in Germany, and in the Low-Countries.

* This very circumstance is mentioned by SENNERTUS *Vid. loc. cit.*

† BARTHOLIN. *Hist. Anat. Rar. cent. ii. hist. lvi.*

That

That city is situated in a low and moist country. This fever was accompanied either with quotidian, or with tertian paroxysms, with bilious vomitings, a burning heat, violent head-achs, often with a *delirium*, and with petechial spots which came out in the fits, and disappeared in the remissions. These spots, with an extraordinary debility, shewed the putrid nature of the disease, which was further ascertained by the fever's ending in profuse sweats, abscesses, a *diarrhœa*, or dysentery. The author of this account, THOMAS BARTHOLINE, upon dissecting the bodies, and finding the stomach and *duodenum* always inflamed, or mortified, assigns to these parts the seat of all malignant fevers.

In the year 1669. a like fever raged at Leyden, described by Professor SYLVIUS DE LE BOE*, who lived at the time, and practised there. The situation of that place is also low and damp. The spring and beginning of summer were cold, but the remainder of summer, and the autumn were unusually hot, with little or no rain, and with a constant calm or stagnation of the air. The water of the canals and ditches was highly corrupted, and the more so, as the author observes, by an inlet of salt-water mixing with the fresh †: the air being thereby rendered more impure, brought on an epidemic fever of a remitting, or intermitting form, and very fatal. Besides a disorder of the stomach, great

* Prax. Med. tract. x.

† The reasons of this may be learned from the experiments in the Appendix, Paper iii. and iv.

anxiety, bilious vomitings, quotidian or tertian paroxysms, and other symptoms the constant attendants of this illness, he mentions spots, oozing of blood from the nose and hemorrhoidal veins, dysenteric stools, putrid urine, great debility, *aphthæ*, and other appearances which argued an uncommon resolution and putrefaction of the blood. And yet, which is strange, SYLVIVS ascribed the cause to a prevailing acid*, and treated the distemper accordingly: so that we cannot help remarking, that the great mortality among the principal inhabitants of that city (of which, he says, two thirds died) might have been owing, in some measure, to the method of cure by absorbents, and other medicines, agreeably to the notion which that ingenious and learned man and his followers entertained of its cause.

These and other instances of the same kind may confirm what was observed before, of the danger arising from hot and dry summers in moist and low countries †.

But the putrid diseases are still more frequent and fatal in the marshy countries of the South, where the heats are longer and more intense. In some parts of Italy, and in other tracts of the same latitude, these fevers have appeared with such alarming symptoms, as not only to have been called *pestilential*, but confounded with the

* SYLV. Prax. lib. cit. DCXXVII.

† Part i. ch. i. Part ii. ch. i. § ii.

plague itself. In this sense we are to understand CELSUS*, in the terms *pestilentia* and *febris pestilentialis*, which he describes as peculiar to the *grave anni tempus* and the *graves regiones*. His meaning is, that this bad fever is the disease of the latter part of summer, and of autumn, when the air is thickest and most foggy, and that it is most frequent in low and marshy countries.

Rome was always liable to these fevers. GALEN calls the *hemitritaa* the epidemic of that city, and speaks of its moist air †. Nay, in the beginning of that republic, before the Romans seem to have been aware of the noxious effects of stagnating water, or at least before they knew how to let it off, that place appears to have been so very sickly, that from the beginning of the state to the year U. C. 459, I find fifteen plagues mentioned by LIVY ‡, which yet, from other circumstances, appear to have been only so many destructive epidemics occasioned by the putrid *effluvia* from the neighbouring marshes. But when drains and common sewers were made, Rome became more healthful, and then only the low and wetter places of Latium remained sickly. Afterwards, when the city fell into the hands of the Goths, the drains being stopped and the aqueducts cut, the Roman

* CELS. de Medicin. lib. i. cap. x. lib. iii. cap. viii.

† De Temperam. lib. ii.

‡ LANCISIUS reckons up several more from the same author. Vid. *Dissert. de Advent. Rom. Cæli Qualit. cap. iii.*

territory became one continued marsh, which for a series of years occasioned an incredible desolation*. And though these evils have been since remedied, yet still, by neglecting to draw off the stagnating and corrupted water (after inundations of the Tyber, succeeded by great heats) the remitting, and intermitting fevers become both general and fatal. The examination of the bodies by LANCISIUS, which he has added to his excellent account of those epidemics, is a full proof of their putrid nature †.

Although it does not appear that the countries in which HIPPOCRATES practised were either marshy or subject to inundations, yet we find him frequently mentioning these fevers as common in summer and autumn, and as prevailing most when wet springs with southerly winds were succeeded by hot and close summers. A remarkable constitution of this kind is described in his Epidemics ‡, at which time the diseases were ardent, remitting, and intermitting fevers of a bad kind, attended with fluxes, parotids, and eruptions of a pestilential nature.

PROSPER ALPINUS observes, that the stagnating canals at Grand Cairo breed every year a bad kind of small-pox, as also the putrid and pestilential fevers that prevail in March, April and May, which the southerly winds make the hottest months in that country ||. He also remarks, that the

* Id. loc cit. † De Nox. Palud. Effluv. lib. ii. epid. i. cap. vi.

‡ Lib. iii. § iii. || De Med. Ægypt. lib. i. cap. xiv.

pestilential fevers are both epidemic and fatal at Alexandria in autumn after the recess of the Nile. They begin with a *nausea*, great sickness at the stomach, extraordinary inquietude, and a vomiting of an acrid bile* ; and many have bilious and putrid stools. Now, as these distempers rage in both those cities every year, it is not surprising, if in seasons uncommonly hot and moist they should be raised to a plague. For though the learned author asserts that the true plague is not properly indigenous in Egypt, but is brought thither from Greece, Syria, or the more southern parts of Africa, yet he thinks that it may sometimes begin there after extraordinary inundations of the Nile, when the water, extending itself beyond the usual drains, stagnates, and forms some large and putrid marshes †.

Java, lying between 5 and 10 degrees of south latitude, is so near the line, that the seasons are not so properly divided into summer and winter, as into the dry and the rainy. The rains begin in November and continue till May, in which time an immense quantity falls. There is also at Batavia a great deal of marshy ground, and canals with stagnating water, by the exhalation of which the air is rendered moist, foggy and unhealthful. BONTIUS observes, that at this time the humidity is great, and that even in the driest months metals

* The author's phrase is *bilis virulenta*.

† Ibid. cap. xv.

rust *, and clothes rot, in that country sooner than in any part of Europe. Nevertheless, the plague is unknown in Java, though from these circumstances one might expect that this island should be much exposed to it. But we are to consider, that when the sun is most vertical in that region, it is also most clouded; by which circumstance, and the continual interchanges of the sea- and land-breezes, the heat of the air is moderated, and its stagnation in a great measure prevented. The distempers are the *cholera*, flux, and a continued putrid fever. This last comes on suddenly with a *delirium*, is attended with constant watchfulness, and a vomiting of bile of various colours, but chiefly green. The extremities grow cold, whilst the inward parts burn, and the thirst is excessive; but the fever comes soon to a *crisis*. The evacuation of the first passages is the principal part of the cure; and next to that the author recommends saffron †, which, by the way, is a powerful antiseptic as well as a cordial medicine ‡.

* The rusting of metals is perhaps only an ambiguous sign of moisture, in any place near the sea, within the tropics. For I have been told by a gentleman, who made the experiment in Jamaica, that though iron rusts very soon in that island, yet that salt of tartar seemed to attract moisture from the air more slowly there than in Britain. I imagine therefore that the speedy rusting of metals, in hot climates, near the ocean, is owing to the great exhalation of the spirit of salt, which flies off from the sea water, by means of the heat.

† Bonn. Method. Medend. cap. xiv.

‡ Append. Paper ii. exp. xi. Pap. iii. exp. xvi.

The British settlements on the Gold-coast, in Guinea, are as near the line on one side as Java is on the other. In that country, the rainy season begins about the end of April, and continues till past the middle of June; from that time the weather is cold for the climate, and the air very moist, from the exhalation of so much rain. During this cold season, remitting and intermitting fevers with quotidian paroxysms are epidemic. These fevers are accompanied with great thirst, with a *nausea* and inquietude, and frequently with a vomiting and purging of an offensive bile; nor do they usually abate till that is evacuated. If a discharge of that humour is not made in time, the distemper assumes a continued and alarming form, the pulse sinks, and a *delirium* comes on, which is generally fatal. Fluxes are likewise frequent at this season; and both fever and flux are not less common on board the ships lying off the coast, than on shore, but do not affect such as keep out at sea beyond the limits of the foggy air. The sea- and land-breezes here, with the haziness of the weather during the hot season, seem to be of the same use as at Java for preventing pestilential diseases*.

Nor do the fevers of the West-Indies, though of a putrid nature, ever turn to a pestilence; because the same kind of breezes prevailing there probably prevents that degree of stagnation of the air, and corruption in it, which is necessary to produce that

* This account of Guinea, I had from persons of observation who had lived some years in that country.

distemper. But the heats being great, and the atmosphere loaded with vapours, fevers of remitting and intermitting forms, with bilious vomitings, become frequent in June and July, and epidemic in August, September and October, which are there, at least in Jamaica, the three most rainy months in the year. These fevers are incident to the natives as well as to strangers. But new comers are liable to a different *species*, at least to a different degree of the same disease, a more rapid, a more putrid, and more dangerous fever, distinguished by a *black vomiting*, but chiefly by the yellowness of the skin, which gives it the name of the *yellow-fever*. The blood is here so much resolved, that before death it enters the smallest serous vessels, tinges the *saliva*, and the *serum* discharged by a blister, and by oozing into the stomach, gives that blackish cast to what is then thrown up*.

The

* Dr. HUCK having been upon the expeditions to the French and Spanish islands, in the late war, made the following remark upon the paragraph above: “ Even in the most ardent
 “ and worst kinds of the yellow-fever, I think a paroxysm
 “ may generally be perceived once in four and twenty hours;
 “ for the patient is commonly worst towards the evening, or
 “ at night. And if the yellow-fever could be distinguished,
 “ in its beginning, from the common remitting or intermit-
 “ ting fever which was so fatal to our army, it was only by all
 “ the symptoms running higher, and by a greater degree of
 “ the fever when one might have expected more free remissions,
 “ Both fevers began with nearly the same symptoms; some-
 “ times, though rarely, with a shivering. But whenever the
 “ fever ran high, with burning heat, violent pains of the head
 “ and loins, profuse sweats without relief, redness and burn-
 “ ing

The result of the whole is: Wherever the greatest causes of moisture and putrefaction in the air exist, there also will be seen the greatest number and the worst kinds of the remitting and intermitting fevers.

Before I conclude, it may be proper to observe, that we have the same kind of fevers in Britain; and that both our remitting and intermitting fevers, and dysenteries, may be owing to a putrid cause,

“ ing pains of the eyes, inflamed countenance, watchfulness,
 “ anxiety, oppression, and burning pains about the *præcordia*,
 “ frequent vomitings of green or yellow bile, or (what I think
 “ was rather worse) a constant retching to vomit without
 “ bringing up any thing, or vomiting the drinks only, one
 “ might then almost certainly foretel the yellowness; and if
 “ this appeared on the second, third, or fourth day, the disease
 “ was generally mortal. I have often seen patients labouring
 “ under most of these symptoms immediately relieved by early
 “ evacuations, and the fever brought to intermit. And I
 “ have more than once seen this fever with all these symptoms
 “ carried off by bleeding, and exhibiting within a few hours
 “ from the first attack of the disease, a medicine which ope-
 “ rated pretty briskly both by vomit and stool; and I have
 “ known some of those very patients, who were so well as to go
 “ abroad on the second or third day after, and who continued
 “ well for four or five days, but on committing some error,
 “ such as exposing themselves too much to the sun, were again
 “ seized with the same symptoms, and died on the fourth or
 “ fifth day, with their skin tinged of a deep yellow or copper-
 “ colour. Hence I am apt to think that these are different
 “ degrees of the same disease, and that it sometimes depends
 “ upon the manner in which the patient is treated in the be-
 “ ginning, whether he shall have the yellow- or only a remit-
 “ ting or intermitting fever.”

though

though in a lesser degree than in most other countries. For such is the dryness of the soil, and its freedom from marshes, the constant perspiration, and the moderate and interrupted heats of our summers, that unless in extraordinary hot and close seasons, and in marshy places, these distempers are mild, and scarcely ever epidemic.

In fine, during the latter part of summer, and throughout autumn, there seems to be in most places a disposition, more or less, to these remitting, and intermitting fevers, or to some disorders of the first passages, connected with a tendency to a resolution of the fluid- and a relaxation of the fibrous parts of the body. And this holds chiefly in hot and moist countries, and in all camps, for the reasons already given*. And I must add, that all I have learned from the best authors, the relations of those who have communicated their observations to me, and my own practice, induce me to believe, that the cure of all those fevers, in so many different climates, depends nearly upon that method of treatment which shall be set forth in the next section.

* Part i. ch. i. Part ii. ch. ii. § 2.

§ 5.

Of the cure of the autumnal remitting, and intermitting, fevers of the camp, and of those of low and marshy countries.

I COME now to the cure, in treating of which I shall observe the following method. In the first place I shall distinguish the two species of fevers as before; and then I shall mention such remedies as I have found most successful in them.

In the cure of these fevers, I found it necessary to begin with opening a vein, and to repeat the bleeding according to the urgency of the symptoms. The vernal and latter autumnal remitting fevers are accompanied with pleuritic and rheumatic pains, from the coldness of the weather, and on that account require more bleeding. A physician unacquainted with the nature of this disease, and attending chiefly to the paroxysms and remissions, would be apt to omit this evacuation, and give the Bark too soon, which might bring on a continued inflammatory fever. A vein may be safely opened either during the remission, or in the height of a paroxysm. For besides that I have observed the remission to come sooner and fuller after an hemorrhage, I have repeated experience of the safety of bleeding in the hot fits, and not only in this, but in the marsh-fever, even after it had come to almost regular intermissions. In order therefore to make the maxim of CELSUS * consistent

* Quod si vehemens febris urget, in ipso impetu ejus sanguinem mittere, hominem jugulare est. *Lib. ii. cap. x.*

with

with this practice, we must interpret his term *impetus febris* to mean that chilliness or cold fit which preceded the hot one in the fevers which he describes; for then bleeding would indeed be improper. But as the paroxysms of our fever, after the first attack, were generally without any coldness, his caution was not minded; nor any other except the common one, of not bleeding during the sweat.

After the first two editions of this work, having had more opportunities of seeing these fevers, I found it best to give a purge, at any time of the day, immediately after bleeding, and the rather as the patient was then generally costive:

℞ *Infusi senæ communis* ℥iii. *electarii lenitivi* ℥ss.
nitri puri ℥i. *tincturæ senæ* ℥vi. *misce.*

The half only was taken at once; and if it did not move him twice in four hours, which usually it did not, he then took the remainder. This potion agreed with the stomach, purged plentifully and with ease, and therefore was a more useful than an elegant composition. Next morning, when there was almost always some remission, I gave one grain of emetic tartar, rubbed to a powder with twelve grains of crabs-eyes, and repeated the dose in two hours, if the first had little or no effect; at any rate, in four hours. This medicine was intended not only to vomit, but also to open the body, and raise a sweat. If these evacuations were pro-
cured,

cured, the fever generally became easier, and was even sometimes cured. Formerly, instead of this powder, I gave in the first remission after seeing the patient, a scruple of ipecacuanha with two grains of emetic tartar, in one dose. But though this often succeeded, yet upon comparison I preferred the method above-mentioned, *viz.* first purging, and then clearing the *primæ viæ* with such doses of the antimonial preparation. This medicine I usually repeated next day, or the day following; if not, I opened the body with some mild laxative or a clyster, and continued this method every other day, till the fever went gradually off, or so intermitted as to be cured by the Bark.

I was afterwards confirmed in this practice, by the account which Dr. HUCK gave me of his success in such fevers, both in North-America and the West-Indies, by a method similar to mine. In the beginning, he let blood, and in the first remission, gave four or five grains of ipecacuanha, with from half a grain to two grains of emetic tartar: this powder he repeated in two hours, taking care that the patient should not drink before the second dose; for then the medicine more readily passed into the bowels before it operated by vomiting. If after two hours more, the operation either way was small, he gave a third dose, which commonly had a good effect in emptying the first passages; and then the fever either went quite off, or intermitted so far as to yield to the Bark.

On the continent, he found little difficulty after the intermission; but in the West-Indies, unless he gave the Bark upon the first intermission, though imperfect, the fever was apt to assume a continued and dangerous form. Dr. HUCK never varied this method, except from a stronger indication to purge than to vomit; in which case, he made an eight-ounce decoction, with half an ounce of tamarinds, two ounces of manna, and two grains of emetic tartar; and dividing this into four parts, he gave one every hour till the medicine operated by stool*.

As I did not begin to use the emetic tartar, in small and repeated doses, till the late war, and then only during three encampments in England, I had in those easy campaigns too few opportunities of trying this practice, so as fully to satisfy me about its effects; but partly from what I then saw, what I have learned from others, and from my own expe-

* Since the last war, Dr. HUCK informed me, “ That in
 “ the yellow-fever of the West-Indies (where the stronger vo-
 “ mits, if not administered very early in the disease, are found
 “ to be hurtful, but where nevertheless it seems necessary to
 “ clear the *primæ viæ*) he preferred this medicine. For
 “ though the first or second dose generally excited some degree
 “ of vomiting, yet in three or four hours it also purged; and
 “ this last operation he endeavoured to keep up, by giving
 “ from time to time two or three spoonfuls more, until an evi-
 “ dent remission appeared, which was usually on the fourth or
 “ fifth day. That he watched attentively for this remission,
 “ and upon its first appearance began to give a decoction of
 “ the Bark, in as large and as frequently repeated doses as the
 “ stomach could bear.”

rience,

rience, I am now persuaded that after bleeding, if there be occasion for it, the emetic tartar is an efficacious medicine, either for wholly removing, or speedily bringing these fevers to such remissions, as will admit of the Bark. But I must add, that as the virtue of that antimonial does not depend upon its emetic quality alone, but its cathartic also, it must be exhibited accordingly. Thus, in a quart of water dissolve six grains, and of this warm, let the patient drink every 10 minutes 4 or 5 ounces, till he begin to vomit, and then promote the operation by some warm water, or camomile tea; or, if necessary, by going on with the medicine in the same, or smaller doses, or at longer intervals. Commonly when the vomiting stops, the purging begins. But if this last effect should not be produced, let a clyster be administered; and next day, or when there shall be an occasion to repeat the evacuation, dissolve half an ounce, more or less, of one of the neutral purging salts, along with the emetic tartar, in the same quantity of water, to be taken as before. This I find is a safe, and commonly an easy manner of using that antimonial, which was first recommended by the French, under the title of *l'emetique en lavage*, and has been much used by them in such fevers.

Salt of wormwood, saturated with lemon-juice, or with the vitriolic acid, was given with a view to bring the fever sooner to a crisis, or to more regular intermissions; but I must confess, that, except

when this had the effect of a laxative, and thereby cooled, its virtues were little perceptible; and I am apt to believe, that if I had been more acquainted with the qualities of emetic tartar, given in the manner above mentioned, I should easily have dispensed with the use of all such neutral salts in these fevers.

I come next to the Bark, and shall observe, that though these fevers have often such fair remissions, and even with a breaking in the water, as might persuade a physician, unacquainted with their nature, that with little or no preparation, they would yield to that medicine, yet, for the most part, he would be disappointed; at least among our men, whose constitution, or manner of living disposed them more to inflammation than the Dutch soldiers, as will appear afterwards. For though I have generally seen the paroxysms yield to the Bark, yet having often found the breathing affected, or a lurking fever remain after its use, I became at last doubtful whether it were not better to attempt the cure without it, or at least to delay till, in the convalescent state, the patient required it only as a strengthener. And indeed there seems to be the less occasion for the Bark here, as by bleeding once or twice, clearing the *primæ viæ* by the purge and the emetic, and afterwards by keeping the body open, the paroxysms commonly lessen daily till they quite disappear. But whenever I found, that notwithstanding the evacuations, the fits be-
came

came worse (which was often the case in the marsh-fever) I then had recourse to the Bark; and when it was most wanted, I had generally the satisfaction of seeing it most effectual. As the intervals between the end of the sweats and the beginning of the subsequent paroxysms were very short, in order to have the more time for this febrifuge to act, I began to give it two or three hours before the sweat ended. In general, we may consider the feverish paroxysm as over, when the thirst and heat have ceased, and the patient finds himself in a profuse and easy sweat. But if ever the fever appeared in a tertian or quartan form, after the usual evacuations the Bark was a sure remedy.

Among the various ways of ordering the Bark, I preferred the following: an ounce of the fine powder was infused over night in a pint of Rhenish wine, and next day the turbid mixture was given in divided doses. But for common use, it was made into an electuary, in which, to each ounce of the powder, a drachm of *sal Ammoniacus* was added, and occasionally as much rhubarb as kept the body open, for the first two or three days; afterwards the Bark was alone, till the patient had taken as much as seemed sufficient to prevent a relapse.

This was the practice in the beginning of the fever, and also in its remitting and intermitting state. But if the disease was neglected in the first stage, or if after remissions or intermissions it changed into a continued fever, a vein was opened,

P

if

if the pulse could bear it; but at any rate, if the head was affected with pain or *delirium*, six leeches were applied to the temples, and a large blister between the shoulders. At this time, neither strong vomits nor cathartics were given; but gentle pukés, repeated clysters, or some lenient purges were administered. The chief rule was to clear the *primæ viæ*; and for that purpose the emetic tartar, with a purging salt, would probably have been the most effectual medicine.

Sometimes the fever changed into a dysentery, which was treated in the manner directed in the following chapter. But if a *diarrhœa* came on, though that was never to be stopped suddenly, yet it was often found proper to restrain it gradually, and to promote a *diaphoresis* *. Although a looseness was not

* If the first passages had not been sufficiently cleared in the beginning, and the body kept open during the course of the fever, we could expect no other crisis than by a looseness, which therefore was not stopped as long as the strength could bear it. But if there was no omission at first, with regard to the evacuations by emetics and cathartics, or if the patient was too much weakened by the flux, after a dose of rhubarb, he took twice a day the following bolus:

℞ *Theriacæ Andromachi* ℥i. *radicis ipecacuanhæ in pulverem contritæ* gr. ii. *vel* iii. *cretæ preparatæ quantum satis sit: misce.*

This medicine, with the proportion of the ingredients varied occasionally, I have known effectual in checking the purging, and bringing a salutary moisture upon the skin. But when the looseness could not be moderated by it, I then ordered the following mixture:

℞ *Ex-*

not the common crisis, yet if nature pointed that way (by colic-pains, or a tension of the belly, attended with a dryness of the skin) it was necessary to procure frequent stools by clysters, or some mild laxative, such as an infusion of rhubarb with manna, repeated as often as the patient could bear the evacuation.

II. The camp and marsh-fevers were not more alike in their symptoms than in their cure. The rules therefore laid down in the preceding paragraphs being applicable to both, I shall only offer a few cautions concerning those points wherein they seem most to differ. When the fever of the marshes is of an ardent kind, it may seem to require large bleeding; but in general as the humours had here a more putrid tendency than common, this disease admitted of less bleeding than the camp-fever, in which, by great and frequent colds, the blood became more inflamed. However, in most cases I believed it necessary to open a vein, either upon the first attack, or the next day, if there was no intermission. But repeated bleedings, unless upon evident marks of a fixed inflammation, were so far from producing the desired effect, that they seemed to render the fever more obstinate. It ought also

℞ *Extracti Thebaici grana ii. solvantur ex julepi e creta ℥xvi.*
Dentur post alternas sedes liquidas cochlearia iv.

This is my common astringent mixture, which, upon comparison, I have observed to be fully as efficacious as that with the *electarium e scordio*, and more agreeable to the taste, and to the stomach.

to be remarked, that the rule about bleeding regards the foldiers only, and not the natives, whose constitutions were different from those of our men, who were not only young, but in general more robust and sanguine. And even amongst the foldiers, bleeding was seldom necessary upon a relapse, or after the weather grew cool; as the fever then appeared without inflammation, and as a regular intermittent.

I observed, that vomits were still more efficacious in the marshes than in the camp; insomuch, that when a large quantity of bile was evacuated by an emetic, the fever would often be removed at once. But this was not to be obtained by the ipecacuanha alone, which I have seen produce a contrary effect, by making the subsequent paroxysms longer and more violent than the preceding; whether that was by acting weakly, and sending more of the corrupted humours into the blood, than it discharged from the *primæ viæ*, or from some other cause, is uncertain*: for this reason I added two grains of the emetic tartar.

The marsh-fever, during the hot season, being more apt to run into double paroxysms, or to change into a continued form, than to remain regularly intermitting, it was necessary, after preparation, to stop it in the first intermission. And for this purpose the Bark was found to be no less

* I had twice experience of this effect of the ipecacuanha, by itself, in my own case.

specific in those parts than at home. But I must add, that though large quantities were given, relapses were not only frequent but certain, if the medicine was not repeated more frequently than the soldiers could generally be prevailed upon to take it: so that upon the whole, the Bark was less useful than might have been expected. But observe, that no bad consequence arose from repeating it often. For, the visceral obstructions, which succeeded to these fevers, were not to be imputed to that medicine, but to a long continuance of the disease, or to frequent relapses; against which there was no security, unless the patient took an ounce of the powder once every ten or twelve days, throughout the autumn. The most effectual method to make a soldier continue the Bark, is to mix it with equal parts of brandy and water*.

The next means of prevention depended on a proper diet. The convalescents were advised to eat moderately, especially of greens and of fruit, and were to abstain from whatever was flatulent or tending to relax. In general whatever produces such effects, disposes the stomach to indigestions, and thereby to a corruption of the humours; and, on the other hand, whatever braces proves anti-septic. A moderate use of spirits is at this time

* I have since observed, that the surest way of preventing a relapse, in those who unwillingly return to the use of the Bark, is, to give four or five ounces in powder, as fast as the patient can be prevailed upon to take it: this quantity he may finish in six or seven days.

necessary; but as the pay of a soldier is insufficient for providing both wholesome food and strong liquor, the public should make, on such occasions, an allowance of spirits to the army, as it does to the navy, though perhaps half that quantity might be sufficient.

For the round worms, which so often accompany these fevers, I commonly gave half a drachm of rhubarb, with twelve grains of calomel; without observing any inconvenience from so large a dose of mercury, which with us was always duly prepared. Such anthelmintics as act slowly, and do not purge, seemed to have little chance for doing service here, as the symptoms were often so urgent as to require some of the quickest remedies. For though those animals will sometimes lie long in the bowels, without creating much uneasiness to a person otherwise well, yet in a fever, especially one of a putrid kind, the worms being annoyed by the increase of the heat, and the corruption of the humours in the *primæ viæ* (consequent on the fever) begin to move about, and struggle to get out. LANCISIUS, who makes this remark, adds, that upon opening the bodies of some who died at Rome, of such fevers as we have now described, wounds were found in the intestines made by the biting of the worms; nay, that some of them had even pierced through the coats of the guts, and lay in the cavity of the *abdomen*. In our hospitals, no dissection of that kind was made; but I have known many cases in which the worms escaped

by the patient's mouth, though there had been no previous retching to bring them up. But without advancing so far, they will occasion some very alarming symptoms. One soldier, in particular, was brought to the hospital, about the end of summer, ill of one of these fevers, but with a more than usual disorder in his stomach and bowels, not yielding to the common evacuations; the muscles of his face were strangely convulsed, and he was so restless that he could not lie for a minute in the same posture. At first I did not suspect worms, but in a day or two after, the patient having voided a round one by stool, I then gave him the powder above mentioned, which either upon the first or second dose, brought away several more: after this, the extraordinary symptoms ceased, and he soon got well.

I shall conclude this subject with an extract of a letter which I received from Dr. DE MONCHY of Rotterdam, who, during the time of my service, was physician to the Dutch troops which then made part of the allied army. This gentleman, after perusing the first edition of this work, favoured me with some remarks upon it; and among others, with what follows, upon those autumnal remitting and intermitting fevers, which he calls *bilious*. This was the more acceptable, as my learned friend had not only had the same opportunities with me, of seeing those distempers in the camp, but also in his private practice (both before and since the war) in his own country, where they

are more numerous, and in general of a worse kind than in Britain, but where the Bark in such cases was not then used. These are his words:—*Sic ceteræ observationes meæ a tuis parum vel nihil differunt, nisi forte quod venam secandi (raro saltem) non tantam in febris biliosis necessitatem invenerim; imo naturam imitando, præcedente emetico, subinde vomitum excitando (prout magis minusve ad superiora materia turgeret) et levem, sed per dies aliquot protractam diarrhœam eccoproticis efficiendo, feliciter, sine ulla alia notabili critica evacuatione, centenos curaverim; et adhuc quotannis, tempore autumnali, optimo cum successu et brevi cures. Quoad tempus vomitorio utendi BOERHAAVIUM aliosque præcticos secutus sum, dando illud tribus vel quatuor horis ante paroxysmum, in ea continuo permanens opinione, quod major tunc sit materiæ morbosæ accumulatio et activitas; et postea major subactio, et facilius per urinam evacuatio. Simplex hæc fuit mea semper methodus curandi febres biliosas cum oris amaritie, nausea, vomitu, &c. dum ægri adhuc in primo initio morbi versabantur. Quotocumque in continuis, vel parum tantum remittentibus, æque tempore vespertino quam matutino præscribebam vomitorium ex pulveris ipecacuanhæ scrupulis ij, et tartari emetici granis ij; et statim hora post hujus remediî finitam operationem, ut purgans, cremorem tartari ad unciam i. ex lacte ebutyrato assumerent ægri sedulo curabam. Hæc postero die, si eadem fomitis adessent signa in primis viis, imo et tertio die iterabam. Si vero febrem, ut et pleraque ejus symptomata imminuta videbam, alvum tantum laxam servare conabar simplici decocto hordei et tamarindorum cum nitro.*

C H A P. V.

Observations on the obstructions consequent on the autumnal remitting, and intermitting, fevers of the camp, and those of marshy countries.

A LONG continuance of these fevers, or frequent relapses into them, brought on visceral obstructions, ending in a dropsy, or a jaundice.

The dropsies seemed to be chiefly owing to obstructions of the liver and spleen; in which case the watery swelling generally began at the feet and rose gradually to the belly.

But when the belly alone was swelled, and that suddenly, after the unseasonable use of opiates in the dysentery, or of the Bark in intermittents, the colon then became distended with air, and the distemper was a true *tympanites*. Such cases indeed did not often occur; but when they did, they generally yielded to the following remedies. If there was any degree of fever, I began with bleeding, and salt of wormwood saturated with lemon-juice, to which I added some rhubarb to keep the body open. But if there was no fever, I ordered some of the *species aromaticæ* in camomile tea, of which the patient drank some cupfuls in the day; and every night at bed-time, till the tumour disappeared, I gave fifteen grains of rhubarb, or as much as was sufficient to procure one or two motions next day. When the swelling gave way, if

7 the

the pulse was slow, and if there was no thirst, without omitting the rhubarb, I endeavoured to strengthen the bowels by an electuary of camomile flowers and ginger, with a small proportion of steel.

All strong purging medicines, and carminatives without laxatives were hurtful.

A man who had been some weeks ill of this distemper and was feverish, died suddenly in the night time, upon his belly subsiding all at once, after three or four loose stools occasioned by taking some pills compounded of aromatics and squills. The body being opened, neither air nor water were found in the cavity of the *abdomen*; but the *colon* was so large and relaxed, that it seemed to have contained air enough to have been the cause of the tumour. This case suggested the use of a swathe in such disorders; as the patient by that means may always make a compression suitable to the decrease of the air in his bowels.

The *ascites* comes on more slowly, and is generally attended with anasarcaous swellings, and a paucity and thickness of urine. Sometimes the intermittent goes off when the swelling begins; at other times it continues, or comes and goes in an irregular manner. I observed, that those dropsies were not to be cured by purging alone, nor by soap, nor mercurials; but chiefly by the lixivial salts, either in the form of broom-ashes, salt of wormwood, or salt of tartar. The common method was this: about forty grains of salt of wormwood (or of tartar)

tartar) were dissolved in about ten ounces of an infusion of the *absinthium vulgare*, to which were added about two ounces of the Dutch spirit of juniper; and this mixture was taken at three draughts and repeated daily. The patient had no other medicine, except, once in four or five days, half a drachm of *pilulæ ex colocynthide cum aloë* for a purge; and in the decline of the disease, some common chalybeate. Sometimes the *diuresis* was promoted by swallowing garlic, or mustard-feed. Although the *ascites* was accompanied with the hard swelling formerly mentioned*, yet nothing was further done, except fomenting the part, or covering it with a warm plaster. Some irregular and obstinate intermittents were removed by the same medicines; or if they returned after the cure of the dropfy, they were then successfully treated with the Bark †.

The jaundice, without fever, was likewise cured by the lixivial salts, and the same purge; and both in that distemper and in the dropfy, I have observed good effects from antimonial vomits.

* Part iii. ch. iv. § 2.

† Since that time, I have given in cases of irregular intermittents, where I suspected obstructions of the *viscera*, the following mixture (little different from that mentioned above) for a continuance, and with good effects:

℞ *Florum chamæmeli* ℥β. *aquæ puræ bullientis* ℥viii. *macera per dimidium horæ, et colaturæ admisce spiritus vini Gallici* ℥ii. *salis absinthii* ℥i.

Dentur quater, quotidie, cochlearia iv.

C H A P. VI.

Observations on the camp-dysentery.

THE autumnal disorders of the camp were divided into fevers and fluxes * ; and therefore, as I have fully treated of the former, I shall now come to the latter, but confine myself to that species called the *dysentery*, as it is the least known out of the field, and is often general and fatal there. I shall first describe the disease ; then give an account of the examination of the bodies of some who died of it ; after which, I shall inquire into its cause ; and lastly, propose what I have observed to be most successful in the cure.

§ 1.

A description of the camp dysentery.

SOME dysenteries appear upon first taking the field ; but the cases are never so bad, nor nearly so frequent as towards the end of summer, or in the beginning of autumn. At that time they become epidemic and contagious, prevail for about six weeks or two months, and then cease. They have been always most numerous and worst after hot and close summers, especially in fixed camps, or

* Part ii. ch. i.

when the men lay wet after a march in warm weather.

The diagnostics of the dysentery, besides some feverish symptoms, are, a disorder at the stomach and wind in the bowels, small, but frequent stools of a slimy and frothy matter, a *tenesmus* and gripes. Blood mixed with the *fæces* is a common, but not a constant symptom; for many have all the other marks without this, at least in the beginning; and others have blood in their stools from various causes without a dysentery: but as this disorder is mostly attended with blood, for that reason it has been called the *bloody flux*.

These may be called the pathognomonic symptoms, and as such may distinguish this illness from a *diarrhœa*, an hemorrhoidal flux, and all others. Agreeably to this description, SYDENHAM and WILLIS use the term *dysentery*, and apply it to every case of that flux which raged at London in the year 1670. though SYDENHAM says, that some of his patients voided no blood*; and WILLIS observes, that those whom he attended, for the most part, had none but watery stools†: the name is one of the few particulars in which those celebrated authors agree in their account of that disease. The learned MORGAGNI mentioning that epidemic, takes notice of the propriety with which WILLIS applies the word *dysenteria* to a flux with the symp-

* Morb. Acut. sect. iv. cap. iii.

† Pharm. Rat. sect. iii. cap. iii.

toms above mentioned, though without blood, but adds, that for the more distinctness he would call such the *dysenteria incruenta* *.

It may be remarked, that in confining this appellation to such symptoms, I have departed from the ancients, and on that account may be the more blameable, as upon a former occasion I found fault with others for the like freedom †. But in the case of the *ileus*, which I allude to, SYDENHAM had made an unnecessary change, by giving different names to two stages of the same disease; whilst here, the ancients having used a term, either in so lax a sense, as to include several ailments of a different nature, or in so confined a sense, as not to include all the varieties of the same distemper, I was forced to leave the ancients, and take the definition from those who seem to have treated with more accuracy those disorders of the bowels.

Thus, the word *dysentery*, in the original Greek, importing *an affection of the bowels* in general, we find HIPPOCRATES using it, not only to signify all ulcerations, but all hemorrhages of the intestines (even those which are critical and salutary) and likewise every kind of flux, with, or without blood ‡. It would seem however that after his time some of

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* De Sed. et Caus. Morb. epist. xxxi. § 11 et 13.

† Part iii. ch. ii. § 6.

‡ *Dysenteria est exulceratio intestinorum* — Alii vero, inter quos ipse HIPPOCRATES est, *dysenteriam* interdum appellant non ipsam modo exulcerationem intestinorum, verum omnem etiam

the other Greek authors, whose works are lost, were sensible of this want of precision, and therefore restricted the meaning of the term to an ulceration of the bowels attended with gripes and *tenesmus*, and with mucous and bloody stools. For a disease with these symptoms, CELSUS calls *tormina*, and says, it is the *δυσεντερία* of the Greeks*; and CÆLIUS AURELIANUS, retaining the Greek name, describes the dysentery much in the same manner with CELSUS †.

Yet GALEN returns to the looser acceptation of the word, sometimes defining a dysentery *an ulceration of the bowels*, at other times mentioning four *species* of that distemper, all with bloody stools; but whereof we find only one agreeing with the *tormina* of CELSUS, or the *dysentery* of the moderns ‡. I have consulted none of the other Greeks upon this article (supposing they followed GALEN) excepting ARETÆUS, who, after ARCHIGENES, confining the term to an ulceration of the bowels, accounts for all the symptoms according to the particular gut affected, and the circumstances of the sore; which sore if deep, and corroding some large

etiam cruoris per intestina vacationem. GORRAEUS, *in voce*
δυσεντερία.

Ejus etiam dysenteriae, quæ plerunque morbos plurimos salutariter ac judicatorie solvit, meminisse videtur HIPPOCRATES (Prorrh. 2.) *δυσεντερίην* etiam pro quovis alvi profluvio capere videtur HIPPOCRATES (lib. ii. Epidem.) FOESII *Oeconom.* HIPPOCR. *in eadem voce*.

* De Med. lib. iv. cap. xv.

† De Morb. Chron. lib. iv. cap. vi.

‡ De Caus. Sympt. lib. iii. De Loc. Affect. lib. ii.

blood-

blood-vessel, he supposed might occasion a mortal hemorrhage*.

From this it appears, that the term *dysentery*, as used by HIPPOCRATES and GALEN, conveys no precise idea of a disease; and that unless those symptoms, which I have called *pathognomonic*, are always joined to an ulceration of the bowels (which is not always the case) the dysentery of CELSUS, of ARETÆUS, and of CÆLIUS AURELIANUS, must be accounted a different affection from that which I am now treating of. Not, but that the bowels are liable to be ulcerated in the true dysentery; but that ulceration is accidental and not essential to the disease. MORGAGNI in one place observes, that in this distemper the intestines are sometimes affected with ulcers, and sometimes not †; and in another place, he takes notice of the ulceration happening only in its more advanced state ‡. Further, from the dissections of that excellent anatomist, compared with those collected by BONETUS, and those made by Dr. CLEGHORN ||, and by myself, there will appear more instances of the soundness of the intestines, in this respect, than the contrary.

This opinion, concerning the constant ulceration of the bowels, continued till SYDENHAM and WILLIS considered the dysentery as a disorder independent

* De Caus. et Sign. Diut. Morb. lib. ii. cap. ix.

† De Sed. et Caus. Morb. ep. xxxi. § 12 et 13.

‡ Somewhere in the same epistle.

|| Observ. on the Epidem. Diseases of Minorca, ch. v.

of any ulcer; and upon their authority physicians seem now to have relinquished the former system. And indeed SYDENHAM'S account is upon the whole so just, that believing it unnecessary to enter upon a further enumeration of symptoms, I shall refer the reader to that justly esteemed author; confining myself to a few observations, to ascertain some points which he has left doubtful; and adding some others, to render the history of the disease more complete.

SYDENHAM having little inquired into the nature of any dysentery, excepting that which he himself describes, therefore questions whether there may not be as many kinds of that distemper, as of the small-pox and other epidemics, which according to him so much vary, as in some respects to require a different method of cure*.

Now, that excellent physician seems to have been led into the opinion of the variable disposition of epidemics, though appearing much in the same form, from a notion, that the wisdom of Nature was most manifested in its variety: “ For (says he) we
 “ are not to be surpris'd at those *lufus Naturæ*, since
 “ it is universally acknowledged, that the deeper
 “ we penetrate into the works of Nature, the more
 “ we shall see of the vast diversity, and the almost
 “ divine contrivance of her operations, which far

* — cum fieri quidem possit, ut variæ enascantur dysenteriarum species, ut sunt variolarum, et epidemicorum aliorum diversis constitutionibus propriæ, et quæ proinde medendi methodum in aliquibus diversam sibi suo jure vendicant. *De Morb. Acut. sect. iv. cap. iii.*

Q

“ surpass

“surpass our comprehension.” — “So that whoever has undertaken to comprehend all these matters, and to trace the various operations of Nature, will find himself disappointed *.”

But does Nature manifest its wisdom more by perplexing mankind, with varying distempers every season; or, by presenting them over and over, to teach us their nature and cure? In the first steps of our inquiry, we meet indeed with much variety and obscurity; but the further we penetrate into Nature, we find so much analogy amongst her works, as to be forced to acknowledge and to revere her simplicity.

In the present case, I can affirm that all the epidemic dysenteries, which I have seen in the army, have been of the same nature; and I have been assured by Dr. HUCK, and others employed since the former war, not only in Germany, but in Minorca, America, and in the West-Indies, that this distemper appeared in those different countries, and very different climates, with the same symptoms (though with more or less violence according to the heat) and yielded to the same medicines in all of them. I may add, that both in

* Neque est, cur hos Naturæ lusus hac in re tantopere demirerur; cum in confesso apud omnes sit, quod quo profundius in quæcunque Naturæ opera penetremus, eo luculentius adfulgeat ingens illa varietas, et divinum pene artificium operationum ejus, quæ captum nostrum longissime superant. Adeo quisquis ille fuerit, qui in se receperit hæc omnia mente adsequi, et multifarias Naturæ operationes *κατα ποδας* indagare, partim magnis ausis excidet. *Ibid.*

Scotland and in this country, whenever I had an opportunity of treating such fluxes in my private practice, I never could see that they required any different method of cure. Nor do I find that DEGENER had reason to consider that flux which he describes, as a species different from others, and distinguishable by its contagious and bilious nature*. For I have never known the dysentery epidemic unless in summer, or in autumn, when the *primæ viæ* are most liable to be disordered; nor have I seen any number ill, without hearing several of them complain of sickness at the stomach and vomiting of gall. As to the violence of the symptoms mentioned by DEGENER, I own it exceeds any thing that I have seen, upon the first seizure; but when many of our soldiers, even with the most favourable cases, have been crowded in the hospitals, the dysentery has at last appeared with all the virulence that it did at Nimeguen.

SYDENHAM observes, “ That as all epidemics, at their first appearance, seem to be of a more spiritual or subtile nature than in their advanced state, so in the like manner the dysentery proceeded; for the longer it continued, it grew the more humoural. For instance, in the first autumn, several had no stools at all; but with respect to the severity of the gripings, the violence of the fever, sudden decay of strength, and other symptoms, it much exceeded the dysenteries of the following years †.” Here

* Hist. Medic. de Dysent. cap. i. § i.

† Loc. cit.

then we seem to have a species of the disease very unlike the common sort. But besides that this remark was never, so far as I know, made by any before SYDENHAM, nor has been confirmed by others since, I must observe, that though we approved of his having considered the dysentery as a disorder, in which there might, or might not, be blood in the stools, yet we cannot justify that celebrated author in calling that a dysentery, “ in which
“ there are no stools at all.”

But if there is any mistake here, it is of little consequence; though I cannot say so much of that observation with which SYDENHAM concludes his subject. He says, “ That though evacuations both
“ by bleeding and purging were indispensable be-
“ fore laudanum could be administered, in those
“ years in which the dysentery was epidemical; yet
“ in any other constitution of the air, which has
“ a less tendency to breed this disease, those evacu-
“ ations may safely be omitted, and the cure com-
“ pleted by a shorter method, *viz.* by laudanum
“ alone *.” Here, I say, I must venture to dis-
sent; for though we cannot doubt, upon the au-
thority of SYDENHAM, that some slight cases of the
dysentery have been cured by laudanum alone, yet

* — quod tamen in his annis, quibus dysenteriae adeo epi-
demice grassarentur, evacuationes prius memoratae prorsus
necessariae erant, antequam ad usum laudani deventum fuisset;
attamen in constitutione quavis huic morbo minus faventi, istae
tuto omitti possunt, ac curatio compendiosiori via, solo nempe
usu laudani, absolvi eo, quem diximus modo. *Loc. cit.*

I have

I have seen such bad effects in general from that practice, both in the army and elsewhere, that I shall not hereafter treat any dysenteric case with opium, before the first passages are cleared.

The dysentery, as SYDENHAM observes, sometimes begins with a *rigor* succeeded by heat, but oftener with gripes without any feverish sensation. This last part, I doubt, is not strictly true; for though the patient himself may not mention any feverish symptom, yet upon examination we shall find, that alternate sensations of heat and cold, lassitude, loss of appetite, and the like febrile affections have generally been, more or less, the forerunners of the disease. Frequently, the beginning of a flux will have the appearance of the autumnal fever; for the patient will be feverish, with a disorder in his stomach and bowels, for two or three days before the purging comes on; but after that, the fever sensibly gives way. At other times, upon fatigue and exposition to cold, during the dysenteric season, the men will be more suddenly seized with the flux, but seldom without some degree of fever. The sensible diminution of the fever upon the appearance of the looseness, seems to justify that expression of SYDENHAM, when he calls the dysentery, “the fever of the season turned “ in upon the bowels*.”

Besides this preceding fever, the patient is liable to one of a low and more dangerous kind. For the

* Loc. cit.

most part I have observed that to be brought on by neglecting the case in the beginning, or by having recourse to opiates and other astringents before evacuations. Sometimes, though seldom, I have seen the same kind of fever accompany the flux from the first, and end in death, without discovering any error committed either in the regimen or medicine. But the most fatal sort of fever, which so often attends the dysentery of the army, though not essential to it, is the hospital- or jail-distemper, which at all times infects foul and crowded wards, but never so much as when they contain men labouring under a putrid disease. This fever combined with the bloody-flux was generally mortal.

The stools at first are commonly copious and excrementitious; but the next day, or soon after, they become small, watery and slimy, and are attended with gripes and *teneismus*. From this time till the favourable turn, formed *fæces* are almost never seen, except when a purge operates briskly and carries them down: then indeed the patient is less griped, has fewer motions, and less *teneismus*.

Besides the *mucus* in the stools, SYDENHAM might have mentioned a watery humour, which is generally mixed with the slime. This *serum* is perhaps one cause of the irritation, and descends from the higher parts of the intestines, whilst the *mucus* is mostly secreted from the *rectum* in straining,

Streaks of blood denote the opening of some small vessels at the end of the *rectum*, but a more intimate mixture is a sign that the blood comes from a higher source. This hemorrhage, which alarms most, is the symptom least to be dreaded; for though the oozing be constant, the quantity of blood lost, except in a few cases, is inconsiderable. MORGAGNI observes, that most of the blood may come from the intestines, without any rupture of the blood-vessels, and only by their greater dilatation; and this opinion is most agreeable to what I have seen upon inspecting the bowels after death.

Nor are we to be alarmed at the loss of so much of the serous humour; for the amount of the whole is not nearly so great as in a common *diarrhœa*. Yet the frequency of the motions has given a false indication for the early use of astringents, whilst, in fact, the passage through the intestines is already so much obstructed, that to restore and preserve it, is the most essential, as well as the most difficult part of the cure.

There are other substances, omitted by SYDENHAM, which are less commonly seen in the stools, *viz.* round worms, balls of hardened excrements, and some smaller bodies of the colour and consistence of suet.

Worms are not to be considered as the cause of the flux, but as concurring with other causes to make it worse. It would seem that in this morbid

state of the bowels, they increased the irritation by struggling to get out. Sometimes I have known them make their way by the mouth.

The balls of hardened *fæces* may come away at any time of the disease, but I have observed them mostly in its advanced state, and when I suspected that purging had been too long neglected. I have commonly seen the *tenesmus* and all other symptoms give way, after they were carried off by a brisk purge. These *scybala* are of so firm a texture, and so round, that they seem to have been formed in the cells of the *colon*, and to have lain there from the beginning; for we can hardly suppose them to have afterwards acquired that figure and consistence, during a constant irritation of the intestines, and the low diet which patients then use.

As to the white substances, which I compared to suet, I do not know whether they are the same which HIPPOCRATES calls *σάρκες* (*carunculæ*) but they are plainly described by ARETÆUS and CÆLIUS AURELIANUS, and have since been taken notice of by later writers, under the name of *corpora pinguia*, and variously accounted for. Although I had frequently seen them, yet I had neglected to examine them, till the autumn 1762. when Dr. HUCK and I visiting a tradesman in this city, ill of a dysentery, who voided such substances, we preserved one of them, which we viewed at leisure, and then were satisfied that the subject of our inquiry was
nothing

nothing but a bit of cheese; though the patient assured us afterwards, that he had tasted none since the beginning of his illness, which had been then of above a fortnight's standing. Now, whether this cheese had been collected from smaller particles, which had passed from the stomach to the *colon* before he sickened, or had been since formed of milk, which he had always used (and which might have curdled in his stomach) we could not determine, but we were both convinced, that, in whatever manner this substance was produced, it must have been of the same nature with all those *corpora pinguia* which we had so often seen in the dysentery.

With regard to the abrasions of the villous coat, and other substances said to have been observed in the stools, I can say nothing, having never seen them; though I do not call in question what has been so often mentioned by others*. The offensiveness, and even the danger of such an inquiry, will serve as some excuse for not carrying it further.

The stools are all along distinguished by a certain smell, different from that of common excrements: it is faint, and not rank at first, but towards the end, when the bowels begin to mortify,

* Hæc sunt ramenta ξυσματα dicta HIPPOCRATI, quæ merito damnavit—Testatur GALENUS se multos vidisse et sæpe, quibus, cum morbis gravibus et diuturnis conflictatis, maxima intestinorum pars sic corrumpebatur, ut compluribus in locis tota interior tunica esset destructa, imprimis in morbis dysentericis. VAN SWIËT. *Comment. in Aphor.* BOERH. § 721.

the *fætor* is cadaverous and intolerable. At such times they are probably most infectious. I have observed elsewhere, that in a natural state the *fætor stercoreus* is owing to a mixture of putrid matter with an acid, and that by this combination the *fæces* acquire a particular and a stronger smell than they would otherwise have, and are less apt to spread infection*. But in this distemper, it would seem as if the acid, which is generated in the stomach and in the smaller intestines, were hindered by the spasms from passing through the larger, and that the *fæces* were thereby deprived of their proper corrector.

Among other symptoms omitted by SYDENHAM, is flatulence, of which the most obvious source is from the aliment, that in this disorder of the stomach ferments too strongly, and generates both this air and an acid, as appears from the experiments subjoined to this work †. Another source may be from the blood and other humours, which stagnate and putrefy in the larger intestines; for it is well known that all animal and vegetable substances yield much air when resolved by putrefaction. Besides, the mass of blood having acquired a more than natural putrescency, by the absorption of corrupted matter from the intestines, may from that cause be more disposed to part with its air, and to throw it upon the *primæ viæ*. But however this may be, it is evident that the air, which abounds

* Appendix, Paper vii. exp. xliii.

† Paper v. and vi.

at this time in the first passages, occasions often a sense of oppression, or increases the gripes, according to the place where it is collected (whether in the stomach, or in the smaller or greater intestines) and in proportion to the spasms which imprison it. I have known more than one case of a *tympanites* (*viz.* an immoderate distension of the *colon* by air) from the premature use of opiates, and of astringents, in the dysentery. Early in the disease, the stools are of a frothy consistence like yeast; but this is only the natural state of the *mucus*, which is mixed with the air when it comes out of the glands. For by M. DE HALLER'S experiments, upon pricking the internal coat of the intestines of a living animal, this kind of frothy matter is expressed from the mouths of all the secretory vessels around the irritated part*.

It might be of use to know what gut is particularly affected when the gripes are most severe. But this we can hardly ascertain, considering how much the intestines are liable to change their place by the peristaltic motion †, how their situation may vary in different persons, and how easily the pain of the *colon* may be confounded with that of the smaller guts, which are surrounded by it. In general, the irritation of the stomach and higher intestines is attended with more sickness than gripes; and therefore when the gripes are most acute, without sickness, it is probable that the spasm

* Opera Minora, p. 394 & seq.

† Ibid. p. 301 & seq.

is lower down. When the pain is about the middle of the belly, we may presume that the spasm is in the smaller intestines; but we cannot be certain, as in some subjects the upper flexure of the *colon* has been found as low as the umbilical region. Pains in the sides, back, and region of the kidneys, may be referred to the *colon*; but if the pains are felt towards the *os sacrum*, we may then suspect that the upper part of the *rectum* is affected. For the pain arising from the irritation of that gut may be referred equally to the back, and to the lower part of the belly; as a stone descending from the ureters is felt both ways, behind as well as before. But when the lower extremity of the *rectum* is irritated, the spasm seems not then to be so much productive of pain, as of a violent *nisus* drawing into consent the muscles of that part, as well as others which act in discharging the *fæces*.

The stools are always preceded by sharp gripings, and succeeded by some respite; but the motions being so frequent, the patient can have no considerable ease, unless the spasms be removed by opiates, fomenting the belly, raising a sweat, or by evacuating the acrid and irritating matter with a purge. Indeed when the bowels begin to mortify, the sick, though restless, complain of little pain or *teneismus*; nay I have known them quite free from these last symptoms, not only for some hours, but for some days before their end. At such times they have some degree of *delirium*, though I have seen others sensible to the last.

It may be remarked, that SYDENHAM mentions nothing of the *tenesmus* till the patient is in a convalescent state, though that symptom be one of the first which characterise the dysentery. But this is no omission of that excellent author; for what others understand by a *tenesmus*, and what I meant by that term, in enumerating the more inseparable symptoms, SYDENHAM expresses by *intestinorum depressio cum dolore*, and by *molestissimus viscerum omnium quasi descensus*. As to his observation, “ of the intestines being affected successively downwards, till the disease at last is driven to the *rectum*, where it ends in a *tenesmus*,” it strictly speaking cannot be admitted. For though the *rectum* is generally the last part that recovers, and the *colon* remains longer diseased than the small intestines, yet I have known no such progression as SYDENHAM describes. From the beginning, the whole intestinal tube seems to be affected, and the *tenesmus* is pretty early as violent as it is ever after in the course of the disease. The obstinacy of the *tenesmus* seems sometimes to be the cause of death; for by the constant irritation, the *rectum* at last mortifies. In those bodies which I have opened, I found the appearances of a mortification always the greater, the nearer it was to the extremity of the *rectum*.

SYDENHAM observes, that the *tenesmus* remaining at the end of the flux, is not owing to an ulceration of the *rectum*: according to him, “ In proportion

“ portion as the bowels recover their tone, they
 “ deposite the remains of the morbid matter in
 “ that gut; which being continually irritated
 “ thereby, discharges in every stool part of the
 “ *mucus* with which the intestines are naturally
 “ lined.” But does it not seem more natural to
 ascribe this remaining *teneſmus* to the soreness of a
 part, which has been so much inflamed and exco-
 riated in the course of the disease, and which by the
 constant irritation is still kept from recovering?
 Add to this, the observation that has been often
 made, of the *teneſmus* giving way upon the patient
 voiding some hardened excrements (such as were
 mentioned above) the frequent cause of that irrita-
 tion. That the *teneſmus* which succeeds the dysen-
 tery may be sometimes owing to an ulcer, is asserted
 by MORGAGNI, but who mentions only one instance
 that occurred in his dissections.

SYDENHAM neither mentions a *proidentia ani*,
 nor a strangury, though I have known both of them
 accompany bad cases of the dysentery. The former
 symptom arises from the violent straining; and the
 latter, from the inflammation spreading from the
rectum to the neck of the bladder.

Nor does that valuable author take notice of any
 contagion that attended his epidemic. WILLIS ex-
 pressly says, that the dysentery which he describes
 (and which was the same with SYDENHAM'S) was not
 infectious. But all that we can infer from thence,
 is, that either the distemper, which they saw, was
 of

of a milder nature than it usually is when it becomes general, or that this circumstance of infection escaped their notice. It is true indeed that this disorder is not so catching as most others of the contagious kind; but whenever it has been epidemic, I always found it in some degree infectious; especially in military hospitals, and in the houses of the poor, who want the means of cleanliness.

The duration and issue of the dysentery are uncertain; much depending upon medicine, good air, attendance, and the care which the patient takes of himself. If nothing is wanting, and the flux recent, it will be generally cured: but these favourable circumstances occur amongst the officers only. The case is different with the private men, who not only apply late for assistance, but are either exposed to colds in the field, or, which is worse, shut up in the foul air of an hospital.

It is the sign of a bad case, when the first vomit and purge do not relieve; when the hectic fever increases; when the disorder of the stomach is obstinate; when the countenance alters much; when the pulse sinks and intermits; when the patient is restless, without complaining of gripes. In the beginning, a hiccup is little to be dreaded; but in the low and advanced state, if obstinate, it is commonly a sign of a mortification. The disease, when fatal, ends in a prostration of strength, a sore throat, or *apthæ*, involuntary and cadaverous stools. Sometimes, before the end, when the spasms give way,

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from

from a putrid resolution, the aliment, as in a lientery, will pass through the intestines with little alteration.

In the most favourable event, those men who have been sent to an hospital can be of little service for the rest of the campaign; for no ailment is more apt to return upon errors in diet, or exposures to cold. Not that these returns are so much relapses into the true dysentery, as they are *diarrhæas*, but with more of the dysenteric symptoms than are common in the white-flux. For though the original disorder takes a favourable turn, yet the disposition to a looseness continues; as the bowels are too tender to bear the natural *stimulus* of the bile, and other secretions, without being irritated by them.

Such are the observations which I have been enabled to add to those of SYDENHAM, from the frequent opportunities that I have had of seeing the dysentery in all its forms.

§ ii.

Of the dissections.

HAVING described the disease, I shall next relate the changes which I have observed in the bodies of those who died of it and were opened. This is a part of its history which both SYDENHAM and DEGNER have omitted.

1. In autumn 1744. a soldier, who had been ill of the bloody-flux for about three weeks, was sent with some other sick from Tournay to the hospital at Bruffels. His pulse was low, his strength wasted, the gripes and *tenesmus* were incessant, and his stools were of an ichorous colour; a change which often happens from the corruption of the blood. On the third day after his arrival, the pains abated, his pulse sunk, his extremities grew cold, a slight *delirium* succeeded, and he died on the fourth.

I found the larger intestines of a blackish colour and putrid appearance, the coats preternaturally thick (the mark of a preceding inflammation) and on the inside ulcerated, especially in the *rectum* and lower part of the *colon*, where the villous coat was either abraded, or changed into a corrupted slimy substance of a greenish cast. The *cæcum* and its *appendix* were less tainted; and the smaller intestines and stomach were neither mortified, discoloured, nor abraded, but only distended with air. The fat of the *omentum* was greenish; but neither the liver nor spleen seemed to be tainted; only the bile was thick, ropey, and of a dark hue. That part of the *vena cava* which lay on the *vertebræ* of the loins was tender. The lungs adhered a little to the left side, but seemed otherwise sound. In the right ventricle of the heart the blood was clotted, but in the larger vessels it was more fluid and of a blackish colour.

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2. About

2. About the same time, a foldier of the artillery, after recovering of a *diarrhœa*, was feized with a dyfentery, as he faid, upon drinking largely of fome cold liquor, on a march, whilst he was hot. Three days after, he was brought into the hofpital, and befides the common fymptoms, he complained of the piles and the gravel. This man could not lie down, but fupported himfelf on his knees and hands, leaning his head forward upon the bolfter till his death, which happened three or four days after his admiffion.

Upon opening the *abdomen*, I found the greateft part of the *omentum* in the left fide under the fmall inteftines, but large and fat. The liver was fmall and found; but the gall-bladder was of an uncommon fize, and full of a dark coloured bile, partly thin, partly curdled. The biliary ducts were clear. The *pancreas* was in a natural ftate. The fpleen, though of a common fhape, was of an extraordinary bulk, being little lefs than the liver, and weighed three pounds eleven ounces: it feemed otherwife found, had no indentations; only, upon the fide next to the blood-veffels, we found a fmall protuberance like the *portæ* of the liver. The kidneys were fmall and flaccid; but the *pelvis* of both, efpecially that of the left, was larger than common; and both thefe and the bladder (which was in a corrupted ftate) contained fome urine, but neither ftone nor gravel. The *rectum* was moft putrid; and from thence the gangrene feemed

to have spread itself to the *colon*, which was mortified, and chiefly at its lower end. The villous coat was partly consumed, and what remained was blackish, tender and easily to be separated. The vascular coat had the appearance of a preparation well injected with red wax. The ligaments, which contract the *colon* and form the cells, were half corrupted, and adhered loosely to the outer coat. Part of the *cæcum* was also mortified; the rest, as well as the smaller intestines, were of a firmer texture, but of an inflamed colour; and both these and the stomach were full of air. It was remarkable, that notwithstanding this diseased state of the bowels, no part of them was ulcerated. The cavity of the *thorax* seemed to be uncommonly small; for the convex part of the diaphragm reached as high as the insertion of the third rib into the *sternum*: the lungs were nevertheless found. The heart was large, and contained in its right ventricle some coagulated blood of a coriaceous firmness, which did not adhere to the sides, but was entangled with the tendinous fibres of the *valvula semilunares*. Both the sinuses were full of blood, partly congealed, partly fluid, and of a blackish colour.

3. In the same season, a foot-soldier was sent into the hospital, supposed to be ill of a dropsy. His belly was much distended, but the tumour was greatest above the navel. He complained of a difficulty in breathing; his ancles were a little

swollen, but he made water freely; his cheeks were florid, while the rest of his face was pale. By his own account, he had been taken ill of a bloody-flux, about three weeks before, which being suddenly stopped by some drug (I presume by opium) given him in the camp, his belly then began to swell with air.

This man soon after his admission was seized with an inflammatory fever, of which he recovered, and then took some squills with aromatics, for curing the *tympanites*; during the course of which, one night a looseness suddenly coming on, his belly subsided all at once, and he died before the morning.

The body was opened about thirty hours after his death; but in that time so much air had been generated anew, that the belly had swelled again, though not so much as before. There was no air, and scarce two spoonfuls of water in the cavity of the *abdomen*; but the intestines were all much inflated, except the *colon*, which, though then flaccid, yet was large enough to have contained, as it probably did, all the air which at first had made the tumour. The ligaments of this gut had either been destroyed, or so relaxed that the divisions of the cells were obliterated; but no part of the intestines was either mortified or inflamed. The liver was of an extraordinary bulk, reaching almost to the navel and spleen, and weighing about ten pounds. Its substance was tender, and in the pos-

terior part of it, next to the diaphragm, we discovered a large abscess. The gall-bladder was of a moderate size, and full of a thin dark-coloured bile. The lungs were found. We found little or no water in the *thorax*, but more than usual in the *pericardium*. The heart was small, without any clot, and indeed with scarce a drop of blood in the ventricles.

4. Some time later in the season, a soldier was received into the hospital, about the twentieth day of a hectic fever succeeding a dysentery. His pulse was then low, his tongue parched, his cheeks florid, though his body was wasted. He complained of great weakness, of a pain in his bowels, of a looseness, and of retchings to vomit. In a few days after, he was seized with a hiccup and died.

Although the body was opened the next day, yet the smell was intolerable. The intestines seemed mortified. The outward coat of the liver was putrid; and in the substance of that *viscus* we found several abscesses containing a purulent, or ichorous matter. The spleen was likewise corrupted; but the kidneys, heart and lungs appeared to be found.

These dissections were made during the former war, and no opportunity of a further inquiry offered till some years after*, when, after an unusually warm and dry summer, the dysentery was frequent in London.

* Viz. in autumn 1762.

5. A young woman of 17 years of age was taken ill, in the beginning of October, with some of the more alarming symptoms of this disease. Her pulse sunk, and her strength failed early; the stools were incessant, slimy, watery and bloody; and whenever she was free from gripes she complained of sickness. Nothing gave her relief, and she died on the 11th day. About a fortnight after, the father, who had been much affected, and indisposed since the death of his daughter, was seized with the same distemper. He was then in his 46th year, of a full habit, and had lived freely. Till within three or four years of this illness, he had been subject to frequent returns of a fever; but from that time a tetter breaking out in several parts of his body, he became free from every complaint, excepting the crusts and blotches occasioned by that eruption. The dysentery began with a sickness and heat at his stomach, with gripes, *tenesmus* and a looseness. In a day or two, the stools were frequent, slimy and bloody. I was called early in the disease, and believing that evacuations had not been timely enough made in the case of the daughter, I began with taking away a large quantity of blood; but as the patient was not relieved, as his blood was not fizy, and as his pulse was never hard nor full, the bleeding was not repeated.

I shall not enter into further particulars of this case, but observe, that though various medicines were tried, such as evacuants, antiseptics, demulcents,

cents, and anodynes, none of them were of any sensible benefit, excepting a decoction of snake-root with *theriaca*, which was given him when his pulse began to sink and intermit. He died on the 20th day after I was called; but for some days before his death, I observed his countenance alter, and the hectic fever increase; and though his gripes and *tenesmus* had ceased, yet the motions were more frequent than ever, and more watery and bloody. From the first, he was feverish, restless, and complained of a sickness at his stomach, which was increased by every thing he ate or drank; towards the end he was troubled with a hiccup; he never could retain a clyster, and his stools were extremely offensive. He was sometimes slightly delirious; but it was uncertain whether that symptom arose from his fever, or the opiates. On the day after his death, the body was opened by Mr. HEWSON surgeon and anatomist, Dr. HUCK and I being present.

Upon cutting into the *abdomen*, we found the *tunica adiposa* of a considerable thickness, notwithstanding the long continuance of the disease. The stomach and smaller intestines were inflated, but otherwise in a natural state, except at the extremity of the *ileum* where it joins the *cæcum*; for at that place the coats of the gut were thicker and more tender than they ought to have been; and on the inside we found that glossy colour which is considered as a mark of inflammation.

But the larger intestines, from the *cæcum* to the end of the *rectum*, were not distended, and the *rectum* was even more contracted than in a natural state. Their colour, externally, was of a purple black; and this gangrenous appearance increased gradually from the *cæcum* to the extremity of the *rectum*. Upon opening them, we found the coats thickened, the inside as black as the under part of the *coagulum* of blood, and the whole surface more or less covered with a dark-coloured bloody slime. In the *rectum* these morbid appearances were worst. The blood did not seem to have come from any ruptured vessel (for it was collected no where in any quantity) but to have gradually oozed through a number of fine pores into the cavity of the intestines. The *factor* of these parts was exceedingly offensive.

At first sight the villous coat seemed to have been resolved into the slime above mentioned, yet upon a nearer inspection we thought it more probable, that both in the *cæcum* and *colon* that coat, though diseased, yet was not separated, whatever it might be in the *rectum*, which was too putrid to be minutely examined.

The dissector having cleared away the blood and *mucus* from the inside of the *cæcum* and *colon*, and of the upper part of the *rectum*, pointed out to us certain protuberances of a lighter colour than that of the rest of the surface. They were
of

of a roundish figure, nearly equal in their height (which was about the twelfth part of an inch) but of an unequal breadth. We all agreed that we had never seen any thing so nearly resemble the small-pox, or a flat fort, at the height of the disease. These eruptions stood as thick on this tract of the intestines, as variolous pustules when numerous do upon the skin; but differed from them in this, that as far as we could perceive they were of a firm consistence without any cavity. Mr. HEWSON was of opinion that they took their rise from the cellular membrane which lies immediately above the villous coat; for that some days before, having opened another person, who had likewise died of the dysentery, he had found the appearances there much the same as in this subject, and particularly with regard to these tubercles, which he had examined at leisure. He added, that he had preserved a part of the *colon* in spirits, which he would shew us some other time. These eminences were only in the larger intestines; for though we likewise inspected the smaller, yet we could observe nothing similar to them there.

In the whole intestinal tube we found neither worms, *scybala*, nor any formed feculent matter, though the nurse told us, that on the day before his death the patient had voided some hard substances of a roundish shape.

The mesentery was loaded with fat of a natural colour and consistence; as was also the *mesocolon*,
even

even to its process belonging to the *rectum*, which of all the intestines was observed to be the most putrid.

The urinary bladder was contracted: that part which lay next the cavity of the abdomen was found, the other was not examined. I ought to have observed, that the patient could retain his urine to the last, though in the beginning of the disease he had complained of a strangury. The kidneys were not inspected.

The liver was in a sound state, not only as to its outward appearance, but in its substance. The gall-bladder was empty of bile, and contained only a little air. The spleen had no apparent fault. The *pancreas* was of a small size, and somewhat hard; yet it was not scirrhus, and Mr. HEWSON even doubted whether in any degree it could be called morbid. As the cartilages of the ribs were intirely ossified, the *thorax* could not be opened but by a saw, with which we happened not to be provided; but we cut through the diaphragm, and observed that the lungs were sound. No water had been collected either in this cavity or in the *abdomen*, nor were there any ulcers or purulent matter to be seen in either.

Some time afterwards, Mr. HEWSON shewed me that portion of the *colon*, which he had cut out of the other body and had preserved in spirits: he said that to the best of his remembrance he had

taken it from the lower part of the gut. I could easily trace the resemblance between this preparation, and what I had seen in the recent subject, though the tubercles were here more numerous, and generally higher than in the other. Dr. HUNTER, who was present, did not recollect to have seen that kind of morbid appearance before, but was satisfied that the villous coat had not been separated, further than that some partial abrasions might have been seen on dissection.

These were the only bodies which I examined of those who died of the dysentery. Although there was some variety in every case, yet they all agreed in the bad state of the larger intestines. The colour and smell were proofs of the putrefaction in most of them, and the tenderness of the coats shewed that they had all tended to a mortification. In an external gangrene, we commonly observe some vesicles of air in the cellular membrane, which vesicles being wanting in these subjects, it may be disputed whether the mortification of the bowels was complete without them.

The tubercles, which were found in the large intestines of the last body, might have been considered as a singularity, if the dissector had not taken notice of the same circumstance in that body which he had opened before; for I can well suppose that they might have been seen in the other subjects, if I had more narrowly inspected them. And I am the more inclined to this opinion, from
finding

finding in two authors some hints to the same purpose. Thus LINNÆUS, in treating of the bloody-flux, says, *Dysenteria epidemica scabies est intestinorum interna, ut ex dissectionibus cadaverum dysenteria defunctorum patet* *. Now, for what reason that learned author uses the term *scabies*, he does not inform us; but from his using it, I would infer that he had either seen some such eruptions, or had an account of them from others, upon whose testimony he could rely. And Mr. CLEGHORN, who had frequent opportunities, at Minorca, of seeing the epidemic dysentery, observes, “ That upon
 “ opening the bodies, he constantly found the great
 “ guts either intirely mortified, or partly inflamed,
 “ partly mortified; that the *rectum* was most af-
 “ fected; and that in many he had seen scirrhous
 “ tubercles straitening the cavity of the *colon* in
 “ several places †.” Although those tubercles, which I have described in my patient, were too flat to be taken notice of, as straitening the cavity, yet in Mr. HEWSON’s preparation they were perhaps large enough to have had that effect.

On the other hand it may be remarked, that such protuberances are scarce mentioned in the *Sepulchretum* of BONETUS ‡, or in MORGAGNI’s valuable supplement. But the silence about them in those two works is perhaps no proof against their

* Amoenit. Academ. vol. v. dissert. LXXXII.

† Observations on the Epidemic diseases of Minorca.

‡ Quer. whether in lib. iii. sect. xi. Additam. observ. v. ?

frequently

frequently existing, when we consider that in *BONETUS* we have but a few cases (and those but imperfectly delivered) of those who died of an epidemic flux; and in *MORGAGNI*, of that sort none at all. For though this excellent anatomist has, in his usual manner, made some useful remarks upon the disease, and has added a few dissections of his own *, yet as his cases seem to have been all of the sporadic kind, I must consider them as somewhat different from such as we are now treating of. Indeed *MORGAGNI* acquaints us, that he had generally declined opening the bodies of those who died of any infectious distemper †.

In the first dissections I mention the abrasion of the villous coat, and perhaps in my account of the last, I should have made the same observation, had not Mr. *HEWSON* been inclined to think otherwise; and had not Dr. *HUNTER*, in viewing the preparation (which was mentioned before) been of opinion, that in this portion of the gut, the villous coat had not been separated, though perhaps fissured, and a little abraded on the top of some of the tubercles; and that, from the account which Mr. *HEWSON* and I had given him of the last subject, there had been no considerable abrasion in those intestines, more than in this piece which was before him.

* De Sed. et Caus. Morb. ep. xxxi.

† Ibid. ep. XLIX. § 32.

§ 3.

Of the causes of the dysentery.

THE heat and moisture of the air appear to be no less the chief remote and external causes of the dysentery, than of the autumnal remitting and intermitting fevers*, and therefore when other circumstances are equal, it usually prevails in the camp towards the end of summer, or in autumn, after great and continued heats †, which, as was shewn above, are generally attended with a loaded atmosphere. Upon comparing the account which I have given of the flux that occurred in every campaign, with the description of the same distemper by other authors, we shall find this principle sufficiently verified. SYDENHAM indeed, in the history of the epidemic dysentery of his time, takes no notice of the weather, going, I must say, upon a false principle, that the morbid constitution of the season has never any connexion with the sensible qualities of the air. But WILLIS supplies this defect, and observes that the summer of 1670. (which preceded the autumn wherein that flux was at its greatest height) was remarkably hot ‡. In the year 1762. the summer heats and drought were of a longer continuance than I remember to have observed them in this country,

* Part iii. chap. iv. § iii.

† Part i. chap. iii. and vii. part ii. chap. ii. § i.

‡ Post æstatem impense calidam et siccam. WILLIS *Pharmac. Rat. sect. iii. cap. iii.*

and accordingly in autumn the dysentery was so frequent in London, that though it could not be properly called epidemic, when compared to those fluxes which I have seen in the army, yet I believe that more cases then occurred, than in all the sixteen years that I had resided here. However, I do not advance this as a rule without exception; for that epidemic which raged at Nimeguen in autumn 1736. came after a summer that was warm indeed, but to no extraordinary degree, and then none of the neighbouring towns suffered, unless by their communication with the place infected. When the question is about a remote and external cause, it is to be understood that however prevalent it may be, it is not sufficient to produce an effect, without a concurrence of the occasional or exciting causes; and that when these last, to be afterwards mentioned, are strong, they will sometimes produce the effect independently of other causes.

Corresponding to the remote external-, is the internal pre-disposing cause, namely, a more than ordinary putrescent state of the blood, from a constant exposition to the sun in the hottest weather. We may likewise observe, that our men not caring to eat vegetables, and not being able to afford the price of fermented liquors, were in such circumstances deprived of two considerable antiseptics. For it may be remarked, that this disease *cæteris paribus* prevails mostly among such as are of a scorbutic (that is a putrid) habit, or among the poorer people,

people, who from foul air, bad diet, and nastiness, are most liable to putrid diseases. And there is an old observation, that such seasons as produce most flies, caterpillars and other insects (whose increase depends so much on heat and moisture, and consequently on corruption) have likewise been most productive of the dysentery.

Hitherto we have seen how similar the causes are of the remitting and intermitting fevers, and of the bloody-flux. Nay, the affinity extends even to the occasional or exciting causes; such, as when in the end of summer, or in autumn, the men are exposed to night-damps and fogs, especially after a hot day, or lie upon wet ground, or in wet clothes, part of them will be seized with that kind of fever, and part with this flux; and perhaps some of them will have a disorder compounded of both. Add to this, that those fevers begin to be frequent in camp whilst the dysentery still subsists; that the first symptoms are often similar, such as the rigors, and disorder of the stomach; that the remitting and intermitting fevers of a bad kind have sometimes ended in a bloody-flux*; that such countries as are most subject to those autumnal remitting fevers, are likewise most liable to the dysentery; and that the analogy continues even to the method of cure, in so far as the principal part of it consists in clearing the *primæ viæ*. Upon the whole, the nature of the two distempers appears so much alike, that at first sight SYDENHAM seems

* TH. BARTHOL. Hist. Anatom. cent. ii. hist. lvi.

to have expressed himself justly, when he called this flux “the fever of the season turned upon the bowels.” But upon a nearer view we shall find this notion more ingenious than solid, since the circumstance of its being contagious shews that the dysentery is essentially different from those fevers. DEGNER offers good reasons for believing that the fatal dysentery at Nimeguen was owing to the infection communicated by one person*; and if the strangers suffered so little, in particular the Jews †, we must ascribe that circumstance to the small intercourse which they had with the people of the place.

In camp, the contagion passes from one who is ill, to his companions in the same tent, and from thence perhaps to the next.

The foul straw becomes infectious. But the greatest sources of infection are the privies, after they have received the dysenteric excrements of those who first sicken. The hospitals likewise spread it; since those who are admitted with the flux, not only give it to the rest of the patients, but to the nurses and other attendants of the sick.

In general the contagion does not suddenly spread. For whole towns and camps are never seized at once from the impurity of the atmosphere, but the infection is carried from one to another by

* *Histor. dysent. bilioso-contag. cap. ii. sect. XLVI. et seq.*

† *Ibid. cap. i. sect. xxxv.*

the *effluvia*, or clothes, or bedding &c. of the tainted person, as in the case of the plague, small-pox and measles. Yet the dysenteric *miasma* is of a less catching nature than any of those; so that in the milder epidemics it may pass unnoticed, as in those described by SYDENHAM and WILLIS, which we observed before*.

But of what nature is this infection? In the former editions of this work, I considered the spreading of the distemper as owing to putrid exhalations from the humours of those who are first taken ill of it; and when this *miasma* is received into the blood, I conceived it to act upon the whole mass as a ferment, disposing it to putrefaction. But I am now sensible that this *hypothesis* would be insufficient, without one could at the same time shew, by what law in the animal œconomy, when the blood is thus tainted, the vitiated part of it should be thrown upon the intestines for excretion. This notion of a putrid ferment received some confirmation from a case which occurred, of one who was seized (indeed in a slight degree) with a true dysentery, accompanied with bloody stools, in making experiments upon human blood, which by standing some months in a close phial had become putrid. This case seemed to be the more decisive, as it happened at a time when the distemper was not heard of, and to a person in perfect health, who had formerly attended many dysenteric patients without being infected.

* Page 125.

For that reason I was inclined to refer the chief internal cause of the disease to this putrid ferment; but having since perused a curious dissertation published by LINNÆUS, in favour of KIRCHER'S system of contagion by *animalcula*, I thought it reasonable to suspend all *hypothèses* till that matter should be further inquired into*.

In

* *Amoenit. Academ. vol. v. dissert. LXXXII.* This dissertation, which is intitled *Exanthemata Viva*, is, as well as the rest of that work, in the form of an academical exercise made by a student; but the whole having been published by LINNÆUS, is considered as written by himself, or at least containing nothing but his own doctrine. I shall transcribe what that excellent naturalist says upon the dysenteric contagion, as the book may not be in the hands of every reader. *Hanc (scil. dysenteriam) per secessus et cloacas communes propagari, ne ullus quidem medicinæ peritus ambigit. Medicum Danum, priori seculo Helsingburgi, dysenteria sæpius correptum, excreta sua albina observasse vivis referta, viz. observabili motu se agitantibus, insectis BARTHOLINUS narrat. Quo loco non nobis est prætereunda observatio rem maxime illustrans. Quatuor adhinc annis Dom. ROLANDER, in ædibus N. D. Præsidis enutritus, dysenteria infestabatur; rhabarbarinis & paregoricis, more recepto curabatur. Otiduo abhinc in eundem incidit morbum, similiterque sanatur; octo vero aliis diebus præteritis dysenteria tertium corripitur: in causam omni studio inquiritur, non vero invenitur, quum æger eadem mensa, vitæque genere cum cohabitantibus sanis frueretur. Itaque N. D. Præses ægro, Entomologiæ præcipue studioso, excreta suadet scrutari, quo certius adpareret, utrum allata BARTHOLINI observatio obtineret, nec ne. Hoc factò, in hisce myriades animalculorum se vidisse, quæquæ accurate descripta, esse acaros, & acaris quidem farinæ similes, æger dixit. Causam vero non nemo in potum nocturnum conjiciebat: sed neque hæc alis videbatur sufficiens. Inter edendum bibere insuetus erat: noctu igitur siti pressus e poculo, ex ligno juniperino confecto, potum sæpe hauriebat tenuissimum. Vas hocce introspicens, lincolam quasi albicantem,*

In accounting for the dysentery, it may be remarked, that I have not ascribed the disease either to fruit, or to the bile; though almost all authors in treating of it have accused one or other, and sometimes both. SYDENHAM however ought to be excepted. As to fruit, having in other parts of this work offered several reasons for believing that it has no share in producing this flux*, or indeed any of the military diseases, I need not repeat them here. But with regard to the gall, since so many have considered the dysentery as one of the bilious disorders, some reason may be expected for my taking no notice of that humour upon this occasion. It may be remembered, that I have always used the

oculis nudis vix conspicuam, inter costarum rimas reperiebat; armatis vero observavit, omne hoc albidum non aliud esse quam innumeros acaros, et ejusdem quidem speciei cum illis quos in excretis observaverat. Potu in vas infuso, non mutabantur; eos vero relicti sedibus, media nocte, potus superficiem petere, ubi ad horam usque decimam a. m. pastum querebant, dum priora loca repetebant, crebra tandem investigatione invenit. Exemptis acaris orbiculo humectato impositis, quam parum, variis adfusis liquoribus, irritarentur, et quod per oleum ipsum salvi transfirent, animadvertit; A spiritu vini laedebantur, maxime vero a tinctura rhabarbari; quod imprimis notatu dignum: quum autem rhabarbarum dysenteriae sit specificum, lapathumque acutum ei valde cognatum, & quotidiana scabiei medicina, affinitatem invenimus & analogiam. Vasi, ter licet aqua calida abluto, adhærebant. Illos in alijs etiam locis querebat, inque vasis potus acidi, & sub doliorum obturamentis sæpius reperiebat. Dysenteria, quæ Scaniæ territorium Gyngæ quotannis fere, tempore messis, vexat, æque ac ea, quæ in castris est vulgaris, ex iisdem acaris, in potu acido latentibus, qui inde per secessus propagantur, & contagium generant, originem suam fortassis traxerit.

* Part i. ch. iii. Part ii. ch. ii. § iv.

term *bilious* more in compliance with the ancients, to distinguish a certain class of diseases, than from any opinion that they are really occasioned by the bile. In this light I consider the autumnal remitting and intermitting fevers, which have so often been called *bilious*. And as to the dysentery, I shall observe, that though at first, from the sickness at the stomach and vomiting, the gall may seem to be concerned, yet in the advanced state of the disease it must be wholly acquitted; since upon dissection, the liver and smaller intestines are generally found in a natural state, though those parts ought to be the most liable to be affected by disorders of the bile. And as to the gall itself, do we not see it sometimes here in a large, sometimes in a small quantity, sometimes of one colour, sometimes of another, sometimes thick, sometimes thin, and at other times of a natural consistence? Now, if it had any share in bringing on, or supporting this flux, should we not find a greater uniformity in its appearance? Nay, I have even imagined, that such medicines as could procure a more copious secretion of the bile would often prove useful, having observed the patient most relieved whenever an evacuant acted in such a manner as to carry down with it much of that humour.

§ 4.

Of the cure of the dysentery.

THERE are few acute distempers less beholden to nature for a cure, or attended with more deceitful indications. The hemorrhage seems

to require repeated bleedings; the flux, strong astringents; the pain of the bowels, constant opiates; and yet unless these remedies are used with caution, they tend more to confirm than to remove the disease. On the other hand emetics and purges have been either wholly condemned, or too sparingly used, yet later experience shews them to be the chief means of the cure. But setting aside for the present all indications (which, from our imperfect knowledge of the animal œconomy, we are seldom enabled to form) I shall proceed to offer the result of my experience, and add some observations from others whom I could most rely on, and who have likewise been much conversant with this flux. With these further lights the nature of the disease being more clearly seen, the reader may perhaps be directed to some more certain method of cure than what has yet been practised.

In order to proceed with method, I shall distinguish the dysentery into three states: *viz.* the first, whilst it is recent, or whilst the sick can easily bear evacuations; the second, when the distemper is of a bad kind, or has continued long, and has much impaired the strength, inflamed the intestines, and brought on a hectic fever; and the third state, when the patient, though recovering, is kept low by a *tenesmus*, or some other remains of the disease, or becomes subject to frequent returns of a looseness, from the weakness of his bowels.

I. In the first state, I begin with a moderate bleeding, though it may be true that a dysentery of itself does not require that evacuation*; but as this malady is partly of the inflammatory kind, and is often accompanied with a fulness of blood, bleeding is sometimes indispensable, and indeed is generally conducive to the cure. Yet unless the fever be kept up by some inflammation not peculiar to the disease (as it frequently happens in the winter and vernal cases) repeated bleedings are either unnecessary or hurtful, as may be observed in most distempers arising from a putrid cause. In weakly habits, and in contagion, with few feverish symptoms, I wholly omit that evacuation.

In the evening of the same day I give an emetic. In the beginning of my practice in the army, I used the *vitrum ceratum antimonii*, which I had formerly in this flux observed to be the best medicine for relieving both the stomach and the bowels. Now as the virtues of that antimonial preparation have been fully set forth elsewhere †, I shall not insist on them here, but only observe, that though I was convinced of its being a powerful remedy (by seeing it often succeed when other things had failed) yet the roughness of its operation, and the prejudice conceived against the *glass of antimony*, as a medicine, having deterred some of the physicians of the army, and of the regimental surgeons from using

* Dysenteria qua dysenteria venæsectionem nunquam indicat.
BARBETTE *Prax. lib. iv. cap. v.*

† *Méd. Essays*, vol. v. *Mem. de l'Acad. des Sc. A.* 1745.

it, I also desisted, being desirous of ascertaining the efficacy of some other less exceptionable means. Instead therefore of that preparation, I ordered a scruple of ipecacuanha, and generally added one grain or two of emetic tartar. Whether I gave a weaker or a stronger vomit, I observed it to be most successful when it likewise operated by stool. This effect was the more certain, when instead of the usual quantity of ipecacuanha, five grains only were given at once, and repeated at an hour's distance, twice or thrice, till a purging was brought on, which usually happened soon after the third dose. Fifteen grains exhibited in this manner were commonly sufficient. PISO, who first described this root, and recommended it in the dysentery, appears to have relied chiefly on its purgative quality, though he adds, that it still had a better effect when it vomited also*. When the stomach was chiefly affected, I gave twenty grains

* Perhaps the medicine is more cathartic while fresh than after long keeping, and better in decoction, or infusion, than in substance. We may observe, that PISO recommends the second and third decoction for weak patients, as less cathartic and more astringent. The following is the principal passage which relates to the use of this specific: *Dehinc ad radicem ipecacuanha tanquam ad sacram anchoram confugiendum, quia nullum præstantius aut tutius, cum in hoc, tum in plerisque aliis, cum, vel sine sanguine, fluxibus compescendis, natura excogitavit remedium. Quippe præterquam quod tuto & efficaciter tenacissimos quosque humores per ipsam album, sæpissime autem per vomitum ejiciat, & a parte affecta derivet, vim quoque astringentem post se relinquit.—Illud vero hoc modo perficitur. Drachmæ duæ radicis ipecacuanha in ℥iv. liquoris appropriati coctæ, vel per noctem mace-*
ratæ,

grains of the ipecacuanha either by itself, or with the tartar emetic; but when the person complained more of gripes than sickness, I directed the root to be divided as above, with a view to its more certain operation upon the bowels. In one or other of these forms I ordered the emetic on the first day of my seeing the patient, whether he had been bled or not. If the full quantity was given, the operation was assisted, in the common way, with repeated draughts of camomile tea. But if the small doses were used, he drunk nothing till the medicine wrought downwards, and then he took some water-gruel to promote that effect.

When the stools were large, and the patient fatigued with the operation, I gave no medicine on the following day; but if he had taken the emetic all at once, so as only to clear his stomach, or if the divided powder had wrought weakly by stool, I ordered a purge next morning, *viz.* five grains of calomel, with five and twenty or thirty of rhubarb, which in ordinary constitutions was a moderate, or rather a small dose. At first I gave the rhubarb without any calomel, and usually about half a drachm; but afterwards I found it necessary either to give double that quantity for a dose, or to join the calomel to thirty grains, in order to

ratæ, cujus infusum cum, vel sine oxymellis ℥j. exhibetur. Postridie semel atque iterum, pro re nata, secunda imo tertia ejus decoctio repetenda; tam quod ægri debiliores eam facilius ferant, quam quod astringentia ejus vis tunc magis efficax appareat. GUL. PISON. Hist. Nat. et Med. Indiæ Occident. lib. ii. cap. ix.

procure

procure a thorough passage. I have remarked in the former editions of this work, “ That we are to
 “ attend less to the dose than to the effects, which
 “ are not to be judged of by the frequency, but
 “ by the copiousness of the stools, and the relief
 “ which the patient finds from the gripes and *tenef-*
 “ *mus* after the operation; and that as on the one
 “ hand the physician ought to avoid all the rough
 “ and stimulating purges, so on the other he is not
 “ to spare those of a lenient kind, especially rhu-
 “ barb, which is commonly under-dosed.” This is
 still my opinion, except that with regard to rhu-
 barb, I have not seen it in this flux have so good an
 effect by itself, as when joined with well prepared
 calomel, by which means it becomes more lenient,
 that is, easier in its operation.

At night, after the purge, I usually gave for the first time an opiate, *viz.* ten grains of the *pilula saponacea*, with two, or sometimes with three grains of ipecacuanha, either in a bolus or in a draught: for ever since I found that some soap-pills had passed undissolved, I have disused the pilular form in all weaknesses of the intestines. Formerly I joined to the opiate a small quantity of the *vitrum ceratum antimonii*, in order to promote perspiration; but when I dropped that medicine as an emetic, for the reasons already given, I omitted it here also, and supplied its place with the Indian root.

Here I must observe with regard to opiates in the dysentery, that it were better perhaps they
 were

were never given at all, than used before the first passages are cleared. For though from the beginning they are sure to give some immediate relief, yet by confining the wind and the corrupted humours, they tend to fix the cause, and to render the distemper more obstinate in the end. This is the result of my experience, which I am sorry to find does not exactly correspond with that of SYDENHAM. For though that excellent physician did not omit purging when the dysentery was most epidemic, yet at all other times it appears that he trusted to laudanum alone. Now, whatever was the nature of those fluxes which he treated in that manner, I must believe that such as are most incident to an army are of a less tractable nature, and in general are not to be cured without repeated evacuations. As to the best kind of opiate I have made no particular observation; and therefore if I have here specified the *pilulæ saponacæ*, it was only because I preferred that composition to the simple *extractum Thebaicum*, as there was less hazard of an error in the weight. It is well known that ten grains of those pills are equal to one of pure opium.

When the two first days had been employed in the manner described, I ordered no medicine on the third, unless the sick still complained of gripes, in which case the opiate was repeated at night. But on the fourth day, if any bad symptoms remained, I directed the ipecacuanha to be given once more in divided doses; or, if the patient expressed great
aversion

aversion to a drug which had made him sick before, I repeated the purge, and that in a greater dose, if the former had not operated sufficiently. The largest of this kind, which I used in the dysentery, consisted of thirty grains of rhubarb with eight of calomel.

By this time most of the dysenteric cases gave way, and sometimes sooner. But if some *fois* of the distemper still remained, or if the patient had committed any error in diet, or had exposed himself to cold, so as to relapse, I had recourse to the same remedies, that is, either to the purge, or to the ipecacuanha, according as the one or the other had agreed with him before. In fine, these evacuants were the chief medicines which I trusted to in this stage of the disease.

This method was nearly followed in the last war by the other physicians of the army, and in particular by Dr. HUCK, who having been in constant service either in N. America, or in the W. Indies, had the best opportunities of seeing the dysentery in all its forms. He acquainted me, that notwithstanding the difference of climates, the distemper, when epidemic among the troops, appeared with the same symptoms every where (only with somewhat more violence, in proportion to the greater heat of the country) and when cureable yielded to the same medicines. I shall here subjoin a short account of his practice in his own words.

“ When

“ When the patient is feverish, or plethoric, I
“ always begin with bleeding; and if the fixed
“ pains and the fever seem to indicate a consider-
“ able inflammation, I repeat it. I have thought
“ that giving four or five grains of ipecacuanha
“ with one grain of emetic tartar, without drinking
“ after this dose, but suffering it of itself to work
“ off, and repeating it in two hours, with orders then
“ to the patient to wash his stomach with camo-
“ mile-tea, was the best method of clearing the
“ first passages. Sicknefs at the stomach, bad
“ taste in the mouth, giddinefs, heart-burn, and se-
“ vere gripes were reasons for repeating the vomit
“ on any of the following days. If the stomach
“ did not seem much disordered after it, I used to
“ purge with two ounces of manna and one ounce
“ of GLAUBER’S salt dissolved in a quart of water,
“ whereof a quarter of a pint was drunk every
“ half hour till it procured two or three copious
“ stools. This I preferred to rhubarb and to
“ every other cathartic, especially in the beginning,
“ repeating it every third or fourth day till the
“ gripes, &c. abated, and giving an opiate every
“ night, after the first or second exhibition of this
“ cathartic. But I never knew an opiate of use
“ whilst the fever, the thirst, the gripes, and *tenefes-*
“ *mus* were considerable. If astringents were use-
“ ful, it was only when a laxity of the bowels
“ remained after the disease.”

By this account we find that Dr. HUCK not only divided the ipecacuanha, but to each of the doses
7 added

added some emetic tartar, which upon a comparative trial was found to improve the medicine. And indeed for the future I should prefer his method, as I have reason to believe, from my own observations upon the autumnal fevers, that this antimonial preparation may be of service in removing some feverish spasms, which, though not the original cause, may yet concur with it in supporting the disease.

We may likewise observe, that Dr. HUCK thought the salts and manna a better purge than rhubarb in the beginning of the dysentery; but in talking with him on this subject, I found, that though he had frequently given rhubarb by itself, yet he had never given it with calomel, and therefore that he could not determine whether his purge or mine were the best in this state of the disease.

I likewise understand, that most of our physicians employed in Germany, during the late war, preferred salts and manna (to which they frequently added some oil) to rhubarb alone; and that after bleeding and vomiting, they purged, at least in the beginning, with that mixture*. Possibly there may be

* One of the physicians on that service told me, that he had commonly given his purge in this manner:

R. Mannæ ℥β. vitelli ovi ℥i. contritis simul, in mortario lapideo, admisce paulatim olei oli-varum ℥vi. et salis cathartici amari (aquæ puræ ℥iij. soluti) ℥j.

This was the dose for an ordinary man; but to the weakly patients he gave a smaller quantity. Two other physicians of that army also informed me, that they had used much the same composition.

better

better ways of giving the rhubarb than with calomel. DEGNER praises a tincture of it in a watery *menstruum*, of which he ordered small but repeated doses; but as I did not see his treatise till after the conclusion of the former war, I have since that time met with too few rebellious cases, to induce me to compare his preparations with those remedies which I had used before with tolerable success*.

After clearing the first passages in the manner described, I have generally endeavoured to finish the cure by combining purges with opiates, in such a manner as to keep the body open, and at the same time to abate the gripes, but I have not always succeeded to my wish. In the year 1760. the brigade of guards arriving in Germany about the end of July, in a rainy season, and when there was a scarcity of straw for the tents, such numbers of the men sickened, and for the most part with the dysentery, that when the camp broke up in the

* It may seem strange that authors have not yet agreed about the proper purge to be used in the blood-flux; but we ought to consider that different constitutions require different laxatives. A physician, in his first practice, not attending to this, and meeting with a dysenteric patient, with whom rhubarb, for instance, agrees, and sena or salts disagree, will be afterwards apt to adhere to the first and condemn the other; and *vice versa*. But as to the use of purges in this disease, and the variety of them occasionally to be employed, according to the difference of constitutions, we have such full and just reflexions in YOUNG'S Treatise on Opium (in the section on the dysentery) that I shall not further insist on the subject, but refer the reader to those observations.

month

month of December, above half of that corps were unfit for duty. Mr. PATERSON (one of the surgeons to the hospital, then a surgeon in the guards) gave me this information: “ That
 “ he had been generally successful, by treating
 “ those of his batallion, who had been ill of the
 “ flux, in the following manner. If the patient
 “ was of a plethoric habit and very feverish, he
 “ began with bleeding; then gave a vomit of ipe-
 “ cacuanha; and besides that, if he had seen the
 “ sick person early in the day, a drachm of rhu-
 “ barb at night; if not, the next morning. That
 “ in the evening of the second day, after the ope-
 “ ration of the purge, he gave about twenty drops
 “ of the *tinctura Thebaïca*, or about ten grains of
 “ the *pilulæ saponacææ*. That afterwards, if the
 “ disease continued, he formed a mass of *theriaca*
 “ and rhubarb into the consistence of pills, and of
 “ this administered half a drachm morning and
 “ evening, and sometimes thrice a day. That
 “ the next year, when he himself was seized with
 “ the bloody-flux, he had followed the same me-
 “ thod of cure; that it was near three weeks
 “ before he recovered, being constantly kept in
 “ camp, frequently marching, and being exposed
 “ to cold and wet, and other hardships in the course
 “ of his duty; but that during all the time, he
 “ had found the greatest benefit from the medicine
 “ above mentioned. That about half an hour after
 “ every dose the *tenesmus* abated, and the stools
 “ became more copious and less frequent for three

“ or

“ or four hours following. That on this account,
 “ for the last seven or eight days, he took half a
 “ drachm of the above composition thrice a day,
 “ which amounted to about one drachm of *theriaca*,
 “ and half a drachm of rhubarb in twenty-four
 “ hours.”

If by the means of this medicine, or by other methods, the disease is so far changed, that the patient complains less of gripes and a *tenesmus*, and begins to have stools, though loose, yet of a more natural colour, with less slime and more *faeces*, he being then in a fair way of recovery, his case shall be further considered when I come to the third state of the disease. At present, I am to treat of those who have gone through the first, and who either have had no medicine at all, or received little or no benefit from it; and when their stools are as small, as frequent, as slimy, and as painful as ever.

II. IN the second state therefore, though there be often more of a hectic fever than at first, and though a mortification be threatened by the retention of the putrid matter, and the continuance of the inflammation, yet, so far as I have observed, bleeding is not the remedy, but laxatives (such as have little irritation, and yet are sufficient to prevent an accumulation of the sharp humours) and those medicines which either sheathe the bowels against the acrimony, or procure a respite from pain and spasms, until nature acquires force sufficient for the cure. Here for the first time I used the *sal cathar-*

T

ticus

Acus amarus alone, though probably it might have been more effectual with oil and manna, or given not at once, but in small and repeated doses, as in the *ileus* *. In this state I once ordered, to a young woman, five grains of ipecacuanha with twelve of rhubarb, which first making her sick, and then working downwards, brought away some *feces* of a natural colour, and gave a favourable turn to the disease. But as this was one of my latest patients in a true dysentery, I have had no opportunity of repeating that medicine.

At this period of the flux, finding emollient and anodyne clysters to be of considerable benefit, I therefore used a decoction of linseed, or of starch, or fat mutton broth, from four to eight ounces, according as a smaller or larger quantity could be retained. When the motions were so frequent, that the patient could not keep those clysters, I added to each, from twenty to fifty drops of the *tinctura Thebaïca*, or as much as was necessary for abating the *stimulus*, without too much affecting the head. As the patient must use opiates, this will probably be found the best way of giving them; for thus they are applied immediately to the *rectum*, where the irritation is the greatest. But in bad cases the motions were generally so frequent, that notwithstanding the laudanum in them, one clyster at bedtime was often insufficient for composing the patient throughout the night; and if so, he either

* See Page 151.

took another, or the opiate draught. Although the advantage of clysters was manifest, yet we could not avail ourselves of them in the hospital so much as we wished; partly from the neglect of the nurses, and partly from the reluctance of the men to use them: even in private practice, we are frequently obliged to desist from them, on account of the tenderness of the parts.

For mitigating the gripes and expelling the wind, we are not to use the warmer carminatives; at least I have never known them succeed. Opiates afford immediate relief, but they only palliate, and often augment the cause. I met with no remedy that very sensibly answered this intention: the best, was fomenting the belly, and drinking camomile-tea. The infusion of those flowers was first thought of, on account of their antispasmodic and bracing qualities, but having since found them powerfully antiseptic, I am inclined to think that some of their effects here may be owing to that principle. The fomentations were made of the common herbs, with the addition of some spirits; but as they required frequent repetitions, they were less used by the soldiers than by the officers, who were better attended. The flatulent pains would sometimes affect the side, as in a pleurisy, but a laxative medicine, or the fomentations just mentioned, removed them without bleeding.

When the patient complained of a heart-burn, and of every thing turning sour on his stomach, I ordered from time to time four spoonfuls of the

julepum e creta; and when, at the same time, the gripes and incessant motions required some palliative, I dissolved two grains of the *extractum Thebæicum* in a pint of that julep, and gave it in the manner mentioned before*.

At other times, when there was no complaint of an acid, but of gripes and frequent motions, I endeavoured to blunt the acrimony, and in some degree to sheathe the bowels against the irritation, by food of a mucilaginous quality (which shall be mentioned hereafter) and by giving for drink, a decoction of starch with gum arabic, seasoned with some simple cinnamon water and sugar. A pint of this liquor commonly contained three drachms of starch with half an ounce of the gum. For the same intention, a solution of wax was used in the hospitals in North-America, and, as Dr. HUCK informed me, often with good effects †. Preparations of wax have been long in repute for their virtues in this disorder: BATES recommends the solution of it in spirits ‡; and DIEMBROECK gives

* Page 207.

† *R Ceræ flavæ rasæ ℥i℥. saponis Hispani duri rasī ℥i. aquæ puræ ℥i. liquecant leni igne, et assidue agitentur donec in unum coeant; dein effunde materiam in mortarium lapideum, eique paulatim admisce aquæ puræ ℥viiij. aquæ nucis moschatæ ℥j. et sacchari albi quod satis fit ad gratum saporem.*

This makes a smooth mixture of no disagreeable taste, whereof the patient takes as much, at proper intervals, as to consume the whole quantity in a day. The soap is only used as a dissolvent of the wax.

‡ Pharmacop. BATEAN. in formula *Butyrum Ceræ.*

instances

instances of its extraordinary effects, when dissolved in milk, and mentions some authors who praise that medicine for the dysentery*.

When the flux continues till the strength is much impaired, and the pulse sinks, whilst the hectic heats remain, the danger is great; though there are still hopes, as long as there are neither involuntary stools, nor *aphtæ*, nor a hiccup, and when the patient does not complain of great lowness, and the *anxietas præcordiorum*: if he does, the case is bad indeed, and scarcely admits of palliatives; since opiates have but little effect, either in easing the pain, or checking the frequency of the stools. Sometimes the disease is complicated with the hospital-fever; in which case few recover. But when there is room for medicine, I have commonly used a composition of the Bark with snake-root (described in the next chapter) to which I added a few drops of laudanum. At other times, and especially when the pulse was sunk, I have experienced the good effects of the following decoction, of which four spoonfuls were given every four or five hours:

℞ *Radici serpentariæ Virginianæ* ziiij. coque ex aquæ fontanæ ℥xij. ad ℥viiij. adjecta sub finem coctionis *theriacæ Andromachi* ℥j. cola.

In the year 1760. Dr. WHYTT acquainted me,
 “ That in this bad state of the dysentery, when
 “ the mouth and alimentary canal were threatened

* Observat. et Curat. Med. obs. xxviii.

“ with *aphtæ*, and even sometimes after they
 “ appeared, he had successfully given the Bark;
 “ having first made such evacuations as the case
 “ required, or the patients could bear, by bleed-
 “ ing, vomiting with ipecacuanha, and purging
 “ with rhubarb. That to a pint of a strong de-
 “ coction of the Bark, he added three drachms, or
 “ half an ounce of *confectio Japonica* (a composi-
 “ tion of the Edinburgh dispensatory, of the same
 “ intention with *diascordium*, but simpler) and or-
 “ dered two spoonfuls of it every four hours, with-
 “ out any other medicine except some laudanum
 “ at bed-time. That when, by the continued use
 “ of this, the body became costive, he then gave
 “ rhubarb; and after that, went on with the
 “ decoction of the Bark, but with less of the *con-*
 “ *fectio Japonica*, or even without it.”

At this time, supposing that the *rectum*, from
 the irritation occasioned by the incessant motions,
 tended to a mortification, I endeavoured to quiet
 the spasms by repeated anodyne clysters, but with-
 out any antiseptic ingredient. Something however
 of that kind has been tried by others. For Mr.
 HUNTER, one of the surgeons on the expedition
 to Portugal, told me, that he had frequently
 used antiseptic clysters with good effect, when the
 patient was worn down with continual motions and
 a *tenesmus*. His first trial was with four ounces of
 a strong decoction of the Bark, in which he dis-
 solved some grains of opium; and afterwards, he
 found

he found that a decoction either of the tormentil-root, or of oak-bark, with opium, answered the same purpose. He added, that those clysters were repeated often, and especially if they came soon away without having the desired effect.

Hitherto I have said nothing of the diet, which was nearly the same in both these states of the disease. It consisted chiefly of rice- or barley-gruel, sago, panada, or some light pudding; and to those who were but a little feverish, some mutton-broth was allowed: but this last article was omitted afterwards, as I observed that in general animal food was improper. For drink, I ordered rice or barley-water, toast and water, or the decoction of calcined hartshorn. During the former war we used no salep in the hospital. Although that root has been accounted specific in the distemper, yet from my own experience I can say nothing particularly in its commendation. Mr. TRIQUET, surgeon to the second regiment of guards, informed me (at the camp in the Isle of Wight, in the year 1758.) that in his regimental-hospital no kind of diet had agreed so well with the men who were ill of fluxes, as a mess made of flour boiled in milk, sweetened with sugar, and taken for breakfast and supper. But though all these substances are of the softest and least heating kind of food, yet I have observed, that for the most part the patient could not take any of them, nor swallow any of the liquors mentioned above, nor indeed any

other, except plain warm water, without being sick or griped immediately after. It was therefore natural to conclude, that until the stomach and bowels were able to bear some stronger nourishment without pain or sickness, nothing but water should be given for the whole diet. In this notion I was confirmed, by some curious observations on the dysentery, communicated to me by M. DE SENAC, who, during my service in the Low Countries, in the former war, was physician-general to the French army. That learned person acquainted me, that having had good evidence for believing, that several had been cured by taking nothing but large quantities of warm water, for five or six days together, he had successfully made the experiment upon himself, and upon fourteen more who submitted to that regimen. He added, that after having tried other methods, without being satisfied with any of them, he had at last fixed upon the following, by which he had made numberless cures. This, after evacuating by bleeding, and by a vomit of emetic tartar, consisted chiefly in giving one grain of that antimonial preparation, dissolved in a pint of common whey, or chicken-water, in divided draughts, every day, for all food, drink and medicine, till the patient recovered. His intention, he said, was to keep a free passage from the stomach to the *rectum*, by the mildest laxative, which he found was best answered by this minute quantity of the emetic*. In case

* As the emetic tartar is not every where made to the same standard, it is easily understood that the laxative dose must vary according to the preparation of that medicine.

the gripes proved more obstinate than usual, notwithstanding the evacuations, he then endeavoured to quiet them, by giving some syrup of white-poppies at bed-time. But though this course (in which the lowness of the diet is a material circumstance) was not only agreeable to my sentiments upon the nature of the disease, but was recommended to me by a physician, in whose judgment and veracity I had entire confidence, yet I have never been able to avail myself of the communication, on account of the difficulty, I may say the impossibility, of making the people of this country submit to so low a diet, even for a few days.

Under the article of diet, I must not omit a caution with regard to the kettles of the hospital, which are all made of copper tinned. Now, as the tinning soon wears off, the metal is corroded by every liquid that is salt or acid; and we may well imagine how apt the nurses will be to let such things stand in those vessels, and to neglect cleaning them before they are again used. I suspect that this may be often the cause of mischief, especially during the dysenteric season, when the stomach and bowels are otherwise so much disposed to be out of order. It would therefore be an advantage to military hospitals, to have a Brazier constantly attending them.

III. I come now to the third state of the disease, in which the patient, though seemingly recovering, is kept low by a *tenesmus*, almost his only complaint; or by frequent returns of a looseness, from the weakness of his bowels.

The *tenesmus* is not always owing to one cause; sometimes I have known it occasioned by the hard *scybala* formerly mentioned, which coming away in small parcels, for several days together, have made a constant irritation. The discharge of these I have hastened by an ounce of GLAUBER'S salt, dissolved in half a pint of water, and given at different draughts in a morning. If one or two such potions had no effect, I imputed the continuance of the *tenesmus* to an excoriation, or some sore of the *rectum*, by which the part became so tender, as to be irritated by the humours of the intestines, though those humours might not be more acrid than natural. For medicine, if the *tenesmus* was great, and the motions frequent, I had still recourse to opiates, and especially to the anodyne clysters first mentioned*. In every case of great irritation, during this state of the disease, I formerly used the decoction of starch with gum-Arabic described above †, but of late I have more frequently prescribed mutton-suet, prepared according to the following receipt, which for some time has been known here: “ Take two ounces of fresh suet, and
“ a pint of new-milk, set them over a slow fire,

* Page 271.

† Page 273.

“ and let them be stirred till they boil, then add a
“ heaped spoonful of starch finely powdered, and
“ mixing it well with the rest, let them boil a little
“ together.” This preparation may be sweetened,
or not, according to the taste: the quantity here,
or even the double, if the stomach will bear it,
may be consumed in a day; and it will have the
better effect if the patient takes no other food. I
have sometimes attempted to give this mess in
the first and second state of the disease, but it never
answered; for at that time the stomach was too
much disordered to bear it.

SYDENHAM has said, that the *tenesmus*, at the end
of a dysentery, is never occasioned by an ulcer in
the *rectum*: in this he is corrected by MORGAGNI,
who mentions one case to the contrary, that had
occurred in his own practice*; but, by quoting
that case only, it appears that MORGAGNI knew
but of few exceptions to SYDENHAM’S rule; which
indeed, from my own observation, I should reckon
a pretty general one.

As to the frequent returns of purging, we are
not, as I observed, to consider them so much as
relapses into the dysentery, as into a *diarrhœa* or
white-flux, owing to the weakness of the bowels.

Whenever therefore the patient is in this condi-
tion, I begin with a scruple of ipecacuanha, and
the next day I put him upon a course of those

* De Sed. et Caus. Morb. ep. xxxi. § 27, 28.

medicines,

medicines, which, from their effects in stopping a looseness, have been called astringents. For this purpose, during the former war, I commonly prescribed the following mixture:

℞ *Extracti ligni Campechensis* ℥iij. solve ex aquæ *cinnamomi spirituosæ* ℥iij. admisce aquæ *fontanæ* ℥vij. et *tincturæ Japonicæ* ℥ij.

Of this the patient took two spoonfuls once in four or five hours, and sometimes also an opiate at bedtime. I have understood since, that in one of the hospitals of this city, where this *formula* has been adopted, for old and obstinate *diarrhæas*, and for dysenteries not yielding to the common methods, they order at the same time a bolus to be taken, every night, consisting of a scruple of *philonium Londinense* and two grains of *ipecacuanha*, and that they have been generally successful.

Since the former war, having read the account which DEGNER and others have given of the virtues of the *simaruba*, I made a few trials of that medicine, and which were mostly in its favour. DEGNER not only recommends it as a mild astringent, but as a corrector of the bile; for according to his theory, the depravation of that humour was the cause of the epidemic flux which he treats of. On that account he gave it early in the disease, whilst the gripes and *tenesmus* continued, and whilst blood was yet found in the stools. But from my own experiments I could discover none of the salutary effects of the *simaruba* before the third state. Dr.

HUCK,

HUCK, who had used it often in North-America, observed, that he had never seen it answer in the beginning, nor even in the advanced state of the dysentery, till the gripes and *tenesmus* had in a great measure ceased, and till the blood had disappeared in the stools; but that when only a looseness remained, he had often found it successful. This was his *formula* :

℞ *Corticis radice simarubæ* ʒij. vel iij. coque ex
aquæ fontanæ sesquilibra ad libram, et cola.

This quantity was given every day in several draughts. He began with the weakest decoction, and when the stomach of the patient could easily bear it, he then ordered the strongest. And he observed further, that unless the sick found themselves sensibly better within three days from the time they began the medicine, they seldom afterwards received any benefit from it. Dr. MITCHELL, who formerly practised in Virginia, where the dysentery is frequent, also informed me, that he had likewise often used this vegetable, but with no success, except when the patient either voided an immoderate quantity of blood during the height of the disorder, or had a *diarrhœa* after the inflammatory state was passed. He added, that he had commonly made a stronger decoction than that which DEGNER prescribed, who probably was induced to give the *simaruba* with the more caution, as the bowels were so much inflamed when he began to use it.

I have also known good effects of small doses of ipecacuanha joined to an opiate, such as two grains of that powder with fifteen of the *philonium Londinense*, taken twice a day. Others have received benefit from ipecacuanha alone. Dr. HUCK told me, that a soldier, after getting over the inflammatory state of the dysentery, was much reduced by a white-flux of the lenteric kind, and that after giving him several astringents without effect, he had at last succeeded by ordering him six grains of ipecacuanha in powder, to be taken every morning fasting; that this man was puked by the medicine for the first three or four days only, but that afterwards he took it without complaining that it made him sick.

During this astringent course the men are still to be attentive to their diet, abstaining from greens, fruit, malt-liquor and acids. In this state I have allowed them some flesh meat; and for drink, water mixed with a little rum or brandy: to the officers and private patients, I have given some wine when they were very desirous of it. But from further experience, I am apt to believe that at this period of the disease, the cures would be both more frequent and speedy, could we prevail upon our patients to abstain altogether from animal food, and from vinous and spirituous liquors; for when no astringents have availed, I have frequently known the cure obtained by a milk- and farinaceous diet, without them.

Therefore

Therefore when the astringents fail, and especially when the pulse is quick, and the patient complains of inward heat, I first give a vomit of ipecacuanha, and then begin this regimen, which I continue until the hectic symptoms have ceased, and the bowels have recovered their tone. During this course, I have seldom had occasion for medicines, excepting the chalk-julep mentioned before, which I employ for correcting that strong acid so incident to relaxed stomachs. Sometimes I add an opiate at night, in order to procure rest, but after a few days I generally lay both aside. All that I require (which indeed is often hard to obtain) is a strict perseverance in the diet, and now and then a repetition of the vomit, upon any new disorder of the stomach, or greater laxity of the bowels.

Whilst the patient continues in this state, I would forbid, as was said, all animal food; and besides milk, allow only sago, salep, and the common *fari-nacea*. In large hospitals, the soldiers cannot be fully supplied with milk; but in such circumstances they must be contented with less, and with the other parts of diet here prescribed, without eating cheese, eggs, or other things that are heavy, or heating, to men in their condition. If the milk by itself should turn sour on the stomach, let a third part of lime-water be added. Although greens and fruit may seem to favour the general intention of cooling, yet, as they are naturally loosening, I have often thought that the use of them at this time was less proper; but it is possible that upon further experience

rience we may find some kinds both of the one and the other conducive to the cure. And I am the rather inclined to this opinion, from having observed, in one of my later cases, that when the patient drank butter-milk (indeed none of the fourest) he received more benefit than could have been expected from sweet milk; though the former, from an acidity, like that of some fruits, might be supposed to be contrary to the nature of the disease.

In this regimen I allow of neither fermented liquors nor spirits. The chief drinks are the decoctions of barley, of rice, or of calcined hartshorn, toast and water, or milk and water. Having observed, in my private practice, that some were better for drinking Bristol-water, not only at the spring, but at a distance, I desired one of my patients (who had come from the Havannah) to observe, whether he found any difference between drinking the river-water and the pump-water in this city; and after some trials he assured me, that he was less liable to a return of his flux when he used the latter. Now, Bristol-water, and most of the pump-water in London, agree in not easily lathering with soap; that is, in being in reality hard, however soft they may be to the taste. But I would not from thence infer, that this mineral water has no other advantage than hardness when drunk warm at the spring, considering how long it has been in repute for its efficacy in cases of this kind, and especially when hectic heats are joined.

Pure

Pure air being of such consequence in the cure, the physician can hardly be successful in full hospitals unless the wards be uncommonly well aired. The best expedient, in the dysenteric season, is to divide the sick, and to lay them in churches, or in barns, or in ruinous houses only, where neither they nor their nurses can confine the air. Not, but that expositions to cold are hurtful, and that a free insensible perspiration is favourable to the cure; but when warmth is not to be had with a purity of air, we must chiefly regard the latter. Not only in the camp, but in the hospitals, the privies should be covered every day with a layer of earth; and at those times, particularly, the wards should be fumigated and kept clean. Such men as have long languished in the hospital under a hectic, and a laxity of the bowels, have been unexpectedly restored, by cantoning them in the country, where they had a milk diet, and breathed the fresh air.

Lastly, as conducive to the cure, and as a preservative against a relapse, especially when the weather begins to grow cold, the convalescents ought to be provided with under-waistcoats. Some of the officers, who had been subject to returns of the flux, have informed me, that they had found much benefit from wearing a flannel waistcoat next their skin.

C H A P. VII.

Observations on the jail- or hospital-fever.

I COME now to the last fatal distemper incident to an army, namely the hospital-fever. In treating of this, I shall 1. describe its rise, and the manner of the infection; 2. the symptoms; 3. the prognostics; 4. the examination of the bodies of some who died of it; 5. the method of cure: and lastly, from these and other materials, I shall inquire into the nature and causes of such fevers.

§ I.

Of the rise of the jail- or hospital-fever, and the manner of the infection.

THE hospitals of an army, when crowded with sick, or when the distempers are of a putrid nature, or at any time when the air is confined, especially in hot weather, produce a fever of a particular kind, and often mortal*. I have observed the same sort to arise in full and crowded barracks, and in transport-ships when filled beyond a due number, and detained long by contrary winds; or when the men have been long kept at sea under close hatches in stormy weather. Hos-

* Part i. ch. ii. iii. iv. viii, Part ii. ch. iii, § iii.

pital-ships, for distant expeditions, have for this reason been generally destructive both to the sick and their attendants.

As soon as I became acquainted with this fever in the hospitals abroad, I suspected it to be the same with what is called here the *jail-distemper*, which I had never seen; and I was confirmed in my opinion, by having an opportunity of comparing them, furnished by an accident mentioned in the first part of these observations*.

This disease is incident to every place ill-aired and kept dirty, that is, filled with animal steams from foul or diseased bodies. And upon this account jails and military hospitals are most exposed to this kind of pestilential infection; as the first are in a constant state of filth and impurity, and as the latter are so much filled with the poisonous *effluvia* of sores, mortifications, dysenteric and other putrid excrements. I have seen instances of its beginning in a ward, when there was no other cause but one of the men having a mortified limb. Nay, there is reason to apprehend, that even when a single person is taken ill of any putrid disease (such as the small-pox, dysentery, or the like) and lies in a small and close apartment, he may fall into this fever. This I have actually known to happen in camp, when one has been seized with an illness of that kind, and kept his tent too close. But except-

* Page 36.

ing on those occasions, this fever is not properly one of the camp-diseases, though it be universally accounted such; for being frequently seen in camp-hospitals, it is therefore erroneously supposed to come from the field.

I have observed some instances of a high degree of contagion attending it; but the common course of the infection is slow, and catching to those chiefly who are constantly confined to the bad air, such as the sick in hospitals, and their nurses, and prisoners in jails. But when there is no great quantity of infectious matter, or when a person has not breathed long in such dangerous steams, or when they are not particularly virulent, he will either escape altogether, or sicken so slowly, as to give time for stopping the fever before it be quite formed. Much will also depend on the constitution: some will have the disorder hanging about them for days before it confines them to their bed; others will complain for weeks of the same symptoms, without any regular fever; and others, after leaving the infectious place, without the fever, will afterwards be seized with it*.

* Part i. ch. vi. p. 47.

§ 2.

Of the symptoms.

WHEN the distemper comes on slowly, the first complaints are slight interchanges of heat and cold, a trembling of the hands, sometimes a sense of numbness in the arms, weakness of the limbs, loss of appetite; and the disorder being greater at night, the body grows hot, the sleep is interrupted and not refreshing. With these symptoms, for the most part, there is some pain or confusion of the head. The pulse at first is a little quicker than natural, the tongue is white, but the drought is inconsiderable. Those who are thus affected find themselves too much indisposed to go about business, but too well to be wholly confined. In this state, sometimes a vomit, sometimes a change of air, will remove the disorder, sometimes a sweat: I have had experience of the two last methods of prevention in my own case.

The disease in the beginning is not easily to be distinguished from any common fever *. I have observed the *tremor* of the hands to be one of the most constant signs: but in order to form our diagnostics, we must take other circumstances into consideration. We are to inquire, whether the person has been exposed to the usual causes of fevers,

* Febres malignas in principio statim cognoscere difficile est; cum malignitas sæpe diu lateat, et non nisi ubi vires sumfit sese prodant. SENNERT. *Epit. de Febr. lib. iv. chap. x.*

or to foul air and infection; as also, if he has been bled, whether he has been relieved by the evacuation; because in inflammatory fevers bleeding generally moderates all the symptoms, but in this it seldom has that effect.

When the fever advances, the symptoms already mentioned are in a higher degree, and in particular the patient complains of lassitude, of a *nausea*, pains in his back, a more constant pain and confusion in his head; and then we perceive an uncommon dejection of spirits. At this time the pulse is never sunk, but beats quick, and often varies in the same day both as to strength and fulness. It is little affected by bleeding once, if a moderate quantity of blood be taken away; but if the evacuation is large, and especially if repeated, to answer a false indication of inflammation, the pulse, increasing in frequency, is apt to sink in force, and often irrecoverably, whilst the patient becomes delirious. But withal we must observe, that in every case, independent of evacuations, the pulse sooner or later sinks, and gives then certain intelligence of the nature of the disease.

The appearance of the blood is various; for though it is commonly little altered, yet sometimes it will be fizy, not only on the first attack, but after the fever is formed. The worst appearance is when the *crassamentum* is resolved; though this does not happen till the advanced state of the fever: but
indeed

indeed as blood has been then so seldom taken away, I cannot say whether this be a frequent occurrence or not.

The urine is also various. Sometimes it is of a reddish or flame-colour, which it preserves a long time; but it is oftener pale, and changes from time to time in colour as well as crudity, being sometimes clear, sometimes clouded: towards the end, upon a favourable crisis, it becomes thick, but does not always deposite a sediment.

If the sick lie warm, and have had no preceding flux, the body is generally bound; but when they lie cold, as they often do in field-hospitals, the pores of the skin being shut, a *diarrhœa* is a common symptom, but is not critical. In the worst cases a flux appears in the last stage; then the stools are involuntary, colliquative, ichorous, or bloody, and have a cadaverous smell; the effects of a mortification of the bowels, and the sign of approaching death. When the hospitals are filled with dysenteric patients, some of the nurses will be infected with the flux only, and others with this fever, ending in these bloody and gangrenous stools.

In the beginning the heat is moderate; even in the advanced state, on first touching the skin, it seems inconsiderable; but upon feeling the pulse for some time, I have been sensible of an uncommon ardour, leaving an unpleasant sensa-

tion on my fingers for a few minutes after *. The first time I observed this, I referred it to the force of imagination, but I was assured of the reality by repeated experiments, and by the testimony of others, who, without knowing of my observation, had made the same remark. A day or two before death, if care be not taken, the extremities become cold, and the pulse is then hardly to be felt.

The skin is generally dry and parched, though sometimes there are shorter or longer sweats, especially in the beginning. Such as are produced by medicine are of no use, except on the first attack, at which time they will often remove the fever; but such as are natural are never critical till the distemper begins to decline. These last are rarely profuse, but gentle, continued, and equally diffused over the body: sometimes the disease will terminate by an almost imperceptible moisture of the skin. The sweats are usually fetid, and even offensive to the patient himself.

The tongue is mostly dry, and without constant care of the nurse becomes hard and brown, with deep chops: but this symptom is common to most

* GALEN, describing those he calls *putrid fevers*, makes the same remark about the heat, which LACUNA thus expresses; *Februm, quæ a putredine oriuntur, maximum indicium est mordacitas et acrimonia caloris, quæ perinde ac fumus nares et oculos, sic ipsa erodere tactum videtur. — Non statim ea qualitas, admota manu, discernitur, at per moram prædicta caliditatis species effertur ex penitioribus partibus.* Epit. GALEN. de Differ. Febr. lib. i. cap. vii.

fevers. At other times, though rarely, the tongue will be soft and moist to the last, but with a mixture of a greenish or yellowish colour. The thirst is sometimes great but more frequently moderate. In the advanced state the breath is offensive, and a blackish furring gathers about the roots of the teeth.

Some are never delirious, but all lie under a *stupor* or confusion. Few retain their senses till death; many lose them early, and from two causes; either from immoderate bleeding, or the premature use of warm and spirituous medicines. They rarely sleep, and unless delirious have more of a dejected and thoughtful look, than what is commonly seen in other fevers. The face is late in acquiring either a ghastly-, or a very morbid appearance; yet the eyes are always muddy, and generally the white is of a reddish cast, as if inflamed. The confusion of the head often rises to a *delirium*, especially at night; but unless by an unseasonable hot *regimen*, it seldom turns to rage, or to those high flights of imagination frequent in other fevers. When the *delirium* comes to that height, the face is flushed, the eyes are red, the voice is quick, and the patient struggles to get up. But when that symptom is owing to large evacuations, or only to the advanced state of the disease, the face appears meagre, the eye-lids in slumbers are only half shut, and the voice, which is commonly slow and low, sinks to a degree scarce to be heard. From
the

the beginning there is generally a great dejection of mind, and a failure of strength.

A *tremor* of the hands is more common than a starting of the tendons; or if the *subfultus* occurs, it is in a lesser degree than in many other fevers. In every stage of the disease, as the pulse sinks, the *delirium* and *tremor* increase; and in proportion as the pulse rises, the head and spirits are relieved. Sometimes in the beginning, but for the most part in the advanced state, the patient grows dull of hearing, and at last almost deaf.

When the fever is protracted, with a slow and low voice, the sick have a particular craving for something cordial; and nothing is so acceptable and so cordial as wine. They long for no food, yet willingly take a little panada if wine be added. But such as are delirious, with a quick voice, wild looks, a *subfultus tendinum*, or violent actions, though their pulse be sunk, yet bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and sickness at the stomach, though usual symptoms, are not essential to the disease; nor are pleuritic stitches, difficulty in breathing, or flying pains to be referred so much to it, as to the constitution of the patient, or to a preceding cold.

There is a certain eruption, which is the frequent, but not inseparable attendant of this fever.

This

This is a petechial efflorescence*, which is sometimes of a brighter, or paler red, at other times of a livid colour, but never rises above the skin †. The spots are small, but generally so confluent, that at a little distance the skin appears only somewhat redder than ordinary, as if the colour were uniform; but upon a nearer inspection there are interstices seen. For the most part this eruption is so little conspicuous, that unless looked for attentively it may escape notice. The spots appear thickest on the breast and the back, less on the legs and arms, and I do not remember to have observed any upon the face. I have sometimes seen them as early as the fourth, or fifth day, and at other times as late as the fourteenth. They are never critical, nor are they reckoned among the mortal symptoms, but only concur with other signs

* It is doubtful whether the ancients knew any thing of these spots, or of the fever which they accompany; but among the moderns, they were, so far as I know, first described by FRACASTORIUS, under the names of *Lenticulæ*, *Puncticula*, or *Peticulæ*; for by all these, both the fever and the spots were commonly called in his time. *Sunt et aliæ febres, quæ medicæ quodammodo sunt inter vere pestilentes et non pestilentes — quales illæ fuere quæ annis 1505. et 1528. in Italia primum apparuere, ætate nostra non prius notæ, certis vero regionibus familiares; ut Cypro, et vicinis insulis, majoribus etiam nostris cognitæ, vulgus Lenticulas, aut Puncticula appellat, quod maculas proferant lenticulis, aut puncturis pulicum similes. Quidam mutatis literis Peticulas dicunt.* FRACAST. de Morb. Contag. lib. ii. cap. vi.

† For this reason they are not to be referred to any of the *ecthymata* of the ancients, which denote pustules or eruptions higher than the skin, as in miliary fevers, with which this fever is not to be confounded.

to ascertain the nature of the disease. The nearer they approach to a purple, the more they are to be dreaded. In a few cases, instead of spots, I have observed purple streaks and blotches, which perhaps are still a worse symptom. The *petechiæ* will sometimes not appear till after death *; and we had a case in the hospital, in which, upon bleeding, these spots were seen on the arm, below the ligature, and no where else on the skin.

This fever, though accounted one of the continued kind, yet has generally some exacerbation at night, with a remission and often partial sweats in the day; and after a long continuance, it is apt to change into a hectic, or an intermitting form.

The length of the disease is uncertain: I have known it end either in death, or recovery, in seven days from the time the patient took to his bed; but in the hospitals it generally continued from fourteen to twenty †; and some died, or recovered, after four weeks. From the time of the sinking of the pulse until death, or a favourable crisis, there is perhaps less change to be seen from day to day in this, than in most other fevers. When its course

* A circumstance, with several others in this fever, incident to the plague. DIEMERBR. *de Peste, lib. iv. hist. v.*

† DR. CLEPHANE, one of the physicians of the army, observed that the most sensible change to the better was generally upon the 17th day, from the time the patient found himself so ill as to keep his bed. The common period of the fever is the more diligently to be attended to, as we seldom have a crisis before that time, excepting upon a relapse, and then I have observed the course to be commonly shorter.

is long, it sometimes terminates in suppurations of the parotid *, or axillary glands; and when these do not appear, it is probable that the fever is kept up by the formation of some internal abscess. Many after the crisis complain of a pain in their limbs and want of rest; and almost all of them mention great weakness, confusion in their head, *vertigo*, and a noise in their ears.

Having now related the most distinguishing marks of this fever, I shall only add, that there are sometimes slight degrees of it hardly to be described, and which can only be discovered in full hospitals, by observing the men to languish, though the nature of the illness, for which they came in, should seem to admit of a speedier cure. In such cases they have a whitish tongue, they complain of slight headaches, of want of appetite, and other inconsiderable feverish symptoms.

§ 3.

Of the prognostics.

MEN who have been weakened by distempers, or other accidents (as those who have undergone a salivation) are more susceptible of the

* The parotid glands themselves do not suppurate, but only some of the lymphatic glands that lie over them. I remember one instance of a swelling of this kind, on both sides, without any previous indisposition, when the person, not suspecting the cause, and applying discutient cataplasms, was, upon the tumours subsiding, seized with the hospital-fever. This happened to Mr. FORBES, surgeon to the second troop of horse-guards, then a mate in the hospital, when this fever was frequent in it.

infection,

infection, than the strong and vigorous, and run more risk. Those who are taken into crowded hospitals, ill of the small-pox, however good the sort may be, fall readily into this fever, and run more risk than others of dying of it. One who has recovered is not less subject to a relapse, than he was to the distemper at first; but it has not been observed, whether such as have had abscesses are as liable to relapse as others. The second fever is attended with double danger, seeing the patient has been so much weakened by the first. A sure sign of the corruption of the air in an hospital, is when many of the nurses fall sick.

We cannot draw a prognostic from any sign by itself, and perhaps all of them together are more fallible in this fever than in others. Generally the following are good: to have little *delirium*; the strength little impaired; turbid urine in the decline of the disease; and at that time, a gentle sweat or moisture diffused over the body; or even the skin soft, and the tongue moist; or to have some loose stools succeeded by a *diaphoresis*; the pulse to rise by wine or cordials, with an abatement of the *stupor*, *tremor*, and other affections of the brain. Deafness is rather a good sign. A sediment in the urine, without other changes to the better, is no sure mark of recovery; and some have recovered in whose water I had seen no sediment.

The bad signs are, a *subsultus tendinum*; the eyes much inflamed and staring; the speech quick, and the sound of the voice altered; a high *delirium*;
constant

constant watchfulness; constant sickness at the stomach, and vomitings; frequent stools with a sinking pulse, and the disorder of the head increased; coldness of the extremities; and a tremulous motion of the tongue. It is observed to be among the worst signs, when the patient complains of blindness; when he swallows with difficulty; or cannot put out his tongue when desired to do it; when he can lie on his back only, and pulls up his knees; or when insensible, he endeavours to uncover his breast; or makes frequent attempts to get out of bed, without assigning a reason. If to any of these, are added ichorous, cadaverous and involuntary stools, it is a sign of a mortification of the bowels and approaching death.

It will not seem strange to find most of these prognostics common to the advanced state of other fevers, when we consider, that from whatever cause fevers begin, by a long continuance the humours are corrupted, and the brain and nerves affected, much in the manner as in those which arise from infection.

§ 4.

Of the dissections.

THE bodies opened of those who died of the common hospital-fever, or of HOUGHTON'S regiment, which had the distemper from the jails, were in all ten. In some of them, all the cavities were opened; in others, either the brain alone was

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examined,

examined, or the bowels. These imperfections of this part I thought proper to mention, that the accounts here given might not be considered as complete, or prevent others from pursuing the inquiry further.

The most unexpected appearances were abscesses of the brain, of which therefore I shall take more particular notice. The first I saw of this kind was at Ghent; but the man being brought into the hospital from the barracks, no earlier than two days before he died, I could only conjecture from the symptoms, and the imperfect account I had of him, that his death was owing to a fever of this kind, after lingering near a month in it. I found about three ounces of purulent matter in the ventricles of his brain; and observed that the whole cortical and medullary substance was uncommonly flaccid and tender. Nay, some of the same kind of matter was found in the substance of the upper part of the *cerebellum*: yet this person, with some *stupor* and deafness, had his senses till the night before he died, so far at least, that he answered distinctly when roused and spoken to; but about that time the muscles of his face began to be convulsed.

Of two other instances of men who undoubtedly died of this fever, in one, the *cerebrum* was suppurated; in the other, the *cerebellum*. In the former case the patient was under a *stupor*, with deafness from the beginning, but was never delirious, nor altogether insensible. His pulse sunk early, and

about ten days before he died, his head began to swell, and continued very large till within two days of his death, when it subsided a little. For several days before his end, he would taste nothing but cold water; and during his illness he lay constantly on his right side. The head being opened, an abscess as large as an egg was found in the substance of the fore-part of the right hemisphere of the brain, full of thin matter like whey. At that time five more, ill of the same fever, had the like swelling of their heads, but recovered*. This extraordinary symptom I never observed before, nor since. In the other case, the abscess in the *cerebellum* was about the size of a small pigeon's egg, and contained also a thin ichorous matter; nor had this patient been ever so thoroughly insensible as not to answer reasonably when spoken to. Two days before he died, his urine turned pale. Both these bodies were opened by Mr. BREACH, apothecary in Southwark, then a mate in the hospital.

But suppurations in the brain were not constant; for another who died about this time, and had been ill about the same number of days, with the like symptoms, the pale water excepted, had no abscess either in the brain, or *cerebellum*. And two were opened afterwards, in whom the cortical substance of the brain had an inflammatory appearance, but no suppuration. In one of them, the large intestines

* This happened at Inverness, and all, or most of these men, were of HOUGHTON's regiment. See page 45 & 46.

were corrupted: that man went off with a looseness; and just before his death, he had a discharge of an ichorous matter from his nose. In the military hospital at Ipswich, one who unexpectedly died of this fever, after having been once in a fair way, had no suppuration in his brain. And about that time Dr. CLEPHANE informed me, that he had seen the head of another opened, who died after an abscess in each of the orbits; that he had found the brain flaccid, and about two ounces of a thin *serum* in the ventricles; but that neither of these two bodies had been further inspected.

I shall not enter into a description of other particulars in these dissections, though I have them written at length, as it may be sufficient from what has been said to draw the following conclusions.

That, as there is a visible tendency to putrefaction through the whole course of the illness, it generally terminates, when it proves fatal, either in an actual mortification of some part, or in an abscess of the brain, often ichorous. That the intestines more particularly are disposed to mortify; as few die without cadaverous and involuntary stools: and from an observation which we made, of the *petechiæ* not appearing till after death, it seems reasonable to conclude, that those spots are owing to a resolution and a corruption of the blood. The offensive sweats and smell of the body, before death, are a further argument for what is now advanced. And as to the abscesses, so often found
in

in the brain, the ichorous kind may be considered as a species of mortification proper to parts of that texture; and from the preceding cases, it seems probable that these suppurations are not rare occurrences in this fever*.

From the inflammatory appearance of the brain, without suppuration, we may account for the same remedies having sometimes opposite effects. For though in the advanced state wine and cordials are often the best medicines, yet there are some who cannot take them without increasing the *delirium*: such therefore have probably some more inflammation than usual about the brain.

The last observation which I shall make upon the dissections is, that the evident tendency of this fever to putrefaction reduces it to the pestilential class of diseases; as all of that kind are distinguished by a prostration of strength, sunk pulse, dejection of spirits, putrid sweats and stools, *petechiæ*, and other marks of corruption.

These are the inferences which we may reasonably draw from the examination of the bodies. But from thence to ascertain the first morbid cause, where the effects only are seen; or to account for

* From the numerous dissections of those who died of the last plague at Marseilles, it appeared that some of the *viscera* were always mortified and inflamed, and that the brain and lungs were most frequently affected in that manner. *Traité de la Peste, part. i.*

all the varieties of this fever, would be too great an attempt from such materials. Nor would it be just to propose our method of cure as deduced from the dissections of those who died, since the most successful part of it was taken from the observations of others, or from trials of my own, preceding most of the examinations of the bodies mentioned.

§ 5.

Of the cure.

IN the cure of this fever, as in others, I varied my method according to the state of the disease. Distinguishing it therefore into three states, in each I shall propose those remedies which from experience I found to be the best. Let us suppose the first to continue as long as the person is able to go about; the second, to begin with his confinement, when the fever is manifest, the head in some degree affected, but the pulse still full; and the third, when the pulse sinks, and a *stupor* comes on, with the other symptoms already described.

I. In the first state, as well as in all the rest, the fundamental part of the cure is to remove the patient out of the foul air. When that cannot be done, the room or ward is to be purified, by making a succession of air by means of fires, or letting it in by doors and windows, diffusing the steams of vinegar, or the like; for whatever medicines
are

are given while the corruption of the air continues, or indeed increases by the *effluvia* of the sick, there can be little hopes of recovery. Therefore in every stage, though the patient should breathe no other infectious air but that of his own atmosphere, it will be necessary, if the bed has curtains, to keep them open, and use all other means to procure a free ventilation. On the strict observation of this rule, the cure will much depend.

For the next article of prevention, I gave a vomit; and that night, after its operation, half a drachm of *theriaca* with ten grains of *sal cornu cervi*, and some draughts of vinegar-whey; and I repeated the same, without the emetic, the following evening. Sometimes I have used the sudorific alone; and by both methods I have seen those symptoms removed, which I apprehended to be the forerunners of this fever received by contagion.

I must not omit to observe, what may appear a minute circumstance, that, as the prevention depended so much upon a free *diaphoresis*, I found it conducive to that end, especially with the less cleanly sort, to have their feet and hands washed with warm vinegar and water. After sweating, if the patient was to remain in the foul air, I used as a preservative a decoction of the Bark and Snake-root, which I shall treat of afterwards.

II. But in the second state, when the fever was manifest, if the pulse was full, I generally took

away some blood, if that had not been done before. When the symptoms run high, a plentiful evacuation of that kind seemed indicated, yet I observed, that large bleedings generally did harm, by sinking the pulse and affecting the head. Nor was a moderate bleeding to be repeated without caution: for as several circumstances here were different from those of common fevers, so experience shewed, that even those whose blood was fizy, unless their lungs were inflamed, were the worse for a second bleeding. If the head only suffered, I judged it safer to bleed by leeches at the temples, than to open a vein in the arm. But in the *delirium*, with a sunk pulse, even leeches did no good, sometimes, I imagined, were hurtful, and therefore phlebotomy was not to be tried. Many recovered without letting blood, but few who lost much of it.

Vomits are also to be cautiously used. Before the disease was formed, I recommended one for prevention; and even if the stomach was foul, as is usual in autumn, an emetic was believed to be proper in the beginning of the second period also, in order to relieve that organ, and dispose to perspiration. In autumn 1757. when our troops returned from the expedition to the Rade de Basque, several of the soldiers were brought into the hospital, at Portsmouth, with a disorder compounded of the autumnal- and jail-fever. For when those men, upon being seized with the common fever of the season, were confined to the holds of the
crowded

crowded transports, their distemper assumed that form. All such as were not in the lowest state, but complained of a headach, costiveness, and a disorder at their stomach, I first bled, then purged; and afterwards, proceeding in the manner described in the cure of the autumnal-fevers *, I gave them twice a day a grain of emetic tartar, which commonly not only puked, and opened the body, but the pores of the skin also. Those who were treated in this manner recovered. But in the advanced state of the hospital-fever, when the patient had all along complained of a sickness at his stomach, I judged emetics to be unsafe, from having, in two instances, seen the disease take suddenly a worse turn, when in that circumstance I had ordered a vomit of ipecacuanha. Nor can I recommend any other method, sufficiently ascertained by my experience, for this symptom. But in other fevers, which I have treated since, and which by a constant *nausea* shewed some similarity to this, I have frequently been able to conquer that complaint, by prescribing the saline draughts of RIVERIUS † in the act of effervescence, but repeated oftener than what is commonly practised by others. This is my *formula* :

R *Salis*

* Page 201 et seq.

† *Huic symptomati (scil. vomitui) gravissimo statim medetur, quasi miraculo, sal absinthii ad ʒi. in succi limonum recentis cochleari exhibitum, ut experientia didici. RIVER. in cap. de Feb. Pestilent.* The manner in which this operates may perhaps be deduced from the Append. paper vii exp. xlv. I find the quantity of a drachm of the salt, in RIVERIUS'S draught,

℞ *Salis absinthii* Div. *sacchari albi* ℥ij. *solve ex aquæ puræ* ℥iv. *et admisce aquæ cinnamoni simplicis* ℥ij. *Dentur omni hora cochlearia* iij. *cum cochleari uno succi limonum, donec æger nauseare desierit.*

Previously to this medicine, I have sometimes made the patient clear his stomach by drinking some camomile-tea; at other times, I have omitted that infusion; but, when costive, I have usually begun with a laxative clyster, and caused it to be repeated every day, or frequently, if the patient had not otherwise stools.

My next care was to promote a perspiration, which, in this state of the fever, was only attempted by the cooler diaphoretics; and for that purpose the *spiritus Mindereri* was chiefly used. But at this time

draught, marked in two editions of the original; but which must be a typographical error for a scruple, if the author meant there should be no more salt than is sufficient to saturate the acid; and if the salt which he used was of the same strength with ours. This last circumstance however may be doubted, considering that formerly the *sal absinthii* was frequently prepared with sulphur, and by means of the acid there, it became a much weaker alkali than that which is now kept in the shops. In those days recourse was had to this salt, in several disorders of the stomach, from a notion that it possessed the virtues of the original plant; and the acid seems chiefly to have been added, to make it more grateful to the stomach. But now we find that the lixivial salt of every plant will answer as well as that of wormwood, and that the lemon-juice, or some other acid, is necessary for producing an effervescence, with an evolution of some fixed air, upon which the virtue of that medicine so much depends. See *Append. paper vii. exp. xlii.*

of the disease, the morbidic cause was generally too much fixed, to be expelled by the pores of the skin; and therefore unless a sweat came easily, and with relief to the patient, it was never insisted on; nay, if voluntary and profuse, with a low and quick pulse, I thought proper to check it. Then the fever began to elude the force of blisters, alexipharmacs, and sudorifics, until the usual time of its decline. Of this I have seen many instances, but shall only mention one. Mr. ANNESLY, one of the mates, was seized with the hospital-fever, and after being confined to his bed, for four or five days, and blistered, he took several doses of musk, of five and twenty grains each, which opened his body, raised his pulse, and brought out a thorough sweat; yet the fever continued till about the seventeenth day, and then went off with a gentle moisture of the skin, and turbid urine.

As soon therefore as the fever was confirmed, I used such medicines only as were recommended above in the cure of inflammatory fevers*, *viz.* the contrayerva-powder with nitre and camphire, and barley-water acidulated with vinegar.

Although costiveness was prevented by clysters (lest an accumulation of the *feces* should prove a new *fomes* of corruption) yet a looseness was not encouraged, on account of the great weakness attending the disease.

* Part iii. ch. i.

About this time I have used blisters, but without success. Nay, upon the first attack the whole head has been blistered, and the oozing kept up for some days; but without relieving the brain, or preventing any of the usual symptoms.

III. I come now to the third and longest state, in which the pulse sinks, the *stupor* is great, a *delirium* is threatened, and *petechiæ* often appear. This change begins in three or four days after the fever is formed, often later, according to the treatment and other circumstances. But, what is observable, if the patient had been once or twice largely bled, on the first symptoms, he would sometimes pass over the second stage, and from a condition little removed from health, his pulse would be apt to sink, and he suddenly become delirious. Now, whether this change was occasioned by misconduct, or came in the course of the disease, I found it necessary to vary my method, and to have for my principal intention the support of the *vis vitæ*, especially towards the decline of the fever; but which could not be answered without some warmer medicines, than those which have yet been mentioned. Therefore as soon as the pulse began to sink, and the urine to turn pale, I left out the nitre in the diaphoretic powders*, and substituted 10 grains of the Virginian Snake-root.

Sometimes I have given a plain decoction of that root, adding a small quantity of some spirituous

* Part iii. ch. i.

liquor;

liquor; at other times I have prescribed the same in substance, from two scruples to a drachm every day, and with good effects; but at last an accident was the occasion of my adding the Bark. A man ill of this fever, with petechial spots, having a blister applied to his back, the part began to mortify; but a strong decoction of the Bark, together with some of the tincture, being given, and continued for some days, with the usual cordials, a suppuration came on, and the case took so favourable a turn, that there was little doubt of the patient's recovery; till nauseating the medicine he left it off, and then the gangrene recurring he died. From this case however, I was induced to join the Bark to the Snake-root in the advanced and sunk state of the fever. The first nine recovered who took this compound decoction, though four of them had the *petechiæ*; and of thirty-nine cases, which were under my care during that season, I lost only four. But it will be just to add, that the places in which the sick then lay were uncommonly well aired, and that the fever was not attended with such bad symptoms as I have seen at other times. For at Ipswich, where the kind was worse, and where the air was so much vitiated in the hospital, that most of the nurses were infected, as well as the men who were admitted for other distempers, I imagine, for I kept no exact account, that I might lose about double that proportion.

When I joined the Bark to the *serpentaria* in ordinary cases, I began with a much smaller proportion
of

of the former, than what I had used for the gangrene, intending to increase it by degrees; but finding the lesser quantity answer so well, I seldom altered it. This is my receipt:

℞ *Corticis Peruviani in pulverem contriti* ℥ij. *coque ex aquæ fontanæ* ℥xvj. *ad* ℥vij. *adjectis sub finem coctionis radicis serpentariæ Virginianæ contusæ* ℥ij. *stent per horam, dein colaturæ admisce aquæ alexeteriæ spirituosæ cum aceto* ℥ij. *sacchari albi* ℥ß.

Of this, my dose was four spoonfuls every six hours; but if the patient seemed to be heated, he took only three. If he was lower than usual, I ordered the larger quantity once in four hours; thus giving the decoction at shorter or longer intervals according to the circumstances: sometimes I have lessened the proportion of the *serpentaria*, and the strong water, when I imagined they might be too heating.

In one case, the fever terminated in an abscess upon one of the parotid glands, which was opened and healed during the use of the same medicine.

Besides this, I found it sometimes proper to give a volatile cordial, in this manner:

℞ *Aquæ fontanæ* ℥vj. *aquæ nucis moschatæ* ℥j. *confectionis cardiacæ* ℥iß. *salis cornu cervi* ℥ß. *syrupi croci* ℥ß *misce.*

Dentur subinde in languoribus cochlearia ij. *vel* iij.

This quantity was commonly consumed in 24 hours. But in cases out of the hospital, and where
wine

wine was to be had in plenty, I either omitted this mixture, or used it more sparingly. In general it agreed well with the low state of these fevers; and in great sinkings, which either came after unseasonable bleedings, or long want of nourishment, it was, next to wine; the best resource. For as a grateful and efficacious cordial at this time, there was nothing comparable to wine, of which the common men had an allowance from a quarter to half a pint in a day, of a strong kind, made into whey, or added to the panada, which was their only food. But to others out of the hospital, I usually prescribed Rhenish, or a small French wine, whereof some have consumed near a quart a day, and part of that undiluted. And indeed so great is the virtue of wine in this stage of the fever, that I have known several recover from the lowest condition, when refusing the decoction, on account of its taste, they took nothing but a little panada with wine, and the volatile mixture, every two or three hours by turns. Perhaps there is no rule more necessary in this state, than not to let the patient, when low, remain long without taking something cordial or nourishing; as I have seen men, once in a promising condition, sunk past recovery, by being suffered to pass a whole night without any support, about the time of the crisis. In the advanced state of this fever, the sick are remarkably low; and therefore FREDERIC HOFFMAN advises, in such cases, that they should be kept constantly in bed, and not permitted even to sit up in it. In the last stage of
this

this fever, as well as in that of the sea-scurvy, it should seem, as if the force of the heart were too small to convey the blood to the brain, except when the body is in an horizontal posture*.

But however necessary wine, and the decoction above mentioned, are in the low state of the fever, we are to remember, that throughout this long stage, these remedies are to be administered only as antiseptics, and supporters of the *vis vitæ*; without aiming at thoroughly raising the pulse, or thoroughly relieving the head, or at forcing a sweat by them, before nature points that way; and which I have seldom seen happen before the fourteenth day. For though the patient may die before that period, if he has been largely bled, or if the cordial medicines have been given him too freely, yet such means as I have used have not been powerful enough to bring on a crisis sooner.

We have seen how inseparable a *stupor* was from this fever, particularly in its low state, and how apt the *stupor* was to turn to a slight *delirium* in the evening. If this was all, as being in the common course, nothing was done. But if the *delirium* increased upon using wine, if the eyes looked wild, or the voice became quick, there was reason to apprehend a *phrenitis*; and accordingly I have often observed, that at such times all internal heating medicines aggravated the symptoms;

* See the description of the sea-scurvy in Lord ANSON'S Voyage.

whilst blisters, before usefess, became then of service: in those circumstances therefore, I began to order them, as in the inflammatory fevers. I have had no opportunity of trying, in the *delirium* of this distemper, the fomentations of warm water and vinegar for the feet, which since the war I found efficacious in other fevers*; but I am inclined to believe, that in this case also, they would answer better than either sinapisms or blisters, provided they were long enough and often enough applied: In the inflammatory fevers, I have known those fomentations have little effect for the first hour, and yet succeed afterwards. For internal medicine, I omitted the decoction for some time, but continued the acid drink †, and gave camphire with the *pulvis contrayervæ compositus* and nitre, as before. If the *delirium* was with a slow voice, and without violent motions, the decoction and wine were given, without any other medicine; for in no instance was this symptom quite removed until the usual time of the crisis. I have observed before, that a *delirium* would arise from two opposite errors; one, from large and repeated bleedings; and the other, from wine and the cordial medicines being taken too early. It appears therefore how nice the principles are that regard the cure: thus neither a hot, nor a cool regimen, will answer with every patient, nor in every state of the disease.

If a *diarrhœa* came on in the decline of the fever, it was moderated (and not suppressed) by adding

* Part iii. ch. ii. § 1. † *Viz.* Barley-water with vinegar.

a few drops of the *tinctura Thebaïca* to the full quantity of the alexipharmac decoction; or by giving some spoonfuls of the chalk-julep with opium, mentioned before*. For though the looseness may be considered as critical, yet as the sick are too low to bear great evacuations, it must in some measure be restrained; and I have often observed, that when it has been treated in this manner, about the usual time of the crisis, the patient has fallen into a gentle sweat, which has carried off the disease. In the worst cases of this fever, and especially when it coincides with the dysentery, the stools are frequently bloody; in which dangerous state, if any thing could be done, it was attempted by the same medicines. In proportion to the putrid nature of the stools, opiates and astringents were used with the greater caution.

We shall next consider the state of the patient after the fever had ceased, or changed into another form. If the disease terminated in a suppuration upon one of the parotid glands (for the gland itself does not suppurate) we opened the abscess, without waiting for a fluctuation, which might never happen; the *pus* being often here so viscid, that after it was ripe, the part felt nearly as hard as if the suppuration had not begun †.

Almost

* Page 207. In order to check the purging and promote a *diaphoresis*, I should now prefer the bolus of theriaca with ipecacuanha, likewise mentioned in that page.

† This may be the reason why these tumours have not always proved critical. For RIVERIUS, after the swelling of the glands, was obliged to make other evacuations; perhaps
from

Almost every patient, after the fever, complained of want of rest, frequently of a *vertigo*, or confusion of the head, of a continuation of the deafness, or of other symptoms which are commonly called *nervous*. I then gave an opiate at night, and in the day some strengthening medicines, such as the Bark, and the elixir of vitriol. I found that in those cases the Bark was not only the best strengthener, but the surest preservative against a return of the fever. For this last intention, I ordered the convalescent about three drachms a day, for six or seven days together; and afterwards, if he remained longer in the hospital, some smaller quantity daily. When the pulse was slow, a few grains of *asa fetida*, taken twice a day, have had a good effect. But if there was any appearance of a hectic fever, from an inward abscess, the case was treated accordingly. Upon comparing some of the remaining symptoms of those who recovered, with the condition of the brain in such as died, and were opened, I have been induced to think, that some part even of that substance might suppurate, and yet the person recover.

Sometimes the patient falls into an irregular intermittent, which, if not of a hectic nature from an internal abscess, may proceed from neglecting from not making timely incisions. *Vid. cap de Feb. Pestilent.* Mr. GIRLE, formerly surgeon at St. Thomas's, observed to me, that such critical tumours, after fevers, were not to be ripened by poultices of bread and milk (which by growing cold are more apt to repel them) but by some of the warm gum-plasters.

to clear the *primæ viæ*. For it is easy to conceive, that after a long fever of so putrid a nature, often attended with a languor of the bowels, the *feces* may be so much accumulated, and so corrupted, as to occasion new disorders. In such circumstances, after proper evacuation by a purge, the Bark was almost a sure remedy.

§ 6.

Of the nature and causes of the jail- or hospital-fever, and pestilential fevers in general.

IT is evident from the preceding account, that this distemper is of a truly pestilential nature; as appears from the manner in which the head is affected, from the dejection of the spirits, debility, sunk pulse, the suppuration on the lymphatic glands, the putrid sweats, petechial spots, mortifications, and contagion. For though all these symptoms may not be found together in one person, yet they are common to the disease; and it is well known that in the plague itself the symptoms are various, according to the degree of virulence, and the constitution of the person infected. I shall not here enter upon the distinction to be made between a pestilential fever and the true plague; the ancients are not clear upon this head, and those of the moderns who contend for a real difference, have not been able so to ascertain it as to end the dispute. I shall therefore only remark, that though the jail- and hospital-fever may differ *in specie* from the plague, yet it must at least be accounted of the same *genus*, as it proceeds from a similar cause, and is attended

with the like symptoms. At Constantinople, as I am informed by Dr. MURDOCK MACKENZIE, who resided there thirty years, their annual pestilential fever, which so much resembles that of our jails and crowded hospitals, is only called the *plague* when attended with buboes and carbuncles: and this perhaps may be the best distinction.

These fevers have been generally called *malignant*, and I myself, in the former editions of these Observations, have frequently used that term; but upon further consideration I have thought proper to drop it, as an expression which is often abused, and which never conveys any precise idea of a disease.

The pestilential fevers are various, according to the kind and quantity of the virulent *miasma* received into the blood; but all seem to depend upon some internal, or external *fomes* of corruption, whether owing to a putrid habit, or to exhalations from corrupted animal, or vegetable substances. I shall first treat of the remote and external causes, and next of the internal.

I. The hospital- and jail-fever are to be considered as the same disease, and little if at all different from that which has arisen after battles, when the bodies of the slain have been left unburied to rot upon the field. This GALEN notes as one of the causes of pestilential fevers*, and is supported by the testimony of other authors, in particular by Fo-

* Epit. GALEN, De Feb. Differ. lib. i. cap. iv.

RESTUS, who was eye-witness to a distemper of this kind (which indeed he calls a *plague*) owing to the same cause, attended with buboes and a high degree of contagion *. The same author also gives an account of a malignant fever breaking out at Egmont in North-Holland, occasioned by the rotting of a whale, which had been left upon the shore †. We have a like observation of a fever affecting the crew of a French ship, upon the putrefaction of some cattle, which they had killed in the island of Nevis in the West-Indies ‡. Those men were seized with a pain in their head and loins, great weakness, and a disorder of the stomach, accompanied with a fever; some had carbuncles; and on others, purple spots appeared after death ‡.

GALEN assigns two causes for pestilential fevers: 1. the great heat of the weather, when the humours happen to be in a more putrescent state than usual; 2. and most frequently, a putrid state of the air, arising either from a multitude of dead bodies left unburnt, as after a battle, or from the evaporation of corrupted lakes and marshes ||.

One of the most remarkable diseases incident to an army is recorded by DIODORUS, the historian §, which broke out among the Carthaginians

* Observat. lib. vi. obs. xxvi.

† Obs. ix. *schol.* PARAEUS observes, that in his time the like happened on the coast of Tuscany. *De Peste, cap. iii.*

‡ *Traité de la Peste.*

|| *De Feb. Differ. lib. i. cap. iv.*

§ *Biblioth. Hist. lib. xiv. cap. lxx. lxxi.*

at the siege of Syracuse. That author not only relates some of its most distinguishing symptoms, but reasons well about its cause. He observes, that pains in the back, and eruptions, * were common; that some had bloody stools; that others were suddenly seized with a *delirium*, so as to run about and beat all that came in their way †; that the physicians knew no cure; and that it was the more fatal as the sick were abandoned by every body, on account of the contagion. As to the cause, the author takes notice of the multitude of people confined within a narrow compass; of the situation of the camp in a low and wet ground; of the scorching heats in the middle of the day, succeeded by the cold and damp air from the marshes in the night-time ‡: he adds, the putrid steams arising first from the marshes, and afterwards from the bodies of those who lay unburied. This distemper seems to have been a compound of a marsh- and pestilential fever,

I observed that I had found the first full account of pestilential fevers, attended with *petechiæ*, in FRACASTORIUS. One of those appeared in the year 1505. another, three and twenty years after, and both in Italy. That author omits the cause of

* In the original, *φλύκταιναι*.

† This circumstance of a sudden *delirium* agrees with what was mentioned in the description of the marsh-fever, in the cantonments near Bois-le-duc. *Part. iii. chap. iv. § 2.*

‡ This is said to be the principal cause of the destructive camp-diseases in Hungary. *See p. 188, 189.*

the former; but the latter he imputes to an extraordinary inundation of the Po, which happening in the spring left marshes, and those corrupting, infected the air throughout the summer.

FORESTUS remarks, that from the putrefaction of the water only, the city of Delft, where he practised, was scarce ten years together free from the plague, or some pestilential distemper*. In the year 1694. a fever broke out at Rochfort in France, which, on account of the uncommon symptoms and great mortality, was at first believed to be the plague †. But M. CHIRAC, who was sent by the court to inquire into its nature, found the cause to arise from some marshes that had been made by an inundation of the sea; and observed, that the corrupted steams, which smelled like gun-powder, were carried to the town by the wind, that had long blown from that quarter. About two thirds of those who were taken ill died ‡. This fever raged in June, July and August, and then ended upon a great fall of rain, which purified the air, and refreshed the stagnating water.

* *Observat. lib vi.* He adds, that the magistrates, upon his representation of the cause, erected a wind-mill for moving and refreshing the water. At that time Holland was more liable to inundations, and to the stagnation of water, than at present.

† *Traité des Fievres Malignes. Oeuvres Posthumes de M. CHIRAC. Eloge de M. CHIRAC par M. de FONTENELLE.*

‡ In those who were opened, the brain was found either inflamed, or loaded with blood; the fibres of the body were uncommonly tender; and the bowels had either suppurated or were mortified.

I might

I might adduce many instances of such fevers (occasioned by the putrid *effluvia* of marshes) from other authors; but as these already mentioned seem sufficient to prove what has been advanced, I shall observe upon the whole, that the autumnal remitting, and intermitting fever, of low and wet countries, when at the worst, may be considered as another species of the pestilence, since they have been seen with all the virulent symptoms peculiar to that class of diseases*.

In general it may be remarked, that the putrefaction of animal or vegetable substances, in a dry air, is most apt to produce a bad fever of a more continued form; whereas putrid *effluvia*, in a moist atmosphere, have a greater tendency to bring on paroxysms and remissions. But the steams of corrupted blood seem to dispose more to a flux, than to any other disorder; for though some will be seized with the hospital-fever by the contagion of bloody stools, yet I have observed, that for the most part that infection occasioned the dysentery †.

From this view of the causes of these fevers *mali moris*, it is easy to conceive how incident they must be, not only to all marshy countries after hot seasons, but to all populous cities, low and ill aired; unprovided with common sewers; or where the streets are narrow and foul; or the houses small and dirty; where fresh water is scarce; where jails and hospitals are crowded, and not ventilated, or kept clean; when in sickly times the burials are within the

* Part iii. ch. iv. § 2, 3.

† Part iii. ch. vi. § 3.

walls *, and the bodies not laid deep; when slaughter-houses are likewise within the walls; or when dead animals and offals are left to rot in the kennels, or on dunghills; when drains are not provided to carry off any large body of stagnating or corrupted water in the neighbourhood; when flesh meats make the greatest part of the diet, without a proper mixture of bread, greens, wine or other fermented liquors; when the grain is old and mouldy, or has been damaged by a wet season; but above all, when houses once infected have not been sufficiently purified. I say, in proportion to the number of these or the like causes concurring, a city will be more or less subject to pestilential fevers, or to receive the leaven of a true plague, when brought into it by any merchandize. I shall add a few instances to confirm these observations.

Constantinople is not only liable to returns of a raging plague, but to an almost annual pestilential fever, which may be considered as the endemic of that place †. But that this is not owing to the air and climate, appears from its healthful state during the Greek empire, and from observing that even now such as live in the suburbs, shut themselves up, or keep out of the way of infection, are secure. Nor is the cause to be referred to the number of inhabitants, nor to the foulness of the place; since many cities are as much crowded,

* SCRETA de Feb. Castrens. Malign.

† See TIMONI's account of the plague at Constantinople. *Phil. Transf.* n. 364. and Dr. Mackenzie's account, *ibid.* vol. XLVII. art. 63. and 87.

and less cleanly, yet keep free from any pestilence: add, that the foreigners are less subject to the sickness than the Turks themselves*. It should seem therefore, as if this calamity were owing to something peculiar to the religion of that people. For besides that pestilential distempers are frequent in all the cities of the Levant, they prevail in Egypt, as their source †, where the inundations are not solely to be blamed, as that country is known to have been more healthful before it became Mahometan. And in Sennar, where Mahometanism is likewise professed, pestilential fevers are frequent; though they seldom visit Abyssinia, which borders on that kingdom, and is hotter, but where the inhabitants are Christians ‡. Now the Turks abstain from wine and all fermented liquors, the great antidotes to putrefaction||; they indulge in warm bathing§; and maintain the principle of fatalism, which hinders the people from avoiding infection, and

* Although TIMONI observes that strangers in general run a greater hazard than the citizens, yet he adds, *Armeni omnium nationum minime ad pestem sunt dispositi: observo illos paucissimis uti carnibus, cepis, porris, alliis, vinoque maxime utuntur.*

† MACKENZIE, loc. cit.

‡ Lettres Edifiantes et Curieuses, recueil iv.

|| We have the following singular observation in FORESTUS, on occasion of a pestilential fever that raged in his time: *Quicumque aquam ob ingentem calorem febrilem bibissent (ut villicus quidam, ad quem curandum alio morbo affectum, accitus essem, mihi narravit) correpti intra duos dies moriebantur. Qui vero cerevisiam bibebant, utpote potum magis huic nostræ regioni consuetum, iis morbus protrahebatur.* Dr. ROGERS observes that “such as riot on animal food, and drink water only, are subject to putrid and slow fevers.”

§ CELSUS forbids bathing in time of the *pestilentia*; that is, as was shewn before, during the season in which the marsh-fevers prevail. *De Med. lib. i. cap. x.*

the

the state from ordering quarantines, and making other regulations, for preventing the importation of the plague, by their commerce with Egypt and other places infected. And from the same mistaken principle, omitting to purify their houses after a contagion, the Turks are liable to a fresh attack, from the seeds of the distemper, as soon as the season and state of the air begin to favour its reproduction.

In the account of the epidemic malignant fever of Cork, in the year 1731. we find the cause ascribed by the author to a concurrence of these circumstances; the moisture of the air; the impurity of the water; the infection of an uncommon number of slaughter-houses; the offals left to corrupt in the streets; and the immoderate quantity of flesh-meats, eaten by the poorest people, without bread or fermented liquors, during the victualling season*.

FORESTUS informs us of a pestilential fever, which raged at Venice in his time, produced by the corruption of a small kind of fish in that part of the Adriatic †. And the same author quotes MONTANUS for a description of the pestilential endemic fever at Famagusta, in Cyprus, arising in summer from the corruption of a lake in the neigh-

* See Dr. ROGERS'S Essay on Epidemic Diseases. In this book we have a full account of the rise of a petechial fever, and small-pox, arising from a putrefaction in the air, peculiar to the city of Cork, from August to January. That place is noted for the great number of cattle killed for the use of the shipping, which is said to amount to above 120,000 head in the year.

† Observat. lib. vi. obs. ix. schol.

bourhood of that town. This very distemper we find taken notice of by FRACASTORIUS, and allowed to be the same with what he calls the *lenticulæ* or *puncticula*, since known by the name of the petechial fever.

History abounds with examples of pestilential fevers added to the other miseries of a siege; nay there is scarce any instance of a town being long invested, without some distemper of this kind. Sometimes it may be owing to the filth of a place, crowded with people and cattle brought in for shelter, as it formerly happened both at Athens * and at Rome †; at other times, the sickness has been occasioned by corrupted grain ‡, and by meats long salted becoming putrid.

Although the putrefaction of vegetables is not so noxious as that of animals, yet it is not without bad effects; for vegetables rotting in a close place yield a cadaverous smell; and we have instances of fevers occasioned by the *effluvia* of putrid cabbages §, as well as of plants in marshes. FORESTUS imputes the plague at Delft, in the year 1557. to the eating of mouldy grain, which had been long kept up by the merchants in a time of scarcity ||. And I have heard it observed, that in this island the dysentery is frequent

* DIODOR. Biblioth. Hist. lib. xii. cap. xlv.

† TIT. LIV. anno U. C. ccxci.

‡ CÆSAR de Bell. Civ. lib. ii. in his account of the siege of *Marseilles*.

§ DR. ROGERS'S Essay on Epidemic Diseases, p. 41.

|| Observat. lib. vi. obs. ix.

among

among the common people, in those parts where they live mostly on grain, when the preceding crop has been damaged in a rainy season, or kept in damp granaries.

Jails have been often the cause of pestilential fevers; and perhaps oftener in this country than has been attended to. Lord BACON makes the following observation: “The most pernicious infection; next the plague, is the smell of the jail, when the prisoners have been long, and close and nastily kept; whereof we have had in our time experience twice or thrice, when both the judges that sat upon the jail *, and numbers of those who attended the business, or were present, sickened upon it and died. Therefore it were good wisdom that in such cases the jail were aired before they be brought forth †.” It is probable that one of the times, pointed at by this noble author, was at the fatal assizes held in the year 1577. of which we have a more particular account in STOWE’S Chronicle, in these words: “On the 4th, 5th and 6th days of July were the assizes held at Oxon, where was arraigned and condemned ROWLAND JENKINS for a seditious tongue; at which time there arose amidst the people such a damp ‡, that almost all were smothered. Very few escaped that were not taken.....

* That is, upon the prisoners from the jail.

† Nat. Hist. exp. DCCCCXIV.

‡ *A damp*, an old expression (still retained by the miners) signifying *bad air*.

“ Here died in Oxon three hundred persons ; and
 “ sickened there, but died in other places, two
 “ hundred and odd *.”

Of the same kind of infection, we have an unhappy instance so fresh in our memory, that I needed not to have mentioned it here, had it not been to inform such as live at a distance, or those who are to come after us. In the year 1750. on the 11th of May, the sessions began at the Old-Bailey, and continued for some days ; in which time there were more criminals tried, and a greater multitude was present in the court than usual. The hall in the Old-Bailey was a room of only about 30 feet square. Now, whether the air was most tainted from the bar by some of the prisoners, then ill of the jail-distemper, or by the general uncleanness of such persons, is uncertain † ; but it is probable that both causes concurred. And we may easily conceive, how much the air might have been vitiated by the foul steams of the Bail dock, and of the two rooms opening into the court, in which the prisoners were the whole day crowded together till they were brought out to be tried ‡. It appeared afterwards

* This account is confirmed by CAMDEN. *Annal. Elizabeth.*

† It has been the custom, some days before every sessions, to remove all the malefactors from the other jails into that of Newgate, already too much crowded. At such times three hundred have been confined within that narrow space ; and it is well known how nastily both this and other prisons here are kept.

‡ I have been informed that at those sessions about a hundred were tried, who were all kept in those close places as long as the court sat ; and that each room was but 14 feet by 11, and

afterwards that those places had not been cleaned for some years. The poisonous quality of the air was aggravated by the heat and closeness of the court, and by the perspirable matter of a number of people of all sorts, penned up for the most part of the day, without breathing the free air, or receiving any refreshment. The bench consisted of six persons *, whereof four died, together with two, or three of the counsel, one of the under-sheriffs, several of the Middlesex-jury, and others

and 7 feet high. The Bail-dock was also a small room taken off one of the corners of the court, and left open at the top; in this, during the trials, were put some of the malefactors who have been under the closest confinement.

* *Viz.* the Lord Mayor, three of the Judges, one of the Aldermen, and the Recorder. Of these died, Sir SAMUEL PENNANT, Lord Mayor; Sir THOMAS ABNEY and Baron CLARKE, Judges; and Sir DANIEL LAMBERT, Alderman. It was remarkable that the Lord Chief Justice and the Recorder, who sat on the Lord Mayor's right hand, escaped, whilst he himself, with the rest of the bench on his left, were seized with the infection; that the Middlesex-jury, on the left side of the court, lost many, whilst the London-jury, opposite to them, received no harm; and that of the whole multitude, but one or two, or, at most, a small number of those who were on the Lord Mayor's right hand, were taken ill. Some unacquainted with the dangerous nature of putrid *effluvia*, have ascribed both this circumstance and the sickness, in general, to a cold taken by opening a window; by which a stream of air was directed to the side of the court on the Lord Mayor's left hand. But it is to be observed, that the window was at the furthest end of the room from the bench, though the Judges suffered most. Nor could the kind of the fever, nor the mortality attending it, be attributed to a cold; it is therefore probable that the air from the window directed the putrid streams to that part of the court abovementioned. Indeed it must be granted that septic particles, passing into the blood, become more active and fatal if the infected person catches cold, or by any accident suffers a stoppage of perspiration; or of any of the other discharges of excrementitious and noxious matter.

present,

present, to the amount of above forty; without making allowance for those of a lower rank, whose death may not have been heard of; and without including any that did not sicken within a fortnight after the sessions.

It was said, that this fever in the beginning had an inflammatory appearance, but that after large evacuations the pulse sunk *, and was not to be raised by blisters, nor cordials; and the patients soon became delirious. Several had *petechiæ*; and all that were seized with the fever died, excepting two, or three at most. Some escaped without a fever, by a looseness coming on, and which was easily cured. How far this sickness spread among the nurses, and other attendants on the sick, is not known.

From Dr. HUXHAM'S observations, we find that the same kind of fever was frequent at Plymouth during the former war, occasioned by the number of French prisoners, and by the hospitals, and other places, being crowded with men taken out of our own ships, actually ill of the distemper †.

It is remarkable how much the plague, pestilential fevers, putrid scurvies, and dysenteries, have abated in Europe within this last century; a blessing which we can attribute to no other second cause, than to our improvement in every thing relating to cleanliness, and to the more general use of anti-

* See page 291.

† Essay on fevers, ch. v. viii.

septics.

septics. FELIX PLATERUS, physician at Basil in Switzerland, gives an account of seven different pestilential fevers (he calls each *pestis*) which afflicted that city in the space of seventy years, all of them within his memory *. THOMAS BARTHOLINE mentions five that raged in Denmark in his time; and all from some foreign contagion †. And other authors, their cotemporaries, throughout Europe, are full of the like observations. FORESTUS relates, that in his days the plague was most frequent at Cologne and Paris, and refers the cause to the multitude of the inhabitants, and the nastiness of the streets ‡; yet both those cities are at present healthful, and not peculiarly subject to any putrid disease. TIMONI takes notice, that at Constantinople the cleaner houses are less liable to be infected with the plague than the dirty §.

As to diet, it may be observed, that hopped beer, wine, and vinous liquors, coming more into

* F. PLATER. Observat. lib. ii.

† Nostra memoria quinquies in Dania pestilentia grassata est, 1619, 1625, 1629, 1637, 1654, semper aliunde translata. *De Medicin. Danor. Domest. dissert. iv.*

‡ Coloniae, et Lutetiae Parisiorum, pestis frequentissima est, ob hominum frequentiam & sorditiam platearum. *Observat. lib. vi. obs. v. schol.* At that time the streets not being paved, we may easily conceive how offensive they must have been in such large and populous cities. It will be proper to observe, that FORESTUS generally makes no distinction between a raging plague and pestilential fevers, and therefore it is probable that he only means the latter; since those two cities have been little liable to what is commonly understood by the *plague*, from their inland situation.

§ Philos. Transact. n. 364. Abridg. vol. vi. part iii. ch. ii. sect. xxi.

general use, have been some means of suppressing putrid diseases. Greens and fruit are likewise more universally eaten *; and salted meats make a much less part of our diet than formerly. To this join the more general consumption of tea and sugar, which I have shewn elsewhere to be no inconsiderable antiseptics †. How far such things may be abused, or become productive of other distempers, is not now the question.

For so great a city, perhaps London is at present one of the least subject to pestilential fevers, to

* Having asked Mr. MILBER, keeper of the botanic garden at Chelsea, what he thought might be the proportion between the quantity of greens and fruit consumed now, and a hundred years ago, he answered, "That in former times, he believed, the tradesmen and common people about this city scarcely used any, and those of higher rank, but little. For that he had been assured by old gardeners, and by others of his acquaintance, that so late as seventy years ago a cabbage sold at three-pence, which now sells for a half-penny; and that most other greens and fruit were proportionally dear; insomuch that those who now eat garden-vegetables every day, would then only use them on Sundays, by way of dainty. From which circumstance and the present extent of ground laid out in kitchen-gardens, he inferred that there was at least six times more garden-stuff used now than about the time of the Revolution." Nor are we to think that this defect of greens and fruit was supplied by a greater consumption of the *farinacea*, in bread, or in other forms; since at that time bread was dearer in proportion to meat, than it is now. Hence it seems reasonable to conclude that formerly a greater quantity of flesh was eaten than at present; and it is well known how much more salted meats were then in common use. Let me add, with regard to the *farinacea*, that they do not seem so much disposed to resist putrefaction, as greens or fruit; as appears by the cure of the sea scurvy, and some experiments that I have made on that subject. See *Append. paper iii. exp. xx, xxi.*

† *Append. paper iv. exp. xxvi.*

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the dyfentery, and other putrid difeafes, with which however it feems formerly to have been little lefs infefed than others, notwithstanding the advantages of its fituation, in a climate not liable to great heats nor clofe weather, on a gravelly foil, and on the banks of a large river, which not only fupplies fresh water, but fresh air, by the conftant motion of the tides. Add, that London ftands in a wide plain, where the fields are kept pretty open. Even fince the days of SYDENHAM, there appears to be a confiderable alteration for the better; for befides that there has been no plague, we have known no epidemic peftilential fever, nor fatal dyfentery *, and few autumnal fevers of a bad kind; or indeed, excepting the fmall-pox and measles, any infectious diftemper that could be called general. In fome of the loweft, moifteft and clofeft parts of the town, and among the poorer people, spotted fevers and dyfenteries are ftill to be feen, which are feldom heard of among thofe of better rank living in more airy fituations. Although many things relating to health might be better regulated here, yet fome of the main points have been well attended to; fuch as regard the privies, the common fewers, and the fupplies of fresh water; and the people in general are very cleanly.

The common dirt of the ftreets does not feem to affect the health of the inhabitants of great cities;

* In autumn 1762. the dyfentery, though frequent, could not be called epidemic. It prevailed chiefly among the lower people, and in general was of a benign kind. See p. 251, 252.
and

and though the more offensive kind of it may concur with other things to render the air less healthful, yet it appears to have little influence in producing pestilential diseases. Stale urine abounds with a volatile alkaline salt that resists putrefaction *; and the common *fæces* are rendered less, if at all, infectious, by means of a strong acid united with the parts which are really corrupted †. The case is different in putrid distempers, and especially in the dysentery, where the *fæces*, as we have already shewn, are in a state of corruption, and contagious ‡.

I shall conclude this part of my subject with observing, that whilst great cities furnish many materials for vitiating the air, they are provided with two considerable antidotes; the first arises from the circulation of the air, by the constant motion of the people and carriages, and by the draughts made by fires; the other, from the quantity of an acid, produced by fuel, the strongest resister of putrefaction.

II. Thus far the remote and external causes of the hospital and other pestilential fevers seem to be

* Append. paper i. exp. ii. iii.

† Append. paper vii. exp. xliii. Add the experiments of M. HOMBERG *sur la matiere fecale*, Hist. de l'Acad. R. des Sciences, A. 1711. F. HOFFMANN. Med. Rat. Syst. tom. i. lib. i. sect. ii. cap. vii.

‡ Part i. ch. iii. Part ii. ch. ii. § 3. Part iii. ch. vi. § 1.

ufficiently afcertained. But in what manner thefe putrid *effluvia* act, and produce the various fymptoms within the body, is not fo eafily determined, and therefore what follows is to be confidered as conjectural only.

I conceive that the *miasma* or feptic ferment (confifting of the *effluvia* from putrid fubftances) being received into the blood may have a power of corrupting the whole mafs *. The refolution of the blood, and fometimes even its fmell in the advanced ftate of a jail-fever, the offenfivenefs of the fweats and other excretions, the livid fspots, blotches and mortifications incident to this diftemper, feem to ftrengthen this opinion. The acrimony irritates the nerves and occafions various fpafms, the pulse is quickened, at firft raifed, but foon depressed, from the heart not receiving enough of the vital principle, or from a refolution of its fibres occafioned by putrefaction. I have elfewhere produced instances of the heart being fo far relaxed in the plague, as to become uncommonly large from the ordinary force of the blood †.

Yet, were putrefaction the only change made in the body by contagion, it might be eafy to cure fuch fevers by the ufe of acids only, or other anti-feptics. But as the difeafe, when once formed, is not to be removed by fuch means alone, it would

* See the Append. paper vii. exp. xlvi.

† Append. paper vii. exp. xlvi.

therefore

therefore seem as if some parts of the brain, or nervous system, were early inflamed, and the fever kept up by that inflammation *; as if to this circumstance most of the symptoms were owing; and as if in the advanced state, a cure could not be obtained until the obstructing matter was resolved by suppuration or putrefaction.

Another presumption for a septic ferment may perhaps be drawn from the cure. Thus, before the inflammation be fixed, the septic particles are expelled by sweating and other discharges; after that period, the most effectual means have been to support the strength, but so as not to increase the inflammation. Near the end of the last stage the humours being resolved by putrefaction, the obstruction is probably removed; and at that time the stronger antiseptic and cordial medicines have place, in order to correct, and to enable nature to expel what is so much vitiated. In this low state, the volatiles have been sometimes useful for raising the pulse, wine has been the best cordial, and we find that not only wine, but camphire, *serpentaria*, and the Bark, to wit the most efficacious medicines here, are considerable antiseptics †.

These are the remarks which I have made on the nature, the cure, and the causes of pestilential

* See the dissections.

† Append, paper ii. exp. xi. xii. xiii.

fevers. In the description, I have endeavoured to distinguish them from all others, as far as I could do it in distempers whose symptoms are so much alike. Some fevers are accompanied with miliary eruptions, which have no resemblance to the *petechiæ*; nor have I ever happened to see miliary eruptions in fevers of the jail- and hospital-kind. The fevers which of late years have been improperly, but commonly called *nervous*, seem to belong sometimes to the inflammatory, and sometimes to the autumnal class of diseases, though incident to those chiefly who are of a weak or lax habit. But whatever be the cause of those fevers, if they end in petechial spots, putrid sweats, or become contagious, we may from thence conclude, that by the long continuance of the disease, the humours have become putrid; or, in other words, that those fevers have changed into one of a pestilential nature, akin to that of hospitals and jails.



C H A P. VIII.

Observations on the Itch.

IN the division of the diseases most incident to an army, this was the last mentioned. Although the itch be of a contagious nature, yet the infection is communicated only by the contact of the diseased person, or by his clothes, bedding, &c. and not by *effluvia*, as in the dysentery and hospital-fever. It is confined to the skin, and seems best accounted for by LEEUWENHOEK, from certain small insects, which he discovered in the pustules by the microscope *. So that the frequency of the itch in the army is not to be ascribed to the change of air, or diet, that soldiers undergo upon expeditions, but to the infection propagated by a few (who happen to have it at first setting out) to others in the same ship, tent, or barrack †. But of all places the hospitals are most liable to this contagion, as receiving all sorts of patients. Hence I have observed, that after the crisis of fevers the itch has generally appeared, though the person was free from it when admitted.

* Since the first edition was published, I found a paper in the Phil. Transact. for the year 1730. called *An abstract of a letter from DR. BONOMO to Signor REDI, containing some observations concerning the worms of human bodies*; by which account I find that DR. BONOMO was the first who discovered these *animalcula*, and who likewise proposed curing the itch by externals only.

† Part i. ch. ii.

One therefore unacquainted with this disorder might be apt to mistake it for a miliary eruption, especially as these two bear a nearer resemblance to each other, than could be expected in two affections of so different a nature. But those who know how seldom the miliary eruptions, and how frequently the itch is seen in the army, will be less liable to fall into this error. The two may also be distinguished by the following marks: the miliary pustules, though not confined to the neck and breast, yet are most numerous and visible there; while the itch infects mostly the parts between the fingers, the inside of the wrists, the sides of the belly, and the hams. The miliary pustules appear before the fever has ceased, they are attended with little itching, and go off of themselves; whereas the itch is not perceived till after the crisis, in the convalescent state, when it increases daily and becomes very troublesome.

Although an army cannot be intirely freed from the itch, yet the cure of each individual is more certain in this, than in most other ailments; and the remedy is so well known that I scarcely need mention it. But I have seen our method oftener fail with the officers than with the private men; because the latter having no change of dress, what they wore was purified by the medicine, at the same time that they themselves were cured; while the former catching the itch, have a chance of keeping it longer, from the circulation of infection between their body and their clothes.

Sulphur

Sulphur is the specific remedy of this disease, and is both more safe and more efficacious than mercury. For unless a mercurial ointment were to touch every part of the skin, there can be no dependance upon it; whereas by a sulphurous application a cure may be obtained by partial unctions only. It would seem as if these, as well as other insects, were killed by the steams of brimstone, though only raised by the heat of the body. And as to the internal use of mercury, which some have accounted specific, I have heard of more than one instance in the hospital, of men undergoing a complete salivation for the cure of the *lues Venerea*, without being cured of the itch. The ointment which I have mostly used was made in this manner:

℞ *Sulphuris vivi præparati* ℥i. *radicis hellebori albi in pulverem subtilissimum contritæ* ℥ii. *axungie porcinae* ℥iiss. *misce* †.

This quantity served for four unctions, and the patient was rubbed every night. But to prevent any disorder that might arise from stopping too many pores at once, I commonly began with anointing only a fourth part of the body at a time. Some are said to cure the itch by rubbing the legs only; but that method I never tried, believing

† I used the *sulphur vivum* when I could depend on its purity, but as it is more liable to adulteration than the roll-brimstone I now commonly prescribe the latter. The hellebore renders the ointment more efficacious, and answers better than the *sal Ammoniacum crudum*, which when that root was wanting I substituted for it.

that

that the medicine would be more efficacious by covering a larger surface.

Although the itch may be removed by one pot of ointment, yet it will be proper to renew the application, and to rub the parts most affected for some nights longer, till a second, or a third quantity be also exhausted. In some bad cases, we are thus obliged to continue to anoint the whole body for many nights together, and also to subjoin the internal use of sulphur; not with a view to purify the blood, but to diffuse the steams more certainly through the skin.

As these fumes may heat the blood, at a time when the perspiration may be so much checked by the ointment, it is proper that the patient should be kept all the while to a cool diet, and guard against cold. If of a full habit, or in any degree feverish, he should let blood and take a purge; otherwise neither of these evacuations are necessary.

The nature of the itch has been often mistaken, while some have referred it to the leprous, and others to the scorbutic class of diseases; but it appears to be a distemper *sui generis*, or at least different from either of these two. The *psora* mentioned by the Greek writers, and the *scabies* by the Latin, have been generally supposed to be this very eruption; but this is so little evident from the description which I have read of them*, that I should

* PAULUS lib. iv. cap. ii. CELSUS lib. v. cap. xxviii.

rather conclude, that though other affections of the skin seem to have been formerly no less frequent than at present, perhaps more, yet the itch was either altogether unknown, or at least uncommon among the ancients; since they take such particular notice of other cutaneous foulnesses, and, as I think, omit this wholly.

Further it may be observed, that in the most marshy parts of the Low-Countries, where the true scurvy is so general and bad, the itch is scarcely known; and that though both the scurvy and the itch may meet on board our ships, yet they are to be considered as two distinct ailments; the former, arising from foul air, bad water, corrupted provisions, and the want of fruit and greens; the other, from contagion; each requiring a different cure.

Both the *scabies*, and the various kinds of the *impetigo**, of the ancients, are frequently in this country confounded under the general, but improper appellation of *scurvy*. But the true scorbutic spots are of a livid colour, not commonly scurfy, nor raised above the skin, and are attended with manifest signs of a lax state of fibres, and a corruption of the blood: for a real scurvy imports a slow, but general resolution or putrefaction of the whole frame; whereas the *scabies*, *impetigo* or leprosy, may be found to affect those of a very different

* It would seem, that by the *impetigo* CELSUS meant the *lepra Græcorum*.

constitution. These latter affections are chiefly distinguished by the hardness of the skin in one or more parts of the body, attended with a dry scurf, or oozing tetter, or scabs, and generally with some degree of itching. But they are so far from being always curable by external applications only, that it is sometimes dangerous to attempt to subdue them in that manner. There it is found necessary to change the humours by a spare diet, frequent purges of the saline kind, or by mercurial, antimonial, or other medicines, which have little or no efficacy in curing the itch, and which rather increase than cure the true scurvy.

Since the first publication of these observations, I have seen some cases of the itch, where the eruption seemed to continue, notwithstanding repeated unctions; but then I found that the fresh pustules, though much resembling the old ones, were yet of a different nature, and were only owing to the ointment itself; for upon ceasing to use it, and allowing the patient to clean his skin by bathing, and then to go out, they soon disappeared and never returned.





A P P E N D I X,

CONTAINING

I. Experiments upon Septic and Antiseptic Substances, with Remarks relating to their Use in the Theory of Medicine, in several Papers read before the ROYAL SOCIETY.

AND

II. An Answer to Professor DE HAEN and M. GABER, concerning some Remarks made by them on the preceding Work.





A P P E N D I X.

P A P E R I.

Experiments shewing that putrid substances are not to be called alkaline; that neither the volatile nor fixed alkaline salts tend naturally to promote putrefaction within the body, being of themselves antiseptic. That the combination of two antiseptics may produce a third weaker than either. Experiments upon the comparative powers of some neutral salts in resisting putrefaction. And of the antiseptic qualities of myrrh, camphire, snake-root, camomile-flowers, and the Peruvian bark.

Read June 28.
1750.

ALTHOUGH an inquiry into the manner how bodies are resolved by putrefaction, with the means of accelerating, or preventing that process, has been reckoned not only curious but useful*, yet we find it little prosecuted in an experimental way; nor is it to be wondered at, considering how

* Lord BACON calls the inducing or accelerating putrefaction, “ a subject of very universal inquiry;” and says, “ that it is of excellent use to inquire into the means of preventing or staying putrefaction; which makes a great part of physic and surgery.” *Nat. Hist. Cent. iv.*

offensive such operations are. But as I have been led to make some experiments and remarks on this subject, by my having had an uncommon number of putrid distempers under my care in the hospitals of the army, I shall venture to lay before the Society what I have found different from the common opinion; as well as some facts, which, as far as I know, have not been mentioned before.

FINDING it a received opinion, “that bodies by putrefaction become highly alkaline,” I made the following experiments to inquire how far this may be true.

EXPERIMENT I.

THE *serum* of human blood putrefied, made, with a solution of the corrosive sublimate, first a turbid mixture, and afterwards a precipitation. This is one of the tests of an alkali, but scarce to be admitted here; since the same thing was done with the recent urine of a person in health, which is not accounted alkaline. The same *serum* did not tinge the syrup of violets green, and shewed no effervescence when the spirit of vitriol was poured upon it. I made the experiment twice with portions of a different *serum*, both highly putrid; and once with water, in which corrupted flesh had been some time infused; yet the most I could find was, that having previously given the syrup a reddish cast with an acid, this colour was rendered fainter (which might be the effect of dilution) but was not destroyed by the putrid humours. And as to effervescence,

effervescence, having dropped some spirit of vitriol into those liquors singly, and also when diluted with water, the mixture was quiet, and only a few air-bubbles appeared on shaking the glasses. Upon the whole, though there were some marks of a latent alkali in the putrid *serum*, yet they were so faint, that a quantity of water equal to that of the putrid liquors, mixed with only one drop of the spirit of hartshorn, being put to the same trial, discovered more of an alkaline nature*.

EXPERIMENT II.

IT has been a maxim, that all animal substances; being distilled after putrefaction, send forth a large quantity of volatile salt, in the first water; but Mr. BOYLE found, that this held good in urine only, and that in the distillation of the *serum* of human blood putrefied, the liquor which came first over had little strength, either as to its smell or taste, and did not at first effervesce with an acid †. And here it may be observed, that the chemists have frequently applied those properties which they discovered in urine to all the humours indifferently, whereas, in fact, there is a great diversity. For some animal substances, such as the urine, the bile, and the *crassamentum* of the blood, soon putrefy;

* My conclusion from this experiment was too general, as will appear by a remark made by M. GABER: see *An Answer* &c. at the end of the Appendix.

† Nat. Hist. of the Human Blood, vol. iv. p. 178, fol. ed.

the *serum*, the *saliva*, and the white of an egg, slowly. Yet those which soonest corrupt do not always arrive at the highest degree of putrefaction. Thus the bile is soon corrupted, but the rankness of it is sensibly less than that of flesh; and the white of an egg is not only less disposed to putrefy than the yolk, but when putrid yields a different and less offensive smell; and it seems peculiar to stale urine to contain an alkaline salt, which, without distillation, makes a strong effervescence with acids; whilst most other animal humours putrefied, though they have a more intolerable *fætor*, yet contain less volatile salt, less extricable, and scarce effervescing with acids. What makes the difference between stale urine and other putrid substances still greater, is its inoffensiveness with regard to health; whilst the *effluvia* from other animal substances have oftentimes been the cause of pestilential diseases.

Now, upon finding in urine a greater quantity of volatile salt, and that more easily separable than from any other humour; and that stale urine is the least noxious of putrid animal substances; so far from dreading the volatile alkali as the deleterious part of corrupted bodies, from this instance we should rather infer it to be a sort of corrector of putrefaction.

EXPERIMENT III.

DAILY experience shews how harmless the volatiles are, whether smelled to, or taken in substance; but still there remains a prejudice, as if these salts, being the produce of corruption, should therefore hasten putrefaction, not only in distempers where they are unwarily given, but also in experiments out of the body.

As to the effects arising from the internal use of them, little can be said, unless the kind of the disorder were precisely stated. For supposing, that by their nature they were disposed to promote putrefaction, yet if that is already begun, from a languid circulation and obstruction, the volatiles may then, by their stimulating and aperient qualities, be the means of stopping its progress. And, on the other hand, though they were really anti-septic, yet if the humours are disposed to corruption, from excess of heat or motion, these very salts, by adding to the cause, may augment the disease. So that upon the whole, it will be the fairest *criterion* of the nature of these volatiles, to find whether, out of the body, they accelerate, or retard putrefaction.

1. In order to decide this question, I made repeated experiments of joining both the spirit, and the salt of hartshorn to various animal substances, and I constantly found, that so far from promoting

putrefaction, they evidently prevented it, and that with a power proportioned to their quantity *. The trials were made with the *serum* of the blood, and also with the *crassamentum*, after it had been dried by keeping. I once separated the thick inflammatory crust of pleuritic blood from the rest of the mass, and having divided it, I put one portion into distilled vinegar, the other into the spirit of hartshorn; and after keeping the infusions above a month, in the middle of summer, I found the piece which lay in the alkaline spirit as sound as that in the acid.

2. Another time, I put into a four-ounce phial about an ounce and a half of an equal mixture of ox's gall and water, with 100 drops of spirit of hartshorn; and in another, as much of the gall and water, without any spirit. The phials being corked were set by a fire, so as to receive about the degree of animal heat, and in less than two days, the mixture without the spirit became putrid; yet the other was not only then, but after two days longer, untainted.

3. I afterwards infused two drachms of the lean of beef in two ounces of water, adding half a drachm of the salt of hartshorn; another phial

* Mr. BOYLE had already observed, that fine urinous spirits added to blood, warm from the vein, would make it appear more florid, keep it more fluid, and long preserve it from putrefaction: *Phil. Transact. n. xxix. Abridg. vol. iii. ch. v. § viii.*

contained as much flesh and water, with a double quantity of sea-salt; in a third were only the flesh and the water, by way of standard: these phials were placed in a lamp furnace, in a heat varying between 94 and 100 degrees of FARENHEIT'S scale. About eighteen hours after infusion, the contents of the phial, which served as a standard, were rank; and in a few hours more, that with the sea-salt was also putrid; but the flesh with the volatile alkali was found, and so continued after standing four-and-twenty hours longer in the same degree of heat. And that the smell of the hartshorn might occasion no deception, the piece of flesh was washed from the salt, and still smelled sweet.

4. About the same time, I took three slices of fresh beef, of the same weight as above mentioned, and laying two of them in gally-pots, I covered one with saw-dust, and the other with bran; but the third piece being strewed with salt of hartshorn powdered, I put into a four-ounce phial which had a glass stopper. They were all three placed on the outside of a window exposed to the sun, and the weather being warm, the flesh in the gally-pots began to smell on the third day, and on the fourth was quite putrid. Next day the phial was examined, when the flesh was washed from the salt, and found perfectly sweet. It was then dried, and salted again with hartshorn; and having stood in the house for some weeks, in hot weather, it was inspected a second time, and found to be as found

as before. Nor was the substance at all dissolved, but of such a consistence as might be expected after lying as long in common brine*. And lest it should be imagined that the flesh in the gally-pots, by being more exposed to the air than that in the phial, became sooner putrid, I also inclosed flesh in phials, like that with the salt of hartshorn, and found the confinement rather hasten the putrefaction.

Now finding, by these and many other experiments of the same kind, that volatile alkaline salts not only do not dispose animal substances to putrefaction, out of the body, but even prevent it, and that more powerfully than common sea-salt, we may presume that the same, taken by way of medicine, will *cæteris paribus* prove antiseptic; at least we cannot justly suppose them corruptors of the humours, more than wine or spirits, which used in immoderate quantities may raise a fever, and thereby accidentally be the occasion of corruption.

E X P E R I M E N T I V.

I LIKEWISE made several experiments with the fixed alkaline salts, and found that they possessed little less antiseptic powers than the volatile. The trials were both with the ley of tartar and the salt of wormwood. But here we must not confound the disagreeable smell of such mixtures, with one that is really putrid; nor the power which these

* The same piece, being kept a twelvemonth, continued untainted, and as firm as at first.

lixivials have of dissolving some animal substances, with putrefaction*.

EXPERIMENT V.

FROM these experiments it was natural to conclude, that since acids by themselves were amongst the most powerful antiseptics, and that the alkaline salts were likewise of that class, a mixture of the two, to saturation, would resist putrefaction little less than the acid alone. But in the trials, which I made upon flesh, with a *spiritus Mindereri*, composed of vinegar saturated with salt of hartshorn; and with lemon-juice saturated with the salt of wormwood, I found the antiseptic virtue considerably less, than when either the acids or alkalies were used singly.

EXPERIMENT VI.

As to the comparative powers of these salts upon flesh, I observed that half an ounce of lemon-juice, saturated with a scruple of the salt of wormwood, resisted putrefaction nearly as much as fifteen grains of nitre; and when the trial was made with ox's gall, that two drachms of that mixture were more antiseptic than a scruple of nitre. Again, that nitre, compared with the dry neutral salts,

* In the trials upon flesh, I observed that though the fixed alkaline salts seemed at first to loosen the texture of fibrous animal substances, yet after infusion for some days, those pieces not only were not dissolved, but were firmer than others which had lain in water only.

weight for weight, was more antiseptic in preserving flesh than any which I had tried. The *sal Ammoniacus* came next to it, and even exceeded it in the experiment with ox's gall. After these, the *sal diureticus*, *tartarus solubilis*, and *tartarus vitriolatus*, seemed to have nearly the same antiseptic power.

EXPERIMENT VII.

THUS far I have examined the common neutral salts, which, however powerful in resisting putrefaction, are inferior to some resinous substances, and even to some plants that I have tried. For myrrh, in a watery *menstruum*, was found at least twelve times more antiseptic than sea-salt. Two grains of camphire, mixed with water, preserved flesh better than sixty grains of sea-salt: and I imagine, that could the camphire have been kept from flying off, or concreting to the sides of the phial, half a grain, or even less would have sufficed. An infusion of a few grains of Virginian snake-root, in powder, exceeded twelve times its weight of sea-salt. Camomile-flowers have nearly the same quality. The Peruvian bark is also antiseptic; and if I have not found it so strong as the two substances last mentioned, I impute that, in some measure, to my not having been able to extract all its embalming parts in water.

Now, the watery infusions of vegetables possessing this balsamic virtue are the more valuable,
in

in that being usually free of acrimony, they may be taken in greater quantities than either spirits, acids, the alkaline, or even the neutral salts. And as in the great variety of substances answering this purpose, there may be some other useful qualities annexed, it would not be amiss to review some part of the *materia medica* with this intention.

I shall add, that besides this remarkable power in preserving bodies, I discovered in some of those substances a sweetening or correcting quality, after putrefaction had actually begun. But those experiments I shall lay before the Society at some other time, with a table of the comparative force of salts, and some further remarks upon the same subject.



PAPER II.

A continuation of the experiments and remarks upon antiseptic substances. A table of the comparative powers of salts in resisting putrefaction. Of the antiseptic quality of several resins, gums, flowers, roots, and leaves of vegetables, compared with common salt. Attempts to sweeten corrupted animal substances by means of camomile-flowers, and the Peruvian bark. A conjecture about the cause of intermitting fevers; and about the action of the Bark in curing them.

Read Nov. 21. 1750. **H**AVING in my last paper just mentioned the comparative force of a few salts, and of other substances in resisting putrefaction, I shall now lay before the Society a particular account of those experiments, and of some other which I have made upon that subject.

EXPERIMENT VIII.

THREE pieces of the lean of fresh beef, each weighing two drachms, were put separately into wide mouthed phials. Two ounces of cistern water were added to each; in one, were dissolved thirty grains of sea-salt*; in another, sixty; but the third contained nothing but flesh and water. These

* All these experiments were made with the white or boiled salt, in common use here.

phials were little more than half full, and being corked were placed in a lamp-furnace regulated by a thermometer, and kept to the degree of heat of the human body,

In about ten or twelve hours after, the contents of the phial without salt had a faint smell, and in two or three hours more became putrid *. In an hour or two longer, the flesh with the least salt was tainted, but that which had most, remained sweet above thirty hours after infusion. This experiment was often repeated, and with the same result, allowance being made for some small variations in the degree of heat.

The use of the experiment was for making standards, whereby to judge of the septic, or antiseptic strength of bodies. Thus, if water with any ingredient preserved flesh better than without it, or better than with the addition of the salt, that ingredient might be said to resist putrefaction more than water alone, or water with thirty, or sixty grains of sea-salt. But if, on the other hand, water with any addition brought on corruption faster than when pure, the substance added was to be reckoned a promoter of putrefaction.

* These pieces were intire. But when they were beaten to the consistence of a pulp, with the same quantity of water, the putrefaction began in less than half the time mentioned above.

The

Saline mixture	-	-	-	-	-	3	
Nitre	-	-	-	-	-	4	+
Salt of hartshorn	-	-	-	-	-	4	+
Salt of wormwood	-	-	-	-	-	4	+
Borax	-	-	-	-	-	12	+
Salt of amber	-	-	-	-	-	20	+
Alum	-	-	-	-	-	30	+

In this table I have marked the proportions by integral numbers, it being difficult, and perhaps unnecessary, to bring this matter to more exactness; only to some I have added the sign +, to shew, that those salts are stronger than the number in the table by some fraction; except in the three last, where the same sign imports that the salts may be stronger by some units*. The vitriolated tartar is rated at 2, though more than thirty grains were taken to equal the standard; but as I perceived that all of it was not dissolved, an allowance was made accordingly. On the other hand, as part of the hartshorn flies off, its real force must be greater than is shewn by the table. The salt of

* Five grains of borax was the smallest quantity compared with sixty grains of sea-salt; but from its holding out so much longer, I suspect that three grains would have been sufficient; in which case the force of this salt was to be estimated at 20: a singular instance of the strength of a salt, which so far from being acid, is rather alkaline, if we may judge by its urinous taste. One grain of alum was weaker than sixty grains of sea-salt, but two grains were stronger: the power therefore of alum lies between 30 and 60, but, by the experiment, nearer the first of these numbers.

amber

amber is little volatile; but as three grains thereof were found more preservative than sixty of the sea-salt, it must therefore be more than twenty times stronger. This is indeed an acid salt; but as the acid part, in so small a quantity, is inconsiderable, it should seem that the antiseptic power is owing to some other principle. The *spiritus Mindereri* was made of common vinegar and salt of hartshorn: the saline mixture of salt of wormwood saturated with lemon-juice*. The alkaline part in either of these mixtures, with water only, would have resisted with a power of 4 †; so that the addition of the acid rendered these salts less antiseptic; viz. the *spiritus Mindereri*, by one half; and the saline mixture, by a fourth part; which was an unexpected circumstance.

EXPERIMENT X.

I. I PROCEEDED to try resins and gums, and began with myrrh. As part of that substance dissolves in water, eight grains were made into an emulsion; but most of it subsiding, I could not reckon on a solution of more than one or two grains, which nevertheless having preserved the flesh longer than the standard, we may account the soluble part of

* Both the *spiritus Mindereri* and the saline mixture being in a liquid form, are compared with the dry salts, upon the quantity which they contain of the alkaline salt.

myrrh perhaps about thirty times stronger than sea-salt.

2. *Aloe, asa fœtida, and terra Japonica*, dissolved in the same manner as myrrh, like it subsided, and had the same antiseptic force. But gum *Ammoniacum* and *Sagapenum* shewed little of this virtue; whether it was, that they opposed putrefaction less, or that most of the antiseptic principle fell with the grosser parts to the bottom. Three grains of opium, dissolved in water, did not subside, and resisted putrefaction better than the standard. But I observed, that more air than usual was generated here, and that the flesh became more tender than with any of the stronger antiseptics.

3. Of all the resinous substances, I found camphire the strongest resister of putrefaction. Two grains dissolved in one drop of spirit of wine, five grains of sugar and two ounces of water, exceeded the standard: though during the infusion most of the camphire flew off, swam at the top, or stuck to the phial. If we suppose only the half lost, the remainder was at least sixty times stronger than sea-salt: but if, as I imagine, the water suspended not above a tenth part, then camphire will be three hundred times more antiseptic than sea-salt. That nothing might be ascribed to the minute portion of the spirit used in this experiment, I made another solution of camphire in a drop or two of oil,

6 and

and found that mixture less perfect, but still beyond the standard.

EXPERIMENT XI.

1. I MADE strong infusions of camomile-flowers; and of Virginian snake-root; and finding them both much beyond the standard, I gradually lessened the quantity of these materials, till I found five grains of either impart a virtue to boiling water superior to the standard. Now, as we cannot suppose that these infusions contained half a grain of the embalming part of these vegetables, it follows, that this substance must be at least an hundred and twenty times more antiseptic than common salt.

2. I also made a strong decoction of the Peruvian bark, and infused a thin bit of flesh in two ounces of it strained; which flesh did not corrupt, though it remained two or three days in the furnace, after the standard was putrid. During this time, the decoction became gradually limpid, whilst the grosser parts subsided; by which it appeared, that a most minute portion of the Bark (perhaps less than of the snake-root or camomile-flowers) intimately mixed with water, was possessed of a considerable antiseptic virtue.

3. Besides these, pepper, ginger, saffron, contrayerva-root, and galls, in the quantity of five grains each, as also ten grains of dried sage, of rhubarb,

rhubarb, and of the root of wild valerian †, separately infused, exceeded sixty grains of salt. The leaves of mint, angelica, groundivy, fena, green tea and red roses; as also the tops of common wormwood, mustard-feed; and horseradish-root were likewise severally infused, but in larger quantities, and proved more antiseptic than the standard. And as none of these can be supposed to yield in the water above a grain or two of the embalming principle, we may look upon them all as powerful resisters of putrefaction. Further, I made a trial with the decoction of white poppy-heads, and another with the expressed juice of lettuce, and found them both above the standard.

From these specimens we may now see how extensive antiseptics are; since, besides salts, vinous spirits, spices, and acids, commonly known to have this property, many resins, astringents, and refrigerants are of the number, and even those plants called alkalescent, and supposed promoters of putrefaction, of which class horseradish is particularly antiseptic. And indeed after these trials I expected to find almost all substances endowed with some degree of this quality, till, upon further experiments, I perceived that some made no resistance to, and others promoted corruption. But before I enter upon that part of my subject, it will be

† Although the experiment was made with ten grains of the powder of this root only, yet, considering how long that quantity resisted putrefaction, we may reckon valerian-root among the stronger antiseptics.

proper to relate some other experiments more nearly connected with the preceding.

EXPERIMENT XII.

HAVING seen how much more antiseptic these infusions were than sea-salt, I then tried whether vegetables would part with this virtue, without infusion. For this purpose, taking three small slices of the lean of beef, each not exceeding the thickness of half a crown, into one I rubbed the powder of the Peruvian bark, into another that of snake-root, and into a third that of camomile-flowers. It was in the heat of summer, yet after keeping these pieces for several days, I found the flesh with the Bark but little tainted, and the other two sweet. The substance of all the three was firm; in particular that piece with the camomile was so hard and dry that it seemed incorruptible. The reason why the Bark had not altogether the same effect, depended probably on its closer texture.

EXPERIMENT XIII.

I HAVE also made some attempts towards the sweetening of corrupted flesh by means of mild substances; because distilled spirits, or strong acids, which might be supposed the most likely to answer this intention, are of too acrid and irritating a nature to be thoroughly useful when this correction is most wanted. And as to salts, besides their acrimony, it is well known that meat once tainted will not take salt.

A piece

A piece of flesh weighing two drachms, which in a former experiment had become putrid (and was thereby made tender, spongy, and to float in water) was thrown into a few ounces of a strong infusion of camomile-flowers, after expressing the air, in order to make it sink in the fluid. That liquor was renewed two or three times in as many days, when perceiving the *fætor* gone, I put the flesh into a clean phial with a fresh infusion; and this I have kept all the summer, and have it still by me, sweet and of a firm texture *. In the like manner I have succeeded, in sweetening several thin pieces of corrupted flesh by repeated infusions in a strong decoction of the Bark, and I have constantly observed, that not only the offensive smell has been removed, but a firmness restored to the fibres.

Now, since the Bark parts with so much of its virtue in water, is it not reasonable to suppose that it may yield still more in the body, when opened by the *saliva* and the bile, and therefore that in some measure it operates by this antiseptic virtue? From this principle we may perhaps account for its success in gangrenes, and in the low state of pestilential fevers where the humours are so apparently corrupted. And as to remitting and intermitting fevers, in which the Bark is most specific, were we

* This piece I kept a twelvemonth after this paper was read at the Royal Society, and I found it then still firm and uncorrupted.

to judge of their nature from circumstances attending them, in climates and in seasons most liable to those distempers, we should assign putrefaction as one of the principal causes. They are the great epidemic of marshy countries, and prevail most after hot summers, with a close and moist state of the air. They begin about the end of summer, and continue throughout autumn, being at the worst when the atmosphere is most loaded with the *effluvia* of stagnating water, rendered more putrid by vegetables and animals dying and rotting in it. At such times all meats are quickly tainted, and dysenteries, with other putrid disorders, coincide with these fevers. The heats dispose the blood to acrimony, the putrid *effluvia* taken in by the lungs are a ferment *, and the foggy air, so common in such situations, either by stopping the pores, or not receiving the perspirable matter, brings on a fever. The more these causes prevail, the easier it is to trace this putrefaction. The *nausea*, thirst, bitter taste of the mouth, and frequent evacuations

* It will be proper to remark, that when I use here (as in the preceding Observations) the word *ferment*, to denote the cause that changes the humours, I mean only to express the assimilating power of all putrid animal substances over the fresh, as shall be explained more fully in the next paper, under experiment xviii. There seemed to be the more need for this caution, as in one of the subsequent papers I am to shew, that putrid animal substances become ferments in the strictest sense, that is, act like yeast, when joined to any vegetable substance susceptible of a vinous fermentation. See *exper. xxviii. and the following.*

of corrupted bile are common symptoms, and arguments for what is advanced. We shall add, that in moist countries, and in bad seasons, the intermittents not only begin with signs of putrefaction, but if unduly treated are easily changed into a dangerous form, with livid spots or blotches on the skin, or a mortification of the bowels. At the same time it must be acknowledged, that such is the quick action of the Bark in removing these fevers, that its febrifuge quality must be something different from its antiseptic. And yet we may remark, that whatever medicines (besides evacuations and the Bark) have been found useful in the cure of intermittents, they are mostly, so far as I know, powerful correctors of putrefaction, such as myrrh, camomile-flowers, wormwood, tincture of roses, alum with nutmeg, the vitriolic, or other strong mineral acids with aromatics.

Thus far having recited my experiments upon flesh or the fibrous parts of animals, I shall proceed to shew what effects the antiseptics have upon the humours. For though from analogy we might conclude, that whatever retards the corruption of the solids, or recovers them after they are tainted, will act similarly upon the fluids, yet as this does not certainly follow, I judged it necessary to make some new trials, which, with some experiments on the promoters of putrefaction, the reverse of the former, shall be offered to the Society at a future meeting.

PAPER III.

Experiments on substances resisting the putrefaction of animal humours, with their use in medicine. Astringents always antiseptics, but antiseptics have not always a manifest astringent. Of the use of putrefaction in general, and particularly in the animal œconomy. Of the different means of inducing putrefaction. Some substances reputed septics have a contrary quality. And the real septics are some of those substances which have been the least suspected to be of that nature, viz. chalk, the testacea, and common salt.

Read Nov. 1, 1750. **H**AVING given a full account of the manner in which I tried the power of antiseptics on the fibrous parts of animals, I shall but just mention the result of some experiments made with them upon the humours*.

EXPERIMENT XIV.

DECOCTIONS of wormwood, and of the Peruvian bark, also infusions of camomile-flowers, and of snake-root, preserved yolks of eggs several days longer not only than water did alone, but also when some sea-salt was added to it. I likewise

* All the following experiments, whether made in the lamp-furnace, or by the fire, were made in a degree of heat equal to that of the human blood, viz. about 100 degrees of FAHRENHEIT'S scale.

found

found that falt of hartshorn preserved this substance better than four times its weight of sea-salt.

E X P E R I M E N T X V.

Ox's gall was kept some time from putrefaction by small quantities of the ley of tartar, spirit of hartshorn, *sal Ammoniacus*, and the saline mixture; and still longer, by a decoction of wormwood, infusions of camomile-flowers, and of snake-root; by solutions of myrrh, camphire, and salt of amber: all these were separately mixed with gall, and found more antiseptic than sea-salt, and seemingly in proportion to their effects upon flesh. Only nitre failed, which though four times stronger than sea-salt in preserving flesh, yet is inferior to it in preserving gall, and much weaker than the *sal Ammoniacus*; which, again, is somewhat less powerful than nitre in keeping flesh sweet. The nitre was soon opened by the gall, and emitted much air, which rose as from a fermenting liquor; and when this happened the gall had begun to putrefy*. But the saline mixture generated no air, and opposed the putrefaction of the gall more than it did that of the flesh.

E X P E R I M E N T X V I.

THE last trial was with the *serum* of human blood, which was preserved by a decoction of the Bark, and by an infusion of snake-root. But saffron and camphire were not here above a fourth

* Perhaps this may be the reason why, as I have observed, nitre disagrees with the stomach and bowels in cases of putrid bile.

part so antiseptic as before: whether it be that they are less preservative of this humour, or, as I suspect, that they were not sufficiently mixed with it. Nitre acted nearly with its full force, being about four times stronger than sea-salt; and it generated some air, but less than it did with the gall. No other humour was tried: but from these specimens, added to the former experiments, we may conclude, that whatever is a preservative of flesh will be universally antiseptic, though perhaps not always with the same force.

EXPERIMENT XVII.

HAVING shewn how putrid flesh may be sweetened, I shall conclude that part of my subject with a like trial made upon the yolk of an egg. A portion of this diluted with a little water, having stood till it was corrupted, a few drops of it were put into a phial with two ounces of pure water, and about twice as many drops were mixed with a strong infusion of camomile-flowers. At first both phials had some degree of a putrid smell, but being corked, and kept a few days near a fire, in about the degree of animal heat, the mixture with plain water contracted a *fætor*, whilst the other smelled only of the flowers.

Thus far I have related my experiments made upon antiseptics, by which it appears, that besides spirits, acids, and salts, we are possessed of many powerful resisters of putrefaction, endowed with qualities of heating, and cooling, of volatility
astriction,

astriktion, &c. which make some substances more adapted than others to particular indications. In some putrid cases many correctors are already known, in others they are wanting. We are yet at a loss how to correct the *sanies* of a cancerous sore; but in such a multitude of antiseptics, it is to be hoped that some will be found at last adequate to that intention.

It may be further remarked, that as different distempers, of the putrid kind, require different antiseptics, so the same disease will not always yield to the same medicine. Thus, the Bark will fail in a gangrene, if the vessels are too full, or the blood is too thick. But if the vessels are relaxed, and the blood resolved, or disposed to putrefaction, either from a bad habit, or from the absorption of putrid matter, then is the Bark specific. With the same caution are we to use it in wounds, *viz.* chiefly in the cases of absorbed matter, when it infects the humours and brings on a hectic fever. But when inflammatory symptoms prevail, the same medicine, by increasing the tension of the fibres (a state very different from the other) has such effects as may well be expected.

From the success of the Bark in various putrid disorders, it should seem that astringent had no small share in the cure*; and indeed does not the

* Are not all astringents strong antiseptics; and have not all antiseptics some astringent quality, though not always manifest?
nature

nature of putrefaction consist in a separation and disunion of parts? But as there are other cases in which astringency is less wanted, we may find in the contrayerva-root, snake-root, camphire, and other substances, a considerable antiseptic power, with little or no appearance of astringency. And as several of these medicines are also diaphoretic, their operation, in this respect, may for that reason be the more successful.

I come now to the second thing proposed, which was, to give an account of some experiments made on substances hastening or promoting putrefaction, and which I shall likewise venture to lay before the Society. For setting aside the offensive idea commonly annexed to the word *putrefaction*, we must acknowledge it to be one of the instruments of Nature, by which some great and salutary changes are brought about. With regard to medicine, we know that neither animal nor vegetable substances can become aliment without undergoing some degree of putrefaction. Some distempers may proceed from a want of it*; the crisis of fevers seems in some measure to depend upon it †; and

* Some learned authors mean the same thing, when they express this by a defect of a due degree of *alkalescence* in the humours; but I have shewn in my first paper how liable that term is to objections.

† It is observable, that HIPPOCRATES entertained the same idea, since he oftener than once uses the word signifying *to putrefy*, as synonymous to that which signifies *to concoct*. Thus, FOESIUS remarks, Σήπειν, quod est putrefacere, HIPPOCRATI concoquere significat; ut et σήψις, concoctionem. Oecon. HIPPOCRAT. in voce Σήπειν. In some of the former editions

perhaps it may even be concerned in producing animal heat*.

But in the prosecution of this subject I have met with few real septics, and found several substances, commonly accounted such, to be of an opposite nature. The most general means of accelerating putrefaction are by heat, moisture, and stagnating air; which being sufficiently known and ascertained, I passed over without making any new experiments about them. But Lord BACON †, as well as some

tions of these experiments, by mistake, I quoted GORRÆUS for FOESIUS; though indeed GORRÆUS, the younger, in his additions to his grandfather's *Definitiones Medicæ*, makes much the same remark, under the article Σηπτικὴ κοιλίη, when to that expression he subjoins, HIPPOCRATI *libello de ventriculo dicitur ubi fit concoctio, velut cibos concoquens aut putrefaciens*. Now, that the *concoction* of the ancients was a kind of putrefaction, seems probable from hence, that in this state of concoction, the humours are generally thinner, and fitter to pass through the smaller vessels, where they stagnated before. But *resolution* is one great mark of putrefaction. And we often find in the offensiveness of the sweats, or in other excretions consequent on a crisis, evident marks of corruption. The time of resolution or putrefaction depends on the degree of heat, the habit of the patient, and on the part obstructed: hence may arise the variety in the duration of fevers of different kinds, and the uniformity among others that are of a like nature. Resolution is the putrefaction of the impacted humour only, but suppuration implies a corruption of the vessels also. This manner of speaking has been disused, from the prejudice that nothing is putrid but what is offensively so; whereas, in fact, every fibre becoming more tender, and every humour becoming thinner, may be considered as resolved or putrid in some degree; whether the change tends to the better health, or to the destruction of the person, or whether it becomes more grateful, or more offensive to the senses.

* See *An Essay on the Cause of Animal Heat*, by Dr. STEVENSON, in the *Medical Essays*, vol. v. In that treatise, the reader will find some good remarks relating to animal putrefaction.

† Nat. Hist. cent. iv. exper. 330.

of the chemists, having hinted at a putrid fermentation, analogous to what is found in vegetables, and this having so near a connexion with contagion, I made the following experiment for a further illustration of that principle.

EXPERIMENT XVIII.

A THREAD being dipped in the yolk of an egg already putrid, a small portion of it was cut off and put into a phial, with half of the yolk of a new-laid egg diluted with a little water. The other half, with as much water, was put into another phial, and both being corked were set by the fire to putrefy. The result was, that the thread infected the fresh yolk; for the putrefaction was sooner perceived in the phial that contained the thread, than in the other. But this experiment was not repeated.

In this manner the putrefaction of meat may advance quicker in a confined, than in a free air; for as the most putrid parts are also the most volatile, they incessantly issue from a corrupting substance, and are dispersed with the wind; but in a stagnation of the air they remain about the body, and by way of ferment excite it to corruption*.

EXPE-

* *Corpus in putredine existens, (corpori) a putredine libero facillime corruptionem conciliat; quia illud ipsum (corpus) quod in motu intestino jam positum est, alterum quiescens, ad talem motum*

EXPERIMENT XIX.

As to other septics received by authors, I found none of them answer the character. The alkaline salts have been considered as the chief putrefiers; but this is disproved by experiments. Of the volatiles it may indeed be observed, that though they preserve animal substances from the common marks of putrefaction, with a force four times greater than that of sea-salt, yet, in warm infusions, a small quantity of these salts will soften and relax

motum tamen proclive, in eundem motum intestinum facile abripere potest. STAHLII Fundam. Chymix par. ii. tract. i. sect. i. cap. v. In this light STAHL and other celebrated chemists have considered a *putrid ferment*, and generally used the same expression for it. BECCHER (*in Physic. Subterr. lib. i. sect. v. cap. i. n. 34.*) treating of a corrosive putrid substance taken in aliment, says of it, *fermentum universo sanguini imprimi*. And Mr. BOYLE has used the words *fermentation* and *putrefaction* of the blood promiscuously in his piece called *Observations and Experiments on the Human Blood*. But these authors are nevertheless careful not to confound *putrefaction* with *vegetable fermentation*, accounting them only analogous processes; and therefore use the same term to express both the *putrefying* and *fermenting* agent, from the want of more expressive words in the languages in which they wrote. It were to be wished, that, to avoid ambiguity, we had two different words, to denote the exciting cause of these two intestine motions; but this is the less to be expected, on account of the disposition of all putrid animal substances to promote both animal putrefaction, and a vinous fermentation in vegetables, as will appear by the sequel of these experiments.

I have insisted the longer on this point, as I apprehended that my use of the term *ferment* in the preceding Observations might induce some readers to think, that I had endeavoured to revive the exploded doctrine of a fermentation of the blood, like that which takes place among vegetable substances, than which nothing could be more contrary to my intention.

the

the fibres more than water does by itself. They also prevent the coagulation of blood; and when taken by way of medicine, perhaps thin and resolve it; but they are not therefore septics. For so little do these salts putrefy, or even resolve the fibres, when applied dry, that I have kept in a phial a small piece of flesh, preserved with salt of hartshorn only, since the beginning of June last (about five months ago) during which time, though the summer was hotter than usual, it has remained not only sound, but firmer than when it was first salted*.

EXPERIMENT XX.

FROM the specimens we had of the antiscorbutic plants, it is likewise probable that none of that class will prove septic. Horseradish, one of the most acrid, is a powerful antiseptic. And though carrots, turnips, garlic, onions, celery, cabbage, and colewort were tried, as alkalescents, they did not hasten, but retard the putrefaction.

EXPERIMENT XXI.

THE case was somewhat different with such farinaceous vegetables as I examined, *viz.* white bread in water, decoctions of flour, barley, and oatmeal; for these infused with flesh did not oppose its putrefaction; but after that process was somewhat advanced, they checked it by turning sour; and

* This piece of flesh continued uncorrupted above a year after this paper was read at the Society, and then I inspected it no longer.

by a long digestion, the acidity so far prevailed as to overcome the corruption of the flesh, and to generate much air. These phials did not then ill represent the state of weak bowels, in which bread and the mildest grains are converted into so strong an acid, as to prevent the thorough resolution and digestion of animal food*.

EXPERIMENT XXII.

I EXAMINED the powder of *cantharides*, of vipers, and of Russian castor, all animal substances, and therefore most likely to prove septic. The flies were tried both with fresh beef, and with the *serum* of human blood; the vipers, with the former only; but neither of them hastened putrefaction. And as to the castor, it was so far from promoting that process, that an infusion of twelve grains opposed putrefaction more than the standard.

EXPERIMENT XXIII.

AFTER finding no septics where they were most expected, I discovered some which seemed the least likely, *viz.* chalk, the *testacea*, and common salt.

Twenty grains of prepared crabs-eyes were mixed with six drachms of ox's gall and as much water;

* It is to be remarked, that in making this experiment I did not then attend to a fermentation that ensued, and which was the cause of the acidity. This kind of fermentation between animal and vegetable substances, having been hitherto overlooked, shall be set forth in my next paper.

into

into another phial I put nothing but gall and water, in the same quantity with the former; and both being placed in the furnace, the putrefaction began much sooner where the absorbent powder was, than in the other phial. I also infused, in the same furnace, thirty grains of levigated chalk, with the usual quantity of flesh and water*; and having shaken the phial from time to time, I found that the corruption not only began sooner, but rose higher by this mixture; nay, which had never happened before, that in a few days the flesh was resolved into a perfect *mucus*. The experiment was repeated with the same result, which being so extraordinary, I suspected that some corrosive substance had been mixed with the powder; but when for another trial, a lump of common chalk was pounded, I found thirty grains of it as septic as the former. The same powder was compared with an equal quantity of salt of wormwood, and care was taken to shake both the mixtures equally; but after three days warm digestion, the salt had neither tainted nor softened the flesh; whilst the chalk had rotted and consumed that piece which was infused with it. Nor was the septic power of the testaceous powders of the Dispensatory less. But egg-shells, in water, seemed to resist putrefaction, and to preserve the flesh longer than water did without them †.

* *Viz* of flesh two drachms, and of water two ounces.

† The trial was made only with a coarse powder of egg-shells, and not repeated.

EXPERIMENT XXIV.

To try whether the *testacea* would also dissolve vegetable substances, I mixed them with barley and water, and compared that mixture with another of barley and water only. After a long maceration by a fire, the plain water swelled the barley, became mucilaginous and sour; but that with the powder kept the grain to its natural size, and though it softened it, yet produced no mucilage, and did not become acid.

EXPERIMENT XXV.

NOTHING could be more unexpected than to find sea-salt a hastener of putrefaction; but the fact is thus. One drachm of salt preserves two drachms of fresh beef, in two ounces of water, about thirty hours, as to smell uncorrupted, in a heat equal to that of the human body; or, what amounts to the same, this quantity of salt keeps flesh sweet about twenty hours longer than pure water; but half a drachm of salt does not preserve it above two hours longer than water. This experiment has been already mentioned. Now, I have since observed, that 25 grains have little or no antiseptic virtue, and that 10 or 15, or even 20 grains both hasten and heighten the corruption*. It is further to be

* I have endeavoured to ascertain the most putrefying quantity of salt, with this proportion of flesh and water, but have not been able to do it with any accuracy.

remarked, that in warm infusions with these smaller quantities, the salt, instead of hardening the flesh (as it does in a dry form, in brine, or even in strong solutions, such as in our standard) it softens and relaxes its texture more than plain water does; though much less than water with chalk, or water with the testaceous powders.

Several inferences might be drawn from this observation, but I shall only mention one at present. Salt, the indispensable seasoner of animal food, has been supposed to act by an antiseptic quality, correcting the too great tendency of meats to putrefaction; but as it is never taken in aliment beyond the proportion of the corrupting quantities in our experiment, it would seem that salt is subservient to digestion chiefly by its septic virtue, that is, by softening and resolving meats; an action very different from what is commonly imagined †.

† BECCHER is the only author, I know, who has hinted at the resolving quality of sea-salt, and also at its corrosive and putrefying nature, when taken too freely in aliment. *Physic. Subterranean. lib. i. sect. v. cap. i.*

But this septic quality of salt has been sufficiently confirmed by some late experiments upon the luminousness of the sea arising from putrefaction. See *Phil. Transact. vol. lix. p. 466.* This note I have added an. 1770.

It is to be observed, that all these experiments were made with the salt kept here for domestic uses.

PAPER IV.

A continuation of the experiments upon septics. Conjectures about the causes of the decline of putrid diseases. Of the difference between the effects of the testacea and lime-water. A power discovered in putrid animal substances of exciting a vinous fermentation in vegetables. Of what use the saliva is in that process. And the application of these experiments to the theory of digestion.

Read April 25, 1751. **I**T being so prevailing an opinion, that salt resists putrefaction with a power proportioned to its quantity, I did not therefore rely on my first trials, but often repeated the experiments which contradicted that notion, and still found that two drachms of fresh beef, with from five to twenty grains of sea-salt and two ounces of water, putrefied sooner than the same quantity of flesh infused with water only.

EXPERIMENT XXVI.

I. I NEXT inquired whether small portions of other neutral, or alkaline salts, were in like manner septic; but upon examining *tartarus vitriolatus*, *sal Ammoniacus*, nitre, and *sal diureticus*, as also salt of hartshorn and salt of wormwood, I could not

perceive that they were so; though all of them, in weak solutions, were found to soften or resolve the flesh; salt of hartshorn most, and nitre least of any.

2. Nor did sugar at all promote putrefaction. A plain syrup has been said to preserve flesh better than any brine; and the trials which I have made induce me to think that this is true; as also, that weak solutions of sugar are proportionally antiseptic. But, what may be unexpected here, though weak solutions of sugar soon yield to the putrefaction of flesh, yet as soon as an acidity is produced by the fermentation of the sugar, that putrid tendency is either retarded, or entirely overcome. Therefore in sugar, the effects both of the *farinacea* and the salts seem to be united; for as a salt it opposes putrefaction at first, which the *farinacea* do not; and like the *farinacea*, it checks putrefaction after the fermentation begins.

To this antiseptic quality in sugar (which for above a hundred years past has been daily joined in large quantities to other acescent food) we may perhaps attribute some share of the general decline of putrid diseases. For how seldom do we now hear of leprosy †, putrid scurvy, dysenteries, pestilential fevers, and the like distempers, formerly so frequent, and to which those were most subject who used animal food in excess, especially salted

† *Viz.* the *lepra Arabum*.

meats *. No doubt other causes concur, but to enumerate them would be foreign to our present purpose; as well as to mention the inconveniences that, on the other hand, may arise from the immoderate use of such things as too much oppose putrefaction.

3. I likewise repeated the experiments with the *testacea*, and in particular on human blood, and found that crabs-eyes promoted the putrefaction of the *crassamentum*, and likewise that of the *serum*, but the latter not so speedily.

EXPERIMENT XXVII.

1. HAVING a mind to see the action of the *testacea* combined with some antiseptics, I infused half a drachm of the compound powder of contrayerva-root with the usual quantity of flesh and water, and observed that the testaceous part of that composition did sensibly weaken the vegetable, which is one of the strongest antiseptics. For though, upon the whole, the powder did indeed resist putrefaction, yet it was with less efficacy, than if the small portion of the root which enters the composition had been used alone †.

2. To

* Add what is said in the preceding Observations, part iii. ch. vi. § 6.

† The high opinion which some physicians of the last century entertained of the *testacea* was founded on the *hypothesis*, that most diseases proceeded from an acid, not even fevers excepted. Now, though this theory is at present much limited,

2. To this examination of chalk and the *testacea*, were added some experiments upon lime-water, made both of chalk-lime, and oyster-shell-lime (for stone lime is not in use here) and I found, that though flesh infused in either immediatly sent forth a disagreeable smell, as in a common ley, yet it did not become putrid so soon as the standard. So that in this trial lime-water made some resistance to putrefaction, though the materials of which it was made, namely chalk and shells, were both septics. Nevertheless I observed, that when the putrefaction began, it became little less offensive in this than in common water*. And though

yet the practice is still common, at least in acute disorders; some using these powders from custom, and others with a view to neutralize the acids then given, to fit them for entering the lacteals and promoting a *diaphoresis*. Otherwise it does not appear how these absorbents should correct any acrimony, either in the *primæ viæ*, or in the blood. But whatever disputes have arisen about their manner of operating, almost all have agreed in believing them harmless, though from these experiments we may perhaps be led to doubt whether they are so always. I would not however from hence infer, that the *testacea* are only to be given when an acid is to be destroyed; since to cure some diseases, it may be requisite to attenuate the humours, and relax the fibres, by some degree of putrefaction. HIPPOCRATES observes, that a fever is the best remedy for some disorders. And the primary effects of mercurials seem to consist, in some degree, of a septic resolution both of the fibres and humours. Possibly therefore the crisis of some fevers may be hastened, or perfected, by the *testacea*; though I should rather imagine that they were of little consequence in the cure.

* The Rev. Dr. HALES having since made some experiments upon lime-water, confirms what is here said about the little antiseptic quality of shell- or chalk-lime. And though he does not mention his having ever found them act as septics, yet he lays before the Royal Society my account how that may happen; *viz.* whenever the chalk or shells are not sufficiently calcined. *Phil. Transact.* vol. *xlviij.* n. 103.

it has been observed by others, that the water of stone-lime is in some degree constantly antiseptic, yet I think it probable, that the virtues of that medicine do not so much consist in preventing putrefaction, as in checking immoderate acidities and concretions, which may be the cause of various chronic affections.

Thus far I have related my experiments upon substances resisting, and promoting putrefaction; by which it seems probable, that there are a great number of the former, and but few of the latter, though perhaps more than we have yet discovered. In this last part, I have confined my inquiries to such things only as induce putrefaction out of the body; for as to mercury, and certain poisons, which taken into the stomach, or absorbed by the veins, are supposed to act as septics, I purposely omitted them, as not being able to take in so large a field. But I shall add, to what I have already laid before the Society, some other observations upon the corruption of animal substances, which have a near relation to the former, and may not be without their use in medicine.

EXPERIMENT XXVIII.

I MADE several mixtures, each consisting of two drachms of raw beef, as much bread, and an ounce of water; and these being beaten to the consistence of a pulp (as in all the rest of these experiments) were put into close phials, of three or four ounces

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measure, •

measure, and placed in the usual heat of 100 degrees. But in this, and in several of the subsequent experiments, the lamp did not burn the whole night.

1. In a few hours, all these mixtures began to ferment, and continued in that action about two days *. For the most part the fermentation was so strong, especially when the heat was a few degrees above the standard, that if the corks had not sometimes given way, the phials must have burst. The bread and flesh, which at first lay at the bottom, soon rose to the top, and constantly, as the air escaped, let fall some particles that had been buoyed up by that fluid. Thus a sediment was formed resembling lees, whilst the lightest parts or flowers remained on the surface; but the fermentation continuing, these also subsided; and the acid taste and smell of the liquors, after the action ceased, was a farther proof of the preceding fermentation. This change was the more unexpected, as these mixtures, when the motion began, were tending to corruption, and in fact, in a few hours after, became offensive; but the next day, the putrid smell abated, and went quite off before the fermentation ceased.

2. I repeated this experiment often, and with the same success. And to ascertain the part which the animal substance had in producing such effects,

* I found afterwards, that when the phials were left quite open, or so that the air could easily escape, the fermentation was completed in less than half that time.

I made

I made mixtures of bread and water only; but these stood several days in the furnace without any sign of fermentation.

3. To two drachms of fresh meat, I added double the quantity of bread, and water in proportion; and having placed that mixture in the furnace, I found the fermentation proceed as before, and with no other difference than that of producing a purer acid.

4. To the same quantity of flesh and an ounce of water, was added only half a drachm of bread; but a fermentation nevertheless ensued, and the liquor became acid to the taste, but with the smell of rank cheese.

5. Another variation was made with flesh and oatmeal, instead of bread; and the effects were only different in a higher degree of fermentation, as the oatmeal had not undergone that process before.

6. I tried whether oatmeal and water would ferment alone; but though they did, the action was not nearly so strong as when an animal substance was added.

7. Experiments were also made with bread and roasted meat, with similar effects; for though the putrefaction was but just discernible, and the generation of air was much less than in the first experiment, yet the fermentation was complete, and the mixtures became acid.

8. I varied the quantity, taking of roasted meat and bread each an ounce, with about two ounces of water. This mixture being poured into a phial and corked, was left in a room with a fire, where the thermometer rose no higher than about 65 degrees. Here the fermentation began late, and proceeded slowly; but, what was observable, it no sooner commenced, than the mixture, without ever becoming putrid, acquired a vinous smell like that of other fermenting liquors, and towards the end the usual acid taste and smell succeeded.

9. I mixed half an ounce of bread with an ounce and a half of water, and a small portion of the *crassamentum* of human blood already putrid; and setting this mixture in the furnace, in a close phial, I observed a strong fermentation some hours after.

10. I discovered the same quality in sheep's gall. For having put two drachms of bread, with half an ounce of that liquor, into a phial, and placed it in the furnace, I perceived that this mixture, the next day, generated air as in the former experiments. The fermentation continued for two days; in which time the gall began to putrefy, but recovered afterwards; so that on the sixth day it seemed to be as uncorrupted as on the first, without becoming acid.

From all these experiments it seems probable, that all animal substances putrid or tending to putrefaction

trefaction are endowed with a power of raising a fermentation in the *farinacea*, and even of renewing that action in such as have undergone some degree of it before.

11. After such mixtures become sour, they never return to a putrid state, but on the contrary grow more and more acid, and to such a degree, that I compared one of them (which consisted of raw meat and bread, of each two drachms, and of an ounce of water) with a like mixture, to which were added in the beginning ten drops of the weaker spirit of vitriol; and after both had stood some days in the furnace, I found them to the taste equally acid. To account for this, we must observe, that the addition of so strong an acid preventing fermentation, the last mixture had no more acidity than what was given to it at first by the spirit.

12. I have also observed, that the acid arising from these processes has something of an austere and saltish taste, but without any offensive smell, unless the phials are kept close during the fermentation: in that case the smell is like that of sour milk, or lean cheese.

Now, considering how much air is generated, and how sour these mixtures are made by fermentation, it may seem strange that the same materials, used as food, should make so little disturbance in the body. And the difficulty would be the greater,

greater, did the *saliva*, as some suppose, promote both fermentation and putrefaction*.

EXPERIMENT XXIX.

To ascertain the effects of the *saliva* in digestion, I added a small portion of it to some raw beef pulped, and observed that this mixture, in the usual heat, putrefied slower than another which had no *saliva* joined to it.

EXPERIMENT XXX.

I. I TOOK two drachms of fresh meat, the same quantity of bread, and an ounce of water, and to these added as much *saliva* as I supposed necessary for digestion. This mixture being beaten in a mortar was put into a close phial, and set in the furnace, where it remained about two days with scarce any visible fermentation; but on the third day that action became manifest. At that time I found the bread and flesh risen in the water, a sedi-

* The *saliva* is ranked by the celebrated STAHL among those substances which are proper to excite a vegetable fermentation. *Vid. Fundam. Chym. part. ii. tract. i. sect. i. cap. v.* And the same opinion has generally prevailed, as I imagine, from this circumstance: a traveller gives an account of a strange method of making a vinous liquor, in use among one of the Indian nations; that is, by first chewing the fruit, or grain, before they put them to ferment. But all that can be inferred from hence, is, that the *saliva*, without bringing on the fermentation sooner, may make it more equable and moderate after it begins, as in our experiments: and this may be a necessary circumstance for conducting that process in a hot climate.

ment

ment nevertheless forming, and bubbles of air continually mounting from it: in a word, the fermentation was complete, being also distinguished by a vinous smell, as in ordinary working liquors. The action continued above twice as long as when no *saliva* was used, and it was more moderate, and generated air with less tumult. When the fermentation intirely ceased, the mixture had a pure acid taste, though weaker than what was produced in the former experiments; and I took notice that it had no putrid smell from the beginning.

2. I likewise varied this experiment as I had done the first, by using roasted meat instead of raw, and sometimes oatmeal instead of bread; but the result was still the same. One circumstance may deserve particular notice: an ounce of bread, as much roasted meat, about two ounces of water, and a small quantity of the *saliva*, being beaten together, were allowed to ferment in a heat of sixty-five degrees; and having examined the phial with a thermometer, I found it about three degrees warmer than the external air*.

* It is probable, that in a fermentation of this kind the heat, to a certain degree, increases in proportion to the quantity of the mixture. In so small a quantity, I doubt whether either vegetable substances fermenting, or animal corrupting, separately, would raise any perceptible degree of heat; though vegetables alone are capable of acquiring an intense heat (so indeed as to break out into a flame) if laid in a great heap, compressed and kept moist. But in that case, a putrefaction beginning, the fermentation is carried on between the septic and the acescent parts, exactly as in the experiment above.

From

From these last experiments it appears, that if the *saliva* is found, in a sufficient quantity, and well mixed with the aliment, it is qualified for retarding putrefaction, preventing immoderate fermentation, flatulence, and acidity in the *primæ viæ*. But if that humour is deficient, unfound, or not sufficiently mixed with what is swallowed, that the aliment may first putrefy, then grow acid, and in that action ferment strongly, and in the stomach and bowels generate much air.



P A P E R V.

Experiments and remarks on the fermentation of vegetables, by means of putrid animal substances, continued. An austere acid produced by such fermentations. The probability that most vegetables are fermentable; not excepting the acrid, antiscorbutic or alkalescent class. Of the fermentation of milk. How far the aliment ferments in the stomach. Of the use of the saliva in alimentary fermentation. Of various causes of indigestion. Of the cause and cure of the heart-burn. And from what cause a sourness of the stomach proceeds.

Read, June 20. 1751. **I**N my last paper, I gave an account of some observations which I had made upon the fermentation of the *farinacea*, excited by animal substances, but not having then finished that subject, I shall now lay before the Society a few more experiments relating thereto.

E X P E R I M E N T XXXI.

AFTER having seen the effects of the fresh *saliva*, both in keeping up and moderating fermentation, I was desirous of knowing its qualities when putrid. For this purpose having collected a sufficient quantity, I kept it about three days in the furnace,

nace*, and then added the usual proportion of it to the common mixtures of bread, flesh and water; and this not only brought on the fermentation sooner, but made it stronger and more productive of air, than would have happened without the *saliva*. The flesh became also more than usually putrid, but at last it was sweetened by means of the fermentation; so that by the time the action ceased, the contents of the phial smelled and tasted sour, without any remains of putrefaction.

From this experiment we find it still more probable, that animal substances have a power (in proportion to their degree of corruption) of exciting a fermentation in the common *farinacea*.

EXPERIMENT XXXII.

I TOOK two drachms of a fresh mackarel skinned, with an equal quantity of bread, and having reduced them to the usual consistence with an ounce

* *Viz.* Blood-warm, or about 100 degrees of FAHRENHEIT'S thermometer; and the same degree of heat is to be understood as used in the rest of these experiments, unless when it is otherwise expressed.

Dr. ALSTON not attending to the note above (which stands in all the editions of this work) in his first Dissertation on Quicklime contradicts the result of one of my experiments, from some that he himself had made only in the common air, at Edinburgh, in the end of April and beginning of May; alleging that I had not specified the degree of heat which I had used in my experiments upon the same substance.

of

of water, I placed them in the furnace; together with another phial containing the like mixture, but with the addition of fresh *saliva*; and a third, with the same quantities of fresh beef, bread and water only, with which the two former were to be compared. In less than five hours after infusion, the materials in all the phials began to rise, to float in the water, and to ferment; and during the whole process I perceived no difference between the fermentation occasioned by the fish, and by the flesh, except that the phials with the former retained the corrupted smell the longest. But next day, the fermentation still subsisting, the acid smell was to be distinguished in all the phials; and on the fourth day (the corks having been drawn the night before) I was scarce sensible of any difference between the first and the third (or standard phial) either as to taste or smell, and both were very acid. But the liquor in the second phial was not so sour, and it yielded such a vinous smell as was taken notice of before, when the fresh *saliva* was added to the common mixture with the beef †.

Having therefore discovered, in this instance, such an exact agreement between the powers of fish and of flesh in causing fermentation, and presuming that all fish possessed more or less of the same quality, I did not repeat the experiment with any other sort. For though I was sensible, that for the better regulation of diet, and rightly under-

† Exper. xxx.

standing the different effects of different animals in food, it might be proper to examine, in this manner, many of the individuals, and to observe which of them were more, or less apt to cause fermentation, and produce more or less of an acid; yet as such experiments would have taken up too much time, I omitted them for the present, and pursued the general point, of inquiring how extensive this principle, of exciting fermentation, was among other animal substances.

EXPERIMENT XXXIII.

I THEREFORE made a trial with the yolks of new-laid eggs. One of those I mixed with two drachms of white bread and an ounce of water; and another, with the same proportion of bread and water, to which I added some *saliva*. But though both phials were kept four days in the furnace, yet I could perceive no marks of fermentation, or any tendency to putrefaction in either. Whereupon recollecting M. *de* REAUMUR's observation, about the slow putrefaction of unimpregnated eggs, I concluded that either these two happened to be so, and therefore resisted putrefaction so much the longer; or, which was most likely, that by a small degree of acidity in the bread, they had been wholly preserved from corrupting, and of course from fermenting too. So that this experiment ought to make no exception to the general principle, that all animal substances, upon putrefying, excite a fermentation in the *farinacea*.

EXPERIMENT XXXIV.

HAVING remarked, that the liquor produced by all the fermentations had not only a sour but an austere taste, in order to be sure that this did not proceed from alum (which the bakers have been accused of mixing with their loaf-bread) I made a like trial with sea-biscuit; but that yielded the same kind of astringent acid as the other; and, as I remember, oatmeal afforded an acid little different from the rest.

As I have now shewn how fermentable some of the *farinacea* are, by means of corrupted animal substances, and how probable it is, that the rest of that class agree in the same quality with the specimens, I shall next relate some experiments which I made upon vegetables of a different kind.

EXPERIMENT XXXV.

INTO one phial, I put two drachms of fresh beef, with a handful of new-cut spinage, and two ounces of water. Into another, the same quantity of flesh, half an ounce of boiled spinage, and between two or three ounces of water. In a third phial, was the same weight of the meat, with half an ounce of fresh asparagus, and two ounces of water. In a fourth, was the like mixture, but with the asparagus boiled. The fifth contained the same quantity of beef, with a small handful of garden scurvy-grass, and two ounces of water. The sixth and last phial served for a standard, with a mixture of beef, bread

and water only. All these were reduced to a pulp as usual.

In less than five hours after placing them in the furnace, I found, not only the standard, but the contents of the two phials with the asparagus in a fermenting state. The motion was particularly brisk in that with the raw plant; but in both, the fermentation went higher, and generated more air than the standard. In other respects the action was the same; for the flesh acquired at first a putrid smell, and afterwards lost it; and the next day, or about thirty hours after infusion, the acid prevailed; which, though considerably less than that of the standard, yet was sufficient for curdling milk. But the greatest difference between the fermentation of the asparagus, and that of the bread, lay in this, that after the bread-mixture became sour, it remained so; whereas the acidity in the asparagus-mixture was so weak, that in two or three days afterwards, it was intirely overcome by the corruption of the meat.

The process with the spinage was little different: it fermented about an hour later than the standard, and the raw plant somewhat later than the boiled. The fermentation of both was more moderate than either that with the asparagus, or bread; less air being generated, and in a less tumultuous manner. At the same time that the standard became acid, this change was also distinguishable in the phials with the spinage, by its curdling milk; but after
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this period, as was remarked of the asparagus, both the spinage mixtures became putrid.

The scurvy-grass also fermented, and as early as the standard, but more moderately and with less flatulence. Its acid was ascertained by the same test with the former, *viz.* by curdling milk; but herein it differed, that after this change it continued to preserve the meat longer from corruption. Hence it appears, that though this plant is without any manifest acid, it is nevertheless a pretty strong resister of putrefaction.

My attention was the more engaged in this process, as the scurvy-grass is of a class supposed unfermentable; and for that reason I repeated the experiment, but with the same result. And since these trials agree with what has been long observed of the virtues of this plant, in the marine or marsh-scurvy, it may therefore seem improperly ranked with such medicines as correct acidities, and promote putrefaction*. As for the asparagus and spinage, though they contain but a weak acid, yet being fermentable, and in some degree resisters of putrefaction, neither can they be deemed septic, but, at most, vegetables of easy corruption. The readiness with which the asparagus ferments seems to correspond with the quickness of its diges-

* The sea- or marsh-scurvy appears to proceed from a putrid acrimony; as the livid blotches, offensive breath, and resolution both of the blood and fibres testify.

tion in the stomach. For from all the experiments which I have made, I am induced to think, that such vegetables as are of the easiest digestion will fall into the speediest fermentation in a blood-warm furnace. Yet excepting these mentioned, I have made trial of no other esculent plants since I discovered their property of fermenting with corrupted flesh. But I remember, that when for some other intention, I had once made a pulp of flesh, water, and turnip, and left it in the furnace, without minding it for two or three days, the liquor then tasted sour; which I presume would not have happened without a previous fermentation. Hence I conjecture, that all the alimentary plants, which are not too bitter, or too spicy, will ferment much in the same manner with those mentioned: and I am almost confirmed in this opinion by the following experiment.

EXPERIMENT XXXVI.

1. To an ounce of new-milk were added some drops of the *crassamentum* of human blood resolved by putrefaction; and the phial with this mixture being exposed to the usual heat of an hundred degrees, in a few hours the contents fermented. The intestine motion was considerable, much air was separated, and an acid was produced, which curdled the milk, and corrected the putrid smell.

2. The

2. The experiment was repeated with four ounces of milk, and about two drachms of the corrupted blood; and after six or seven hours quiet infusion, a strong fermentation ensued, by which the glass stopper was forced out, and the froth came over, though the bottle was little more than half full. Now, since milk may be considered as the juice of grass and various other vegetables, but little assimilated into an animal nature, we may from hence judge how prone all vegetables are to ferment with any thing putrid.

There being so great a similarity between the contents of the phials, in most of these experiments, and the aliment in digestion, it is scarce to be doubted, that a fermentation is begun in the stomach, as often as there is any animal substance to serve for a ferment, and vegetables to be fermented.

That the aliment ferments in the stomach, has been the opinion of some of the ancients as well as the moderns; but as till now, it was not known what share animal substances, beginning to putrefy, had in promoting that process, and that a mixture of animal and vegetable food spontaneously fermented, it is no wonder that their theory was wholly rejected by some, and admitted by others with many restrictions. Nor will I infer from these experiments, that this fermentation is either universal or indispensable, since many live better on a vegetable, than on an animal diet. And though in such cases

the vegetables may be supposed to ferment with the *saliva*, it is plain that this action must be inconsiderable, or at least fall short of what results from an addition of animal food. But then we may observe, that without milk vegetables alone afford but a poor nourishment; and that such as join milk to their vegetables have therein an animal fluid in some degree already prepared. Again, that those with whom a vegetable diet best agrees, are either of a hectic, or a scorbutic, that is, of a putrid habit; in which condition the *saliva*, being in a corrupted state, may induce that change upon the aliment, which, in better health, would be effectuated by the beginning putrefaction of animal food in the stomach. Without these circumstances, a vegetable diet will be digested most easily by those who by hard labour are able to subdue the viscosity of unfermented chyle. This is the case of the common people in the poorer countries, who subsist chiefly on the *farinacea*, and eat no flesh. But whenever such, by age or infirmity, are obliged to leave off work, they become subject to indigestions; and if they have not milk and fermented bread, seem to be less healthy, and are shorter lived, than those who are nourished on a mixture of animal and vegetable substances.

It has been remarked, that the fermentation begins in the phials between four and five hours after infusion; but this we are to understand of the manifest fermentation only; for as to the insensible working of those mixtures, it must be allowed

to take place much sooner, and probably from the very time they are first set in the furnace. Agreeably to this notion, we presume that after every meal a fermentation is begun, and is so far carried on in the *primæ viæ*, that before the chyle enters the lacteals, its particles become as disunited, and the air as much loosened as in the phials, when the bread and flesh first change their specific gravity and float in the water. But we do not pretend, that in a natural state this ever rises to a vinous or an acetous fermentation, being assured that the chyle is admitted into the blood before it undergoes so considerable an alteration.

We have seen the use of the *saliva* in moderating fermentation and continuing it longer, and also in checking the too great propensity of animal substances to putrefaction, and that of vegetables to acidity. Now, when the *saliva* is found, and in sufficient quantity, the aliment well prepared, and not too much of it, the fermentation passes without any tumult, and generates but little air. But in surfeits, or upon swallowing without due mastication; when meats are tough, or fat, or eaten with farinaceous substances unfermented; or when by any accident the *saliva* is vitiated, too small in quantity, or not intimately mixed with the food, the fermentation becomes tumultuous, the stomach swells with air; and this great commotion being attended with an unusual heat, brings on that uneasiness called the *heart-burn*. And as in the experiments,

experiments, a certain quantity of the *saliva* was found requisite for keeping the fermentation within bounds, so in practice we find, that whatever promotes a greater secretion of that humour, or helps to mix it with what we eat, is the best remedy for that indigestion.

3. If an oily substance is added to the common mixture, a stronger fermentation ensues; which cannot be moderated by the usual proportion of the *saliva*, till some fixed alkaline salt be added (suppose that of wormwood) as I found upon trial. And as I have also observed, that those salts will, without the *saliva*, not only suddenly check the high fermentation in the phials, but likewise suppress it for some time, it is no wonder that they should be so sure and speedy a remedy in the heart-burn; as they not only render the *saliva* more saponaceous, but suspend the fermentation till more of that humour can be secreted, and mixed with the aliment.

The theory resulting from these experiments may help to account for other disorders of the stomach; but I shall attempt to explain only one more at this time; which is the *sourness* of the stomach, from a liquor sometimes so acrid as to excoriate the throat, and to set the teeth on edge. In order to learn the cause of this extraordinary acidity, I made various experiments upon our common food; and among others, I made several infusions of bread in water, in different proportions,

tions; which after keeping some days blood-warm in the furnace, became but little acid, and still less so when the *saliva* was added. And as to flesh, so far is it from turning sour, when alone with water, that its corruption seems directly opposed to acidity. Nevertheless it is certain, that many will suffer from an acid, though living on flesh, bread and water only. Now, from the common theory of digestion, we should hardly be able to account for this matter; but easily from this principle of fermentation; by which we find, that not only a strong, but an austere acid, may be produced from these very materials, as often as the stomach is relaxed, or any way disabled from conveying the whole aliment into the intestines: for what is left in the stomach having time to undergo a complete fermentation, is thereby changed into a harsh sort of vinegar.



P A P E R VI.

Experiments upon substances hastening, retarding, increasing, and diminishing alimentary fermentation; with remarks upon their use in explaining the action of digestion, and shewing how that may be occasionally assisted by acids, bitters, aromatics, wine, &c. What substances come nearest to the saliva in its digestive quality; and how those are to be varied according to the habit. Of the difference between the action of the bile and that of common bitters. Sea-salt, in different quantities, either promotes or retards alimentary fermentation; but the other septics always hasten that process. In what properties the testacea, lime-water, and the fixed alkaline salts agree, and differ. What aliments are the easiest, and what the hardest of digestion.

Read October 31, 1751. **H**AVING, in the two preceding papers, laid before the Society some experiments setting forth the general fermentation of alimentary vegetables, by means of animal substances tending to putrefaction, or already putrid, I shall now finish that part of my subject, by reciting some others which I have made upon bodies, which either hasten, or retard, increase, or diminish that process; and I shall endeavour, as before, to apply those experiments to medicine.

EXPERIMENT XXXVII.

1. To two drachms of fresh beef, and as much bread, were added red port-wine and water, of each half an ounce. To the same quantity of bread and flesh, in another phial, was put an ounce of common small beer. In the third phial, the bread and flesh were diluted with an ounce of water, acidulated with a few drops of the spirit of vitriol. And in a fourth phial, were the same materials; only, instead of the spirit of vitriol, I put two drachms of the acid liquor arising from a fermentation of bread, flesh, and water. All these mixtures being reduced to the usual consistence, were set in the furnace, where they remained three days, without generating air, or affording any signs of fermentation. But two tea-spoonfuls of rum being added to the common mixture, retarded fermentation for some hours only: perhaps a double or triple quantity would have wholly suppressed it.

2. In one of the common mixtures were infused five grains of the *species aromaticæ* of the London Dispensatory; in another, ten grains of cumminseed; a third, had half a drachm of the raspings of the wood saffrafras; a fourth, five grains of saffron; a fifth, five grains of gum-myrrh; and a sixth, five grains of aloes. In the two last, the substances were dissolved; but in all the rest, the infusions were made in boiling water, and when cool, added to the bread and flesh beaten to a pulp, as in the former

former experiments. Besides these, another phial with the common mixture was prepared for a standard, with which the rest were to be compared, in relation to the manner, time, and degree of their fermentation. Matters being thus disposed, and the phials placed in the furnace, I observed the fermentation to begin in them all much later than in the standard, that with the saffrafas excepted; but with this difference among them, that the mixtures with the aromatics, especially that with the saffrafas, fermented strongly and generated more air than the standard, whilst those with the saffron, myrrh, and aloes, fermented slower, and were less flatulent.

3. In the same manner I examined the tops of wormwood, and the lesser centaury, camomile-flowers, gentian-root, and green tea; making moderate infusions of all except the last, which was strong; and I perceived that these also retarded fermentation considerably (the camomile and wormwood most) and that all of them, like the former bitters, moderated the fermentation; though none of them nearly so much as the *saliva*.

4. I found the same effect in strained decoctions of the wild valerian-root, and of the Peruvian bark. But when the decoction of the latter was left unstrained (*i. e.* with more of the substance in it) the fermentation became then much higher than in the standard. Whereupon recollecting the like high fermentation of saffrafas, and what is said of
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the fermentation of the Thames-water, in oaken casks *, I imputed these greater commotions to the aptness which all wood has to increase fermentation, when infused with any thing putrid. But however that may be, it is likely that this fermenting quality of the Bark is the cause of its disagreement with weak stomachs, when taken in substance and in large doses.

5. In like manner I examined horseradish, mustard-seed, and garden scurvy-grass, as specimens of the hot alkalescent plants, and observed that the first, like the bitters, suspended the fermentation long; the mustard, a little while; but the scurvy-grass, not at all. And I took notice, that these mixtures not only fermented more moderately than the standard, but also less than any of the substances before mentioned; and therein approached nearer to the nature of the *saliva* than any thing yet tried. Finally, I observed both of the bitter and acrid plants, that after a complete fermentation, the acid thereby produced was sensibly milder than that in the standard.

* The aptness in the Thames-water first to ferment, and then to become pure, in long voyages, is well known and admired; but it is probable that this quality is owing to nothing but the great quantity of putrid matter with which it is impregnated at the place where it is taken up, *viz.* a little below London-bridge. As I have never heard of this, or of any other water, fermenting but in wooden vessels, we may conclude that a vegetable juice is a necessary ingredient. Oaken casks are particularly noted for promoting the fermentation of common vinous liquors.

From

From these experiments it seems probable, that spirits, acids, bitters, aromatics, and the hotter antiscorbutic plants retard fermentation by their power of correcting putrefaction; and that since putrefaction and fermentation are such requisites in digestion, whatever opposes those processes must be contrary to that action. But as by means either of putrid *saliva*, or from a defect of that humour, the aliment may ferment too strongly; or from a debility of the stomach, the food may be detained too long in it, and ferment too much, the acids, bitters, aromatics, wines, &c. may have their several uses; some for checking immoderate fermentation, and others for bracing the stomach, and enabling it to expel its contents in due time.

Fermentation being wholly suppressed in the phials by small-beer, wine, and acids, may seem to prove that this process would not take place in the stomach during the free use of such liquors. But here we must observe, that the experiments mentioned were made without any *saliva*; for when the trials were renewed with a sufficient quantity of that humour, the same materials then fermented well, and only somewhat later than in the standard. Again, when the putrid *saliva* was used, so far were the acids from being of disservice, that they were plainly instrumental in preventing the more violent fermentations, which that corrupted humour would have otherwise produced.

But

But whenever the recent *saliva* was overpowered by the acid, the fermentation was then to be promoted by correcting that acid, either by an alkaline salt, or by the testaceous powders.

Do not these facts correspond with digestion? For the most nourishing and digestible food, to people in health, consists of a due mixture of animal and vegetable substances with water. Scorbutic or putrid habits require acids, wine, or other antiseptics. An acid abounding in the stomach is corrected by absorbents; and in a want of natural heat, or in a debility of the stomach, wines, bitters, warm and acrid substances become necessary for bracing and stimulating the fibres.

Since one great use of the *saliva* is to moderate fermentation, it is probable that such substances as resemble it most in this quality will prove the best stomachics, upon the failure of that humour. Of this class are acids, spirits, and bitters; but seeing that all these much retard, as well as moderate fermentation, they may be frequently less proper than some of the antiscorbutics, which, as we observed, stopped fermentation little, and yet kept it most within bounds †. And as to the aromatics, however assisting they may be in digestion, by their heat and *stimulus*, they promise less of a carminative quality, than either the bitters or antiscorbutics, in as much as they are more disposed to

† Such as mustard and garden scurvy-grass. See page 68.

increase than to moderate fermentation, and consequently to produce air, instead of suppressing it.

EXPERIMENT XXXVIII.

BEING desirous of comparing the effects of bile with those of bitter plants, I made trials with fresh sheep's gall, but found the result different from the common opinion, about the agreement between an animal and vegetable bitter. For having added a portion of the gall to a mixture of flesh, bread and water, and made a standard of a like mixture without the gall, I perceived the fermentation to begin in both about the same time, but to be much stronger and more tumultuous in the former than in the latter. Nay, so little was the gall disposed to restrain fermentation, that without any other animal substance it fermented with bread and water only, as mentioned in a former paper. Now, since vegetable bitters are antiseptic, retarders, and moderators of fermentation, they must therefore influence digestion very differently from the bile, which is possessed of all the opposite qualities. This being the case, we cannot be surpris'd at finding digestion so little mended in the jaundice by bitters, which are commonly given to supply the defect of the gall. Yet there is one quality in which the animal and the vegetable bitters may agree, *viz.* that of correcting acidity; for I took notice, that though the bilious mixtures lost their usual rankness, acquired in the beginning of

the fermentation, yet they never smelled nor tasted sour after it had ceased.

EXPERIMENT XXXIX.

UPON adding sea-salt to the common mixture, I observed, that the same quantity, which proved septic in the former experiments, made the fermentation begin sooner here than in the standard; but that a larger quantity retarded it. Thus, two drachms of bread, with as much flesh, two ounces of water, and ten grains of sea-salt, fermented somewhat sooner than a like mixture without salt; but when the salt was increased to half a drachm, the fermentation came on later than usual.

But salt of wormwood, and ley of tartar, always retarded fermentation, and that in proportion to their quantity. I tried no other salt, being persuaded that all the rest (in any proportion) would resist fermentation, as being all thoroughly antiseptic.

EXPERIMENT XL.

A FEW grains of prepared crabs-eyes, added to the common mixture, brought on the fermentation above half an hour before the standard, and made it greater. The flesh also became ranker than usual; yet it was at last sweetened by the acid produced in this process. But when twenty, or thirty grains of the powder were used, the fermentation came on still earlier and was more violent,

and the flesh becoming once putrid, never recovered its sweetness.

The effects of lime-water were different, as it neither hastened the fermentation, nor made it so strong as above; the motion however was brisk, and when it ceased, the liquor was neither acid nor putrid, but had an agreeable smell like that of new bread.

Thus, the *testacea*, lime-water, and fixed alkaline salts, agree in some things, but differ in others. For both putrefaction and fermentation are resisted by the salts, but promoted by the *testacea*; whereas lime-water neither retards fermentation, like the lixivial salts, nor hastens it, nor makes it so violent as the *testacea* do; and being at the same time somewhat astringent, becomes a good medicine for weak stomachs with a predominating acid; as several have experienced who were subject to the gout, gravel, and other chronic diseases, seemingly depending on that cause.

EXPERIMENT XLI.

ALIMENTARY animal substances, tending to putrefaction, are all likewise promoters of fermentation, so far as I have inquired. Thus, flesh kept till it becomes tender, though still sweet, is a readier ferment than the same kind used quite fresh. But though the fermentation is, by the keeping, sooner excited, yet it does not thereby become
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the stronger. Flesh pounded in a mortar ferments sooner, and with less tumult, than the same does in a lump, or not thoroughly bruised; and raw meat ferments less quietly than roasted. All which circumstances are agreeable to common observation, to wit, that meats are better digested when kept till they are tender, when well dressed, and sufficiently chewed; and seem to prove, that whatever is slow to corrupt, will, *cæteris paribus*, also sit heavy on the stomach.

Of all animal substances, eggs are among the slowest to corrupt, and of course are among the slowest to excite fermentation. Hence a new-laid egg, for its bulk, should be of all tender animal food among the heaviest; and yet the same substance, from another theory, respecting the nutrition of the chick only, has been thought the lightest of any.



P A P E R VII.

Experiments and remarks upon the putrefaction of blood, and other animal substances. Of the nature of the inflammatory crust or the sily part of the blood. Of the fecal acid. Uses drawn from observing the colours of corrupted blood. Of the nature of purulent matter. The resolution of the blood, the relaxation of the fibres, and the emission of air, are the consequences of putrefaction: hence several symptoms of putrid diseases accounted for. The marrow not soon corruptible. The blood may become sensibly putrid whilst the animal lives. The different action of alkaline salts, and of putrid substances, upon the nerves. That there is but one species of the true Scurvy; and that this arises from putrefaction.

Read Feb. 23, 1752. **H**AVING in my last paper finished that part of my subject, which relates to the vinous fermentation of vegetables excited by a putrid ferment, I shall conclude the whole with subjoining a few experiments made upon the putrefaction both of the blood and of the more solid parts of the body, with a view to clear up some other points in the theory of medicine.

E X P E R I M E N T XLII.

A PORTION of blood, taken from a man ill of a pleurisy, was divided into the inflammatory crust *,

* *Viz.* that part of the blood, which M. DE SENAC calls *la matiere blanche qui se coagule d'elle même.* Structure du Cœur, tom. ii. p. 91.

the *crassamentum*, and the *serum*. These were put into different phials, of a larger size (so as to contain a good deal of air) and being corked, were placed in the furnace, heated to the common standard, *viz.* 100 degrees of FAHRENHEIT'S thermometer. In twelve or fourteen hours the crust began to corrupt, the *crassamentum* held out a few hours longer, but the *serum* continued near four times longer than this last without any offensive mark of putrefaction. This experiment was repeated with some fresh pleuritic blood taken from another person, and with the like success.

2. Another time having procured blood with a thick inflammatory crust, I separated that part of it from the rest, and dividing it into two, I exposed one piece to the air, in a room; and the other I kept in a faucer, and covered it with a cup. The experiment was made in summer, and I observed, that the former piece (which at first weighed two drachms) lost half of its weight in twenty-four hours, by evaporation only; and that in two days more, the whole was reduced to a thin pellicle; but that the covered portion, in a few days, ran *per deliquium*; whilst one part of the *crassamentum* (that had likewise been left to evaporate, but upon the outside of a window) formed itself into a thick cake; and the rest of that substance, which had been kept in a close phial, retained for some weeks a considerable degree of cohesion.

The inflammatory crust being therefore so soluble, volatile, and corruptible, may we not conclude that it contains a greater quantity of septic particles than any other part of the blood? How this comes to pass, I shall offer my conjecture.

Whether inflammatory fevers are first brought on by the obstruction of the pores of the skin, or from some other cause, has been a question; though it has scarce been doubted, that a stoppage of perspiration is, at least, the consequence of such fevers; and therefore it follows, that in either case, the most corrupted particles must be retained, at a time, when from a greater degree of heat, the humours are most disposed to putrefaction. But when after bleeding, the blood is allowed to stand till the homogeneous parts have time to unite, the perspirable and septic matter immediately flies off from the *serum*, as least viscous, but adheres to the *crassamentum*, and is still more entangled in the fizy or glutinous portion of the blood that rises to the surface.

EXPERIMENT XLIII.

MINERAL acids being such powerful antiseptics, I was desirous to see their effects upon substances already putrid. For this purpose, I dropped some spirit of vitriol both upon a bit of corrupted beef, and upon the *crassamentum* of human blood, also putrid, and I observed, that this acid, instead of abating the *fætor*, rather increased it; so that by
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this addition it became stercoraceous, or acquired such a smell as arises upon the precipitation of sulphur (by an acid) in a lixivial *menstruum* *.

Having repeated the experiment both with the spirit of sea-salt, and vinegar, with the same result, I from thence began to conjecture, that the *effluvia* issuing from corrupted substances consist chiefly of the *phlogiston* † or sulphur-principle; since these *effluvia* so readily unite with, and volatilize the acids, as appears by the increase and particular change of the smell. But it will be proper to remark, that from a simple putrid substance, the *phlogiston* does not rise alone, but united with the saline parts of the body. For the *phlogiston*, when single, is perhaps imperceptible to the smell; and when divested of these salts, is never, so far as we know, pestilential. So that the deleterious particles of putrid substances seem to consist of a certain combination of the sulphureous with the saline principle, which not only becomes the most irritating *stimulus* to the nerves, but acts upon the humours as a ferment, in promoting their corruption.

* Sciendum vero, sulphur solutum alcalicis, dein misto acido, præcipitari, albescere, *fætorem ingratißimum putrefactorum excrementorum* exhibere . . . Si tincturæ aureæ sulphuris acetum instillas, mox *fætor* prodit *stercoreus* ex præcipitato sulphure. BOERHAAVE *Element. Chem. tom. ii. proc. clix.*

† Materiam et principium ignis, non ipsum ignem, ego *phlogiston* appellari cœpi; nempe primum ignescibile, inflammabile, directe atque eminenter ad calorem suscipiendum atque fovendum habile principium. STAHLII *Fundam. Theor. BECCHERIAN.*

From

From the same experiment it seems likewise probable, that the *faeces alvinæ*, to which this mixture (made between the putrid substance and an acid) has a near affinity, are compounded of some strong acid and corrupted matter; and consequently, that in a natural state the *faeces* are little, if at all, infectious; which could not happen were they wholly putrid*.

EXPERIMENT XLIV.

AFTER the acid was added, in the manner described in the last experiment, I attempted to restore those substances to their former putrid state, by an alkaline salt. But upon instilling the ley of tartar (which was followed by the usual effervescence) I perceived that the mixture became thereby much less offensive, than when the putrid substance was either alone, or joined to the acid; a circumstance which I did not expect. But from hence perhaps we may be able to account for the virtues of the saline draughts of RIVERIUS, taken in the act of effervescence, and first recommended by that author in vomitings incident to pestilential fevers †.

EXPERIMENT XLV.

In order to examine the colour of the different parts of corrupted blood, I procured a fresh

* See the preceding Observations, p. 336.

† Cap. de Feb. Pestilent.

quantity without any inflammatory crust, and divided it into the *crassamentum*, the *serum*, with a few red globules that fell to the bottom, and the pure *serum*. The phials containing these several substances were set in the furnace, where they stood some days till they became thoroughly putrid.

The *crassamentum* changed from a deep crimson to a dark livid colour; so that when any portion of this was diluted with water, it appeared of a tawny hue. Of the same colour was that *serum* in which the red globules had been dissolved. But the pure *serum*, after becoming turbid, dropped a white purulent sediment, and changed into a faint olive-green.

From this experiment it should seem, that the *ichor* of sores, and that of dysenteric fluxes, consists of the *serum* tinged with a small quantity of red blood putrefied; and that when the serous vessels are of a tawny cast, we are not always to refer that colour to inflammation, but to a solution of some of the red globules mixed with the *serum*. An instance of this may be seen in the colour of the white of the eye, in putrid scurvies, and in the advanced state of the hospital-fever. At such times, not only the *serum* of blood drawn from a vein, and that which oozes from a blister, but even the *saliva* and sweat will be tinged in the like manner †.

† See the preceding Observations, page 197.

To the recent urine of a person in health, were added a few drops of this putrid *crassamentum*, which it immediately changed into a flame-coloured water, so common in fevers and in the sea-scurvy. After standing about two hours, it gathered a cloud, resembling what is so often seen in the crude urine, in fevers; and I took notice of a speck or two of an oily substance on the surface, like that scum which is said to appear in putrid scurvies.

As to the greenish *serum*, it is perhaps never to be seen in the vessels of a living body; since in all disorders, the red globules being resolved, enter the serous vessels; and when the *serum* is thus coloured, it never can become green. Besides, as this humour is late in acquiring that cast when out of the body, it is not to be supposed that a person could survive so great a change in his blood. But in dead bodies, this *serum* is to be distinguished by the greenness which the flesh acquires in corrupting. In salted meats we commonly ascribe the greenness to the brine, but erroneously; for salt has no power of giving this tincture, but only of qualifying the taste, and correcting the bad effects of corrupted aliments, in some degree. This colour, in dead bodies, begins first in the intestines, and in the parts adjoining, from the air in the *primæ viæ*, which hastens the putrefaction.

In foul ulcers and in other sores, where the *serum* is left to stagnate long, the matter is likewise

wife found greenish, and then it is always acrimonious. But the effects of a green *serum* are nowhere so much to be dreaded as in the case of an *ascites*, where it is often collected in a large quantity. Of this we have, in the Transactions, a remarkable instance in Mr. Cox, surgeon at Peterborough, who upon tapping an hydropic woman, but a few hours after her death, was so affected with the steams of the water, which was of a green colour, that he was presently seized with a pestilential fever, and narrowly escaped with his life*.

I have already observed that the *serum* of human blood, upon standing but a little time in the furnace, becomes turbid before it grows offensive, and then gradually drops a sediment resembling digested matter. This experiment was also frequently repeated with the same success; and I likewise took notice, that this matter never changed its colour, nor mixed again with the *serum*. From these circumstances I conjecture, that this sediment is a terrestrial substance, intended for the nourishment or reparation of the solids. And I am the more inclined to this opinion, upon discovering a like sediment in the urine of people in perfect health, after long standing; as I consider this last as either the redundance of the nutritious matter, or what has been actually applied, but ceases to be of any longer use.

May we not therefore conclude, that the *serum* is perpetually oozing into ulcers, but that from

* Philos. Transact. n. 454. p. 168. Abridg. vol. ix. part iii. ch. v. art. viii. p. 212.

the heat of the part, and the volatility of our fluids, it is all absorbed or evaporated, excepting this matter that remains in the sore in the form of *pus*, and which is so requisite to the cure? For this reason, are not large ulcers weakening, from the great expence of blood in furnishing as much *serum* as is necessary, to leave a sufficient quantity of this substance behind? And are not issues upon this account of more consequence for making drains, than one would expect from the visible discharge? As near as I could guess, an ounce of *serum*, upon standing some days, did not furnish more of this matter, than what might be produced by the daily running of a good issue, or that of a seton.

EXPERIMENT XLVI.

As all the humours become thinner by putrefaction, so the solid or fibrous parts of animal bodies are relaxed or rendered more tender by the same process. This observation is so common, and uncontroverted, that it requires no new experiments to confirm it. I shall therefore only remark, that this state seems to be one of the clearest cases of a disease depending on weak and lax fibres, as may be seen in all malignant fevers, and in the true sea- or marsh-scurvy, which arises from a putrid cause.

From this circumstance, are we not enabled to account for the extraordinary bulk of the heart,
liver,

liver, and spleen, the common effects of these diseases? For supposing the natural growth of the parts stopped by the rigidity of the fibres, balancing the distending force of the blood, it will follow, that whenever the fibres are preternaturally softened, the increase of the same parts will begin anew *. Of this fact, we have some striking instances in those who died of the last plague at Marseilles (communicated to the Society by M. DEIDIER, one of the physicians to the King of France †) which, with others of the same nature, have been since republished in a large collection of papers relating to that fatal distemper ‡. It is, I say, observable, that in nine dissections, there referred to, the extraordinary growth of the heart is mentioned in all, and that of the liver in seven of them. Thus, in the first, the author takes notice, that “ The heart was of an extraordinary bigness, “ and the liver was of double the natural size.... “ Case 2. The heart was of a prodigious bigness, “ the liver much enlarged....Case 3. The heart of “ double the natural bigness....Case 4. The heart “ was very large, and the liver was bigger and “ harder than ordinary....Case 5. We found the “ heart of a prodigious bigness....Case 6. The heart “ was larger than in its natural state, the liver also “ was very large....Case 7. The heart was of a pro-

* This conjecture I had from Dr. THOMAS SIMSON, Professor of medicine in the university of St. Andrews.

† Phil. Transact. n. 370. Abridg. vol. vi. part iii. ch. ii.

‡ Traité de la Peste.

“ digious size, and the liver was very large....Case
 “ 8. We found the heart much larger than natu-
 “ ral, and the liver of a prodigious size....Case 9.
 “ The heart was double the natural bigness, and
 “ the liver was larger than ordinary.”

As to the scurvy, EUGALENUS, a noted author on that disease, observes, that the liver and spleen were often so much enlarged that the tumour could be seen outwardly *. And M. POUPART, who opened a great number of those who died of that distemper, remarks, that in all those who went off suddenly, he found the auricles of the heart as large as a man's fist, and full of coagulated blood †.

With regard to the corruption of dead bodies, an anatomist of eminence, who had made an uncommon number of dissections, informed me, “ That the
 “ *viscera* and muscles of the *abdomen* corrupt sooner
 “ than any other part of the body, after death;
 “ and therefore it is a rule with anatomists to begin
 “ their dissections and demonstrations with those
 “ parts which first become offensive. That the
 “ quick putrefaction there may be ascribed to the
 “ air included in the intestines, or to the putrid
 “ steams of the *fæces*, especially in a morbid state:
 “ hence also the speedy corruption of the muscles
 “ *psoas*, and *iliacus internus*, in comparison of the

* Lib. de Morbo Scorbuto art. xxxi. Conf. MEAD Mon. & Præc. Med. cap. xvi.

† Mem. de l'Acad. R. des Sc. A. 1699.

“ muscles

“ muscles of the extremities. That next to the
“ abdominal *viscera* and adjacent parts, the lungs
“ are commonly the soonest tainted; whether from
“ the air stagnating in the *vesiculae bronchiales*, or
“ from some remains of the perspirable matter,
“ that may act as a ferment and hasten the putre-
“ faction. For that whoever tries the experiment,
“ of compressing the *thorax*, in a body that has
“ been dead for some time, will be sensible of the
“ putrid state of the lungs, by the offensiveness of
“ the air that is forced out of them. That the
“ brain ought to be dissected as soon as can be
“ conveniently done after death; because in its
“ firmest state, it is but an indifferent subject for
“ the knife, and altogether unfit for dissection
“ when resolved by putrefaction; but that in sever-
“ al cases it has been found unexpectedly firm
“ after being kept some time, and as sweet as any
“ other part of the body. Lastly, that this diffe-
“ rence is observable between the brain and the
“ other parts, that when the brain is kept in the
“ open air, its putrefaction seems thereby rather
“ retarded, and it acquires a dry glossy skin on its
“ outside; whereas all the other parts corrupt
“ manifestly the sooner for being exposed to the
“ air, and get a covering of a putrid *mucus* all over
“ their surface*.”

* Dr. HUNTER, who favoured me with this account, added, that as he had never given a particular attention to this subject, he could only offer what is above as the result of his best recollection.

EXPERIMENT XLVII.

THE marrow is commonly accounted a substance the most offensive when corrupted; perhaps for this reason only, that carious bones are more fetid than other sores. But however that may be, I am apt to think from the following experiment, that in general the marrow must putrefy very slowly. I put an equal, but a small quantity of ox's marrow into two large phials, to one of which I added some prepared crabs-eyes; these phials being corked were set by a fire, kept up all the day to a heat sufficient for liquefying the marrow (that is, above the hundredth degree of FAHRENHEIT'S scale) and continued there near five weeks: yet at the end of this time, I could perceive nothing offensive in the phial with the pure marrow, and the other smelled only a little rancid.

From this experiment one should believe, that the *fætor* of a carious bone is not to be attributed to the marrow, since the corruption of that substance inclines more to the rancid than to the cadaverous smell; and therefore I would refer that rankness of smell to one of the two following causes, or to both of them joined. The first, may be the porousness of the bone, which retains the corrupted matter longer than an ordinary sore. The second, the more constant oozing of vessels conveying the red blood; for when these are broken, in a boney substance, they do not contract so soon as in a common ulcer; and we have seen
that

that the red part of the blood admits of a higher degree of corruption than the ferous.

EXPERIMENT XLVIII.

IT is well known, that as flesh, so blood is specifically heavier than water, and that dead bodies float, after lying some time at the bottom, by means of the fixed air separated in the bowels by putrefaction. But I have observed, that a bit of meat, beaten in a mortar to the consistence of a pulp, being put into a phial with water, and set in the furnace (as in the foregoing experiments) after remaining a few hours at the bottom, has floated before it became offensive; though after it rose, the corruption was soon perceptible. Here it is probable, that the particles of air, incorporated with the animal substance*, begin to be disengaged, and to be so collected together as to buoy up the flesh, though at this time there are scarce any air-bubbles to be seen with the naked eye adhering to it.

Further, I have observed, that both the *crassamentum* and the *serum* of human blood have yielded air (after standing some time in the lamp-furnace) before they smelled offensively. This was easily discovered by the accumulation of air in the phials; for in that small heat, the inclosed air, where there is no animal substance, is scarce sensibly dilated.

But upon the thorough putrefaction of animal substances, a considerable quantity of air is gene-

* HALE'S Veget. Stat. ch. vi.

rated; and this being a fact so well known, I need only add, that I have constantly observed that more air is produced from flesh than from blood; which is likewise a circumstance agreeable to the experiments of the Rev^d. Dr. *Hales* *.

Now, as I could be assured that the blood and other animal substances, at the time they began to emit air, were not so far advanced in the septic process, as they are often found in some putrid diseases, I was induced to think, that several symptoms in the true scurvy † might be owing to the action of the air, within the vessels, either wholly detached from the humours, or but imperfectly incorporated with them; though I was aware of an objection that might arise from the experiment of injecting air into the veins, by which animals are said immediately to die with convulsions. For all that we can infer from thence, is, that more air is thrown in, than is consistent with the circulation, and that if there were less of it, the animals might survive; though perhaps not without some irregular motion of the blood, faintings, a palsy, or other affections of the nerves, in proportion to the quantity of the air injected. In fact, we find some of the most accurate Naturalists allowing, after trial, that air may be conveyed into the veins slowly, and

* Vide loc. cit.

† By the *scurvy*, I always mean the disease of sailors, or of those who live in a moist air, eat salted provisions, have little milk or greens, and drink bad water, and little or no fermented liquors.

in a small quantity, without killing the animal *. And this is further confirmed by the experiments made upon animals, inclosed in an exhausted receiver, which swell all over, and are thrown into convulsions, as soon as the air is withdrawn; yet recover upon the timely re-admission of it †.

Have not therefore the symptoms of a deep scurvy some similitude to what these animals suffer? For we are told by those who have had opportunities of seeing the worst cases, that the sick are afflicted with vague and excruciating pains, coming on and going off suddenly, which are commonly rendered worse by bleeding ‡; that they have tumours appearing in several parts of the body, different from all others §; and that they are subject to a sudden and momentary numbness of their

* *Vena nempe jugularis vivi canis inflatur, protinus coagulatur sanguis, et cita mors sequitur liberum aeris per sanguinem iter. Sed et pauco aere injecto, neque necatis animalibus, pulsus intermittens fit.* [REDI: vol. iv. p. 223.] Respondit dudum BERGERUS, posse bullas magnas aeris frigore suo coagulare sanguinem, et immeabilitate obstruere vias; neque ideo aeris minimas particulas, sensim et parce admittas eadem mala facturas. HALLER. *Not. in BOERH. Praelect. Physiolog. vol. ii. p. 208.*

† BOYLE *Physico-Mechan. Exp. Mem. de l'Acad. R. des Sc. A. 1700. 1707.* MUSSCHENBROEK *Inst. Physic. § 1388.*

‡ EUGALEN. *de Morb. Scorbut. art. xii. et seq. art. xxx.*

§ *Id. ibid. art. xviii.* M. POUPART also observes, that in one year a great number of sick being sent into the Hotel-Dieu, with some alarming symptoms, he had inquired into the nature of their ailment, and found that it was only the scurvy, but in a more than ordinary degree. Among other appearances, he observes that several had such large swellings over their body and in their extremities, that they looked as if they had been blown up. *Mem. de l'Acad. R. des Sciences A.*

limbs, to convulsions, and to palsies of an uncommon kind *. To all which, let me add the effects of the quick changes of the weight of the atmosphere, which being perhaps more sensibly felt by constitutions of this sort than by any other, seem to confirm what has been conjectured, about the looser connexion of the air with the blood in scorbutic habits.

Lastly, it may be proper to obviate the difficulties of those who maintain, that no animal can live whilst the blood is really putrid, and therefore that the most that can be allowed, is only a tendency to putrefaction. But to this we reply, that besides numberless observations of the corruption of most of the secretions, as well as excretions, in diseases, we have frequent instances of the tawny colour of the *serum*, the resolution of the *crassamentum*, and even of the offensive smell of the blood recently drawn †. And indeed if we reflect how
putrescent

* EUGALEN. art. xi. xxvi. xxvii.

† Vapor, ex sanguine exhalans, est mitis, blandus, neque nares neque oculos afficiens; in statu tamen præternaturali plane eodem modo, et sudor morbificus, et vapor ex ulcere manans atque evaporans, acer nares atque oculos ferit. SCHWENCKE *Hæmatolog.* p. 90.

In morbis putridis, dissolutio cruoris quoque advertitur, præsertim pestis specie, in quibus non coagulatur sanguis (scil. e vena emissus) sed gangrænosus et putridus reperitur; quod etiam in eo sanguine observatur, qui post protractam inediam putridus et alcalinus factus est, &c. *Id. Ibid.* p. 129.

Sanguis qui per febres putridas detrahitur sæpe animadvertitur non solum fœtidus & graveolens, sed et putridus; adeo ut nec sibi cohærere nec concreescere queat, omnibus scilicet ejus; fibris putredine consumptis. FERNEL. *de Febr.* cap. v.

Denique notatu dignissimum est, quod mihi nuperrime videre contigit, sanguis fœminæ cujusdam, febre maligna laborantis,

per

putrescent blood is in a heat equal to that of the human body, we may be convinced, that the perspiration by the lungs and skin (or whatever other outlet there may be for the more volatile and corrupted particles) is no sooner impeded, than a resolution begins in the whole mass, which if not timely prevented brings on some putrid disease*.

If the acrimony is great, and the nerves thereby suddenly affected, a fever with putrid symptoms, a vomiting, or a flux will ensue. But if the accumulation is so slow, that the nerves grow in some manner habituated to the putrefaction, a scurvy prevails. This is the case not only of sailors, but of others, when milk, greens, and fermented liquors are wanting, and when the greatest part of the diet consists of meats long salted, which, though rendered palatable by the salt, are in effect putrid. Whatever accident, in such circumstances, tends to stop perspiration, is apt to increase the disorder, and especially if the moisture of the air concurs with such unwholesome aliment †.

per phlebotomiam detractus adeo foetebat, ut ex ejus tetra odore tam chirurgus quam adstantes in animi plane deliquium inciderint. MORTON. *Pyretolog.*

* It has been the opinion of some physiologists, that the blood is kept from putrefaction by its motion only; but for this they assign no other reason, than their observing the greater purity of running water, and that of the sea when agitated by the wind, in comparison of the same when stagnating. But here, as motion seems only to be the accidental cause, by furnishing means to the water for exhaling its more corrupted particles, so, in like manner, the circulation can only enable the blood to throw off such matter as would corrupt it, if retained too long in the vessels.

† See exper. xlv. and Observ. part iii. ch. vii.

Now, instances of this kind are so common, that it may seem strange how the corruption of the humours should ever have been contradicted; and indeed for this I can only assign the following reason. By some mistake of the chemists, the notion of the putrefying principle, in animal substances, was confounded with that of an alkaline salt, which salt being looked upon as corrosive, they concluded, that as it could not enter the blood-vessels without destroying both them and the nerves, so the blood could never be supposed alkaline or putrid whilst the person lived. But from several of these experiments we find, that putrid substances are very different from alkaline. I have frequently given of the salt of hartshorn a drachm in a day, for a continuance, without observing any septic effects; and since the introduction of Mrs. STEPHENS'S medicine for the stone, we see what large quantities of the fixed alkaline salts may pass into the blood without doing any harm. So different therefore are these salts from putrid matter, that of all stimulating medicines they are perhaps the least hurtful to the nerves and vessels; whilst every corrupted animal substance is not only offensive to the senses, but to the whole nervous system; as is evident from the *nausea*, spasms, palpitations, tremors, dejection of spirits, and other symptoms consequent upon the admission of any strong septic ferment into the blood.

It will appear, that in these papers I have considered the scurvy as arising from a putrid cause
only,

only, without regarding whether that putrefaction be owing to corrupted provisions at sea, or to the want of a proper diet in marshy countries. For by not confining the term *scurvy* in this manner, some writers of the first rank have confounded several diseases under that name, though different in their cause, their symptoms, and their cure. I cannot, for instance, see what relation the various kinds of scurfs and tetter (which are *species* of the leprosy) have to the disease of sailors; or how those who admit of putrefaction for one cause of the scurvy, should at the same time acknowledge an acid acrimony for another. It would seem as if they had been led into this last inconsistency by observing, how serviceable the *raphanus rusticanus*, the *cochlearia*, and the like plants, had been in the cure. For as all those were deemed to be of an alkaline or putrefying nature, an acid *species* of scurvy seems to have been invented, in order to account for their virtues. But from the experiments laid before the Society it appears, that those vegetables are real antiseptics*, and therefore possessed of qualities very different from what those respectable authors imagined, when they considered their alkaline parts as septic, and their resolution, in heat and moisture, as tending to putrefaction only, and not to fermentation.

* Exper. xi. xx. xxv. xxxviii. 5.

A N

A N S W E R

TO THE LEARNED

P R O F E S S O R D E H A E N,

A N D

M. G A B E R;

Concerning some remarks made by them on
the preceding work.

I. **W**HILST the third edition of my Observations was in the press, I met with a treatise under the title of *Theses Sistentes Februm Divisiones*, published by Dr. DE HAEN, celebrated professor of medicine in the university of Vienna. Upon perusal, I was a little surpris'd at observing, that the learned author, in his section *de febre miliari*, after finding fault with Dr. HUXHAM's sentiments and practice in regard to the miliary, the petechial, and nervous fevers, should add, "that if, in opposition to
" his own opinion, any thing were advanced from
" my writings similar to what he had condemned
" in Dr. HUXHAM's, the same answer, which he had
" given with regard to him, would serve for me *."

Now,

* Sane me cogit veritatis amor, ut acerbe conquerar, virum hunc (HUXHAM) et Hippocraticum et Sydenhamianum, toties præceptorum utriusque oblivisci. Quæ vero causa hujus? proprii

Now, if either Dr. HUXHAM had copied from me, or I from him, or indeed had there been an exact conformity between us, this short remark might have been sufficient; but as none of these circumstances are true, Dr. DE HAEN will, I hope, excuse me for shewing some of his mistakes on this occasion, so far as I am concerned; for as to what relates to Dr. HUXHAM, I shall leave that learned physician to say what he thinks proper upon the subject.

For my part, I have been so far from proposing any opinion about the nature of a miliary fever, or the method of treating it, that I have never mentioned the distemper but in the most transient manner. Once, in order to distinguish the pustules peculiar to it, from those of the itch*; a second time, to distinguish those pustules from the *petechiæ* (where I have expressly added, that the miliary fever was not to be confounded with the hospital-

proprii amor systematis, quo id ratum habuit, quod maligni quidquam pluribus in febribus subdelitesceret, calidioribus attenuandum, movendumque, sudoribus demum expellendum. Utique plerisque in epidemiis sudori tum symptomatiko, tum vi coacto nimium tribuens, fidentique, miliaris ac petechialis eruptionis incautus exitit, nec ullo modo imitandus, admirator. . . . Doleo profecto me hic cogi tanti viri in praxi revelare errores; sed ante me doctrinam, qualem HUXHAM hic tradidit, condemnavit cel. GILCHRIST, in Actis Edinburg. ubi de his ipsis nervosis HUXHAMI febribus differens, omnem in iisdem condemnat sudorum provocationem. . . . Si quid forte simile ex egregio PRINGLE objiceretur, quod ex HUXHAMO, simile esto responsum. *Thef. Sistent. &c. sect. de Feb. Mil.*

* Observat. on the Diseases of the Army, 1st edition p. 359. present edition p. 341.

fever * ;) again, when I observe, that I never saw the hospital-fever accompanied with miliary pustules †; and lastly, when I say, that the miliary fever is a rare disease in the hospitals of an army ‡. Hence it will appear, that I have never considered the jail- or hospital-fever and the miliary fever as similar: and indeed I may venture to say, that as the symptoms of the two are so much unlike, they ought to be treated as different *in specie*, and consequently, that neither the theory nor the practice in the one, ought to be regulated by analogy from the other. But Dr. DE HAEN insists on a near relation between the miliary and the petechial fever §; and as he will have that distemper, which I call the *jail* or *hospital-fever*, to be the same with his petechial fever, he thinks proper, in his section on the miliary fever, from principles relative only to that disease, to reflect upon my practice in one of a very different kind.

The jail- or hospital-fever cannot properly be called the *febris petechialis*; for I have observed, that though the eruptions, which I call *petechiæ*, will often appear in the fever which I saw, yet they do not constantly accompany it, and therefore have

* Ib. 1st ed. p. 302, in the note, present ed. p. 296, in the note.

† Ib. 1st ed. p. 358. present ed. p. 339.

‡ Ib. 1st ed. p. 359. present ed. p. 341.

§ At the conclusion of his section, *de Febre Petechiali*, he says, *Multa de Petechiis dicenda supersunt; maxime de iisdem tum præveniendis, antequam fiant; tum, cum adsint, curandis; verum cum hæc quoque ad Miliarium eruptionem pertineant. ipsaque Miliarium historia eam Petechiarum elucidet, atque explanet, una fidelia hunc eorumque parietem dealbabo.*

not a title to characterize that disorder, any more than the plague, of which likewise they are a frequent symptom. This distinction, between a petechial fever, and a fever sometimes attended with *petechiæ*, not apprehended by Dr. DE HAEN, is well laid down by SENNERTUS, in his account of the *morbis Hungaricus*, which, as I have elsewhere remarked, was a camp-fever of a truly pestilential nature. SENNERTUS says, *Nonnulli morbum Hungaricum et febrem petechialem plane pro eodem morbo habent; sed mihi quidem videtur, non satis recte. Etsi enim petechiæ et maculæ illæ quandoque etiam in morbo Hungarico conspiciantur, tamen non semper id accidit, et potest hic morbus esse sine maculis. Contra vero maculæ in febre petechiali omni inveniuntur; unde et nomen hæc febris habet* *. I have therefore all along considered the jail- or hospital-fever (in regard to others that commonly occur in these parts) as a fever *sui generis*, at least as different from either the scarlet, the miliary, or any other eruptive fevers which are known here. Indeed, unless at the times mentioned in my treatise; I hardly ever met with such a disease; and I believe that some learned and experienced physicians of this place, employed for those who were taken ill of the jail-fever (at the Sessions held at the Old-Bailey, in the year 1750) had, from the mortality attending it, too good reason to believe, that this disorder was not to be treated in the same manner, either with the miliary fever, or

* De Febr. lib. iv. cap. xiv.

any other which they had been conversant with before †.

The chief cause of Dr. DE HAEN'S mistake, and of the confusion of other authors in treating of these fevers, may be the undetermined meaning of the word *petechiæ*; and indeed the ambiguity here is such, that I must regret my having at all used the term, and not being satisfied with barely describing the eruption, without giving it any name. The terms *lenticulæ* and *puncticula*, given by FRACASTORIUS, afford no just idea of the spots which I constantly saw: or if, with Dr. DE HAEN and others, we use the expression *morbus pulicaris*, the only resemblance of those spots to the bites of fleas, will lie in the colour; though these last are commonly redder. *Febris purpurata* is not more proper; because the purple colour I have never seen, except when there were larger blotches, *plagæ* or streaks of a considerable length upon the skin. DIEMERBROECK, upon the plague, says that the mortification in the *petechiæ* extends from the skin to the *periosteum*; where it is plain, that he can only understand such purple spots as are seen in the bad small-pox, scattered here and there; and not such an efflorescence as appears in the jail- or hospital-fever, often covering the whole trunk, arms and legs, so thick, that, at a little distance, the interstices are hardly to be discerned. Dr. DE HAEN

† See the account of it in the preceding Observations, part iii. ch. vii. § 6.

says,

says, that in the German language the *petechiæ* are called *pfefferkorn* (pepper-corn) on account of their round figure; and in another place he defines them *punctula rubra, aut cinerea, aut purpurea, aut livida, aut nigra*. But I have never seen in the jail- or hospital-fever those small spots of any regular figure, nor of the *color cinereus*; at least, if he means the colour of wood-ashes. Nor did I ever see them black, nor purple; though the large streaks or *vibices* have much of that cast. Possibly the hot stoves, and unventilated apartments, so common in Germany, with too hot a *regimen*, which Dr. DE HAEN justly condemns, may frequently bring out, in common fevers, those spots which resemble flea-bites, and which he calls *petechiæ*; whilst never having had occasion to attend the sick in jails, nor in the foul and crowded hospitals of an army, he has had no opportunity of seeing that eruption, which I call *petechial*, nor the jail- or pestilential fever which it so often accompanys. Nor have I found, in any author, this eruption so defined, that I could reckon it quite the same with that which I describe. Dr. HUXHAM, who during the former war had opportunities of seeing this distemper at Plymouth (whilst the jails were filled with French prisoners, and the hospitals with our own sailors) observes, in his chapter on putrid, malignant, and petechial fevers, “ that the skin
 “ looked sometimes as if it had been marbled or
 “ variegated with a colour like that of the measles,
 “ but more dull and lurid.” This is indeed nearly
 the

APPENDIX.

the thing which I saw. But as that learned author likewise mentions the *petechiæ*, as a symptom of the same fever, I can only conjecture that he meant the same eruption, but called it *petechial* when the spots were single, and more distinctly seen.

I consider those spots, which I have called *petechiæ*, to be the effusions of the *serum*, tinged with some red globules (which being resolved by putrefaction, are enabled to enter into the serous vessels) and that these effusions are made in the *cryptæ* or cells of the *cutis vera*; which cells are smaller, but similar to those of the cellular membrane, of which, according to the best anatomists, the skin is formed*. And perhaps it is owing to the closer texture of the skin of the face, that such effusions so seldom make their appearance there. As to the *vibices* or streaks of a more purple cast, I imagine they may be owing to similar extravasations, where the fine vessels of the *cutis vera*, made tender by putrefaction, have given way, when the patient by accident has scratched himself; for I have sometimes observed the streaks so long, and so parallel to one another, that I could not help thinking they were produced in this manner by the fingers †.

Dr.

* HALLER. Prim. Lin. Physiol. § ccccxxiv.

† Dr. DE HAEN says, *Nec sola macularum sedes cuticula est, &c.* [Thes. Sift. p. 33.] where he does not mention the true skin at all, as the seat of the *petechiæ*, but the *cuticula*; which I wonder at, seeing the scarf-skin having neither cells nor vessels, so far as we know, is not susceptible of an inflammatory colour: nor can the effusions be made
between

Dr. DE HAEN allows, on the authority of SYDENHAM and others, “ that the *petechiæ* may be considered as critical in the pestilential fever;” but adds, “ that even in the plague itself, this eruption would seldom take place, were the antiphlogistic method of BOTALLUS and SYDENHAM strictly followed *.” If so, what must he then think of the *petechiæ* in times not pestilential, such as ours? The author plainly tells us what he thinks, by applying to the present German physicians that censure which SYDENHAM passes upon his own cotemporaries, *viz.* their converting, by means of “ the *regimen calidissimum*, common fevers into the petechial and miliary †.” As to the latter, in particular, though he concludes, and justly (with SYDENHAM) *Miliaria exanthemata frequentius mala arte progigni, sponte longe rarius ‡*, yet, in another place, he pretty plainly insinuates, as if the miliary eruption would never be seen at all under proper management; if so we may judge by the

between the *cutis vera* and the *cuticula*, without pustules, or some elevations of the latter, which I never saw with that eruption. Further, I observe, that Dr. DE HAEN joins with those authors who contend for the seat of the *petechiæ* being likewise in the fat and in the flesh, and does not express his dissent from DIEMERBROECK, who imagined that he could trace them from the *periosteum*, where from a broad base they tapered all the way to the skin. Now, if DIEMERBROECK found these pyramidal substances mortified, what must be the mortification at the root of our *petechiæ*, when their points almost cover the skin? And even then the patient may not only recover, but is liable to no separation of parts, as in a true gangrene. It is therefore plain, that either DIEMERBROECK must have been mistaken, or that his *petechiæ* were different from those described by me.

* Thes. Sift. p. 35.

† Ib. p. 35, 36.

‡ Ib. p. 68.

following passage: *Liceatne id addere, quod et medici complures et ego in nosocomio, sive in vigore morborum, sive eorundem in fine, nunquam nostris in ægris, quibus a principio affueramus arbitri, miliaria deteximus* *. Although, as I have said, the military fever is no part of my subject, yet here, by the way, I must observe, that to whatever excess the hot regimen was carried, in this country, in SYDENHAM'S time (and I believe the excess was great) or whatever may still be the sentiments of some amongst us, the best, and I should hope the general practice is at present different. In the beginning of most fevers we bleed, keep the body open, recommend free air, give acids, diluting liquors, and diaphoretics of a cooling kind; yet in certain seasons military eruptions will appear, and although not always, yet sometimes will relieve the patient and give a favourable turn to the disease.

But as to the jail- or hospital-fever I can more freely affirm, that the spots accompanying it were not the effects of a hot regimen; but on the contrary, that those *exanthemata* were never more apt to appear, than when the patient was largely bled in the beginning, and in the advanced state took nothing cordial. This indeed was not to be wondered at, if the spots, being the effects of putrefaction, were most readily produced when the vital powers were at the lowest. Thus, sometimes they were not seen till the last agonies, or even till after death;

* Ib. p. 66, 67.

whereas the small-pox, measles, scarlet efflorescence, *erysipelas*, and miliary pustules, being more of an inflammatory nature, and attended with some kind of tumour, are most conspicuous when the circulation is strong; and, on the other hand, subside or disappear when the patient is near his end. Is not this a proof of a specific difference between the jail- or hospital-fever and the miliary fever?

Nor does Dr. DE HAEN sufficiently attend to what SYDENHAM says on the subject of the *petechiæ*. For though SYDENHAM ascribes them, for the most part, to too hot a regimen, yet he acknowledges that they come out spontaneously in the plague and in the confluent small-pox *; and I have endeavoured to shew, that the jail- or hospital-fever belongs to the pestilential class of diseases. SYDENHAM indeed believes, that those *petechiæ*, which he mentions, depend upon a high degree of inflammation, but he does not prove it; and I should think it more propable, that they are, as I have observed, the effects of blood resolved by putrefaction; a principle which SYDENHAM does not seem to be acquainted with. As to their being rarely critical, I shall venture to go beyond both SYDENHAM and Dr. DE HAEN, and say, that even in the plague itself, I much doubt whether they are more critical than in the fever of jails or hospitals,

* *Raro sponte sua efflorescunt, præterquam sub adventu pestis ipsius, atque in initio variclarum istarum confluentium, quæ summæ inflammationis participes sunt.* SYDENH. Sched. Monit.

where indeed they never are so, as I have expressly said in the Observations on the Diseases of the Army †.

Lastly, as to the hot regimen in the military and petechial fever (for which Dr. DE HAEN blames Dr. HUXHAM, and me through him) it must be clear how little I am concerned, since I mention nothing of my practice in the military fever; and since it appears, that Dr. DE HAEN's petechial fever

† After publishing what is above, relating to the distinction which I conceived was to be made between Dr. DE HAEN's *petechiæ* and mine, I was confirmed in my opinion by Dr. HUCK, who, in the year 1763. was at Vienna, and was favoured with admittance into all the hospitals there, and in particular had the satisfaction of attending Dr. DE HAEN himself, and seeing, with that celebrated physician, some of his patients in that very fever which he calls *petechial*. Dr. HUCK examined those spots in Dr. DE HAEN's presence, and assured me that they had hardly any resemblance to those which I have called *petechial*, and which he himself had so often seen in the hospitals of the army; but that they were so like flea-bites, that he was apt to believe the one must be often mistaken for the other. Dr. HUCK added, that he had seen several cases of those fevers in the other hospitals, at Vienna, but none of those spots of a deep purple colour, like such as appear in a bad kind of the small-pox; and that therefore he believed, they ought to be considered as no less specifically different from the *maculæ purpureæ variolarum*, than from those which accompany the jail- or hospital-fever. He concluded with observing, that those petechial spots of the hospitals of Vienna, for the most part, attended a slighter kind of fever: from which he accounted for that extraordinary success, in curing so many of these petechial fevers, which Dr. DE HAEN relates in page 86th of his *Theses*. And indeed how should it otherwise happen, that of about 500 soldiers admitted into an hospital, with petechial fevers, twelve only, and those too whose cases were too far advanced, should die? Since this account, I have seen, with Dr. HUCK, in this city, three several cases of such *petechiæ* as are described by Dr. DE HAEN, and found not only those spots, but the symptoms of the disease, a good deal different from those of the jail- or hospital-fever.

is different from that of our hospital. But granting them to be the same, the learned author may observe, that the regimen which I prescribe is far from being hot throughout. Sweating, I indeed advise upon the first symptoms, as SYDENHAM did in the plague, to prevent the fever; but I promote that sweat by mild sudorifics. Half a drachm of *theriaca*, with ten grains of salt of hartshorn, once in four-and-twenty hours, washed down with some warm vinegar-whey, to a soldier lying in a bed without curtains, and often in a cold ward, is surely no very heating medicine. And as I am convinced, that in my own case I have more than once prevented this fever by sweating (when I had reason to believe I had taken the infection) I must recommend that practice to others which I found so beneficial to myself; though I must own, that, as I was easily thrown into a sweat, my sudorific was no hotter than spirit of hartshorn with vinegar-whey, or the *spiritus Mindereri* in a large draught of some diluting liquor. When the fever was formed, the patient took the same medicines as in inflammatory cases; and I never prescribed the hot course, if so it must be called, till his pulse sunk and his strength failed; still attentive so to moderate this new regimen (which consisted chiefly of wine) as never to increase the feverish heat, much less to force a sweat, or to hasten any other crisis, before the natural period of the disease. I have expressly said in all the former editions, as well as in the present, “ that I have observed “ that a *delirium* would arise from two opposite

“ errors ; one, from large and repeated bleedings ;
 “ and the other, from wine and the warm cordial
 “ medicines given too early ; it appears therefore
 “ how nice the principles are that regard the cure ;
 “ thus, neither a hot, nor a cool regimen will an-
 “ swer with every patient, nor with every state of
 “ the disease *.”

Dr. DE HAEN might likewise have taken notice how anxiously I recommend a free circulation of air, which perhaps none of his students would believe after he makes the following exclamation :
Quam sapiebant præ nobis Antiqui ! Videte apud CÆLIUM AURELIANUM Methodicos, calidis in morbis, in id præcipue intentos, ut cubiculum et amplum, et aëre bene perflatum, et subfrigidum esset, &c. I wish, I say, by taking notice of the following passage, he had done me justice with his pupils, who, after his insinuations against my practice in this distemper, will scarce expect to find, in the chapter on the jail- or hospital fever (in all the editions) this plain admonition, yet almost as strong as any of those of the ancients upon such a subject : “ In
 “ the first state (*viz.* of the hospital-fever) as well
 “ as in all the rest, the fundamental part of the
 “ cure is to remove the patients out of the foul air.
 “ When that cannot be done, the room or ward is
 “ to be purified by making a succession of air,
 “ by means of fires, or letting it in by doors and
 “ windows, diffusing the steams of vinegar, or the

* Observ. part iii. ch. vii. § 5. page 316.

“ like; for whatever medicines are given while the
 “ corruption of the air continues, or indeed in-
 “ creases by the *effluvia* of the sick, there can be
 “ little hopes of recovery. Therefore, in every
 “ stage, though the patient can breathe no infec-
 “ tious air but that of his own atmosphere, it will
 “ be necessary to keep the curtains open and to use
 “ all other means to procure a free ventilation.
 “ On the strict observation of this rule, the cure
 “ will in a great measure depend *.” As to the
 caution of not loading the sick with blankets, I
 confess I have omitted giving any of that sort; be-
 cause, in this country, physicians do not suppose
 that a patient, in any fever, is to lie warmer than
 in his best health. To this cool regimen, it may be
 observed, that I add the use of acids and recom-
 mend the lowest diet; so that hitherto there is no
 reason to apprehend any inflammatory symptom.
 The small proportion of the contrayerva-root, in
 the compound powder of the London Dispensatory,
 in the dose which I specify †, could occasion no
 sensible heat; and even then it was joined to nitre.
 The camphire, in so small a dose, could only heat
 by accident, that is, when it disagreed with the
 stomach, and then it was laid aside.

It was therefore only in the advanced and low
 state of this fever, that I began to support the

* Observ. part iii. ch. vii. § 5. p. 305.

† In a scruple of this medicine (which was my common
 dose, repeated once in six hours) there are only about five
 grains of the contrayerva-root, and the rest of the composition
 is only a testaceous powder.

strength by medicines of a cordial nature, and yet with such effects, as rather to abate than to augment the ardour. By these, and especially by wine, I will venture to affirm, that I have frequently seen every symptom soon change for the better, that is, the head become clearer, the skin cooler, and the thirst less: and indeed this is not to be wondered at, when we consider how probable it is, that the putrefaction, gaining ground by the sinking of the *vis vitæ*, occasions that acrimonious heat so remarkable in this disease. Here the salt of hartshorn was only used occasionally in great depressions, and even in other cases I have never been sensible of its raising any inflammatory or fixed heat, but only a momentary glow. The common medicine was the alexipharmac decoction, consisting of the Bark and snake-root, with a small proportion of the *aqua alexeteria spirituosa cum aceto*. It is to be hoped, that though the alexipharmacs have been long abused, as to the choice, the quantity and application of them, yet no offence will be taken at the name. Four spoonfuls of that decoction, once in four or six hours, to a soldier with a sunk pulse, lying in a bed without curtains and with few clothes, seldom occasioned any extraordinary heat; if it did, I either lessened the dose, or, believing the time not yet proper for administering any warm or strengthening medicine, I suspended its use for a day or two longer. The disgrace of the alexipharmacs has been chiefly owing to the opiates joined to them, as in the *theriaca*, *diascordium*, &c. but in the hospital-fever these last were never used, unless

APPENDIX:

unless in order to check a colliquative looseness; or about the crisis, when the patient was worn out by want of rest: at such times I have known the opiates of the greatest service*.

In fine, Dr. DE HAEN may be assured, that the regimen, which I propose, stood at first on no other foundation than experience, after my having seen the bad effects of a contrary method, whether by too large, or too frequent bleedings in the beginning, or by giving hot things too early, in order to raise the pulse when it began to sink, or to force a crisis before the common period of the disease. Some of the medicines may be superfluous, but I am pretty sure that none of them are hurtful. The first perhaps might have been omitted, I mean the diaphoretic powders (consisting of the *pulvis contrayervæ compositus*, camphire, and nitre) since I never knew the fever shortened, or any symptom

* From what Dr. DE HAEN says, of the use which he himself made of cordials, in the low state of miliary, petechial, and nervous fevers, in order to bring on a crisis, we should hardly imagine that he could blame that part of my practice, in that peltiential fever which I treated, where the *vis vitalis* was so apt to fail. The learned author, after condemning in Dr. HUXHAM the too free use of the *confectio Raleighiana*, *theriaca Andromachi*, *radix serpentariæ Virginianæ*, *radix contrayervæ*, *sal cornu cervi*, *pinum rubrum cum mace* & *cinnamomo ustulatum*, &c. in the nervous fevers, subjoins these words, *Lubens equidem fateor, cardiaca ejusmodi nonnunquam danda esse, ut labascens in morbis natura ad bonam crisin animetur; at vero omnium morborum curam, in quibus maligni quid apparere supponitur, hisce excitantibus perpetuo aggredi velle, Hippocraticum non est, Sydenhamianum non est.* These principles I have likewise adopted, and have endeavoured to regulate my practice accordingly; not because they were *Hippocratic*, or *Sydenhamian*, but as they were the result of repeated experience.

abated

A P P E N D I X.

abated by their use. But having once got into a method, which brought about as many cures, as seemed otherwise consistent with the circumstances of my patients, lying in a foul air, amidst a constant noise, and often neglected by their nurses, I did not attempt to reduce my practice to more simplicity than what is mentioned. Yet, whatever confidence I may have in the directions which I have published, I am still ready to alter any part of them, upon a fair representation from those who have had equal opportunities with myself of seeing and treating this fever. But to oppose either mere theory, or analogy from other fevers, where the similarity is so disputable, or to oppose some general maxims from HIPPOCRATES or SYDENHAM to the observations which I have offered, as the result of a long and painful experience, in a distemper that no physician could well know but in such circumstances as mine, is a manner of writing, I must say, more fitted for disputations in a school of medicine, than for the instruction of a practical physician.

II. I must unwillingly take notice of some more inadvertencies of the learned Dr. DE HAEN, with regard to me; for treating of camphire he says, *Quantisne laudibus effertur in malignis camphora, veluti collapsas vires blande restaurans, et somnum ipso opio tutius adducens! Consulite modo egregios viros HUXHAM & PRINGLE* *. The author then proceeds to observe, that the physicians of Breslaw found no such virtues in that medicine, in a ma-

* DE HAEN Ratio Medendi part iii. cap. i.

Signant epidemic of that country; but on the contrary remarked that it rather did harm. Now, though the learned author intended no reflection upon me, yet the reader must be surprized, when I affirm, that I have no where assigned either a *paregoric*, or a *restorative* quality to camphire, nor used any expressions to that purpose. I mention my giving it in inflammatory fevers, but with no other intention than to assist in abating the spasms, and in promoting a *diaphoresis*; and when I prescribe it in the high *delirium* sometimes attending the hospital-fever, yet even there I say nothing of those alledged qualities, but only offer it as one of the best internal medicines for that symptom, that is, one of the best I then knew; which, in truth, was saying but little in its commendation. In my experiments I have indeed assigned to camphire a considerable antiseptic power, but that has nothing to do with the virtues in question, nor have I for that reason ever given it the more freely. It would seem as if Dr. DE HAEN, finding such a conformity between Dr. HUXHAM and me, with regard to the jail- or hospital-fever, believed the harmony to be so great, that whatever is written by Dr. HUXHAM, I must be of the same opinion, and answerable to the Breslaw physicians for it.

III. Lastly, Dr. DE HAEN, in the first part of his book called *Ratio Medendi*, mentions some experiments, which, in imitation of mine, he had made with antiseptics upon urine; when he found,
that

that acids resisted its putrefaction more than any of the alkaline salts, the spirit of hartshorn excepted. In this the learned author does not contradict me, as some of my friends have imagined, since not doubting of the antiseptic quality of the acid salts being in general superior to that of the alkaline, I never made any comparative trial. Nay, I have here the satisfaction, to find a person of Dr. DE HAEN's credit confirming in this instance what I had long ago advanced, to wit, that the volatile alkalis are powerful in preserving animal substances from corruption. I only wish that Dr. DE HAEN had mentioned his experiments with more precision, and, in particular, had told the proportions which he used of the acids and alkalis; since it must seem a greater paradox than any that I have yet advanced on that subject, that, quantity for quantity, the spirit of hartshorn should resist putrefaction more than any of the mineral acids. But when, in the next paragraph, the author adds, *constititque urinam alcalicis (viz. salibus alcalicis fixis) mistam longe citius putrescere ea, cui affusum nihil*, that is, "that
 " a portion of urine mixed with the fixed alkaline
 " salts putrefied sooner than another portion, to
 " which nothing was added;" there indeed is a plain contradiction to the conclusions that I have drawn from my experiments, which allow of no septic quality in any of those salts, fixed or volatile.

To see therefore which of us were in the wrong, about the end of June 1760. I made the following experiment.

experiment. I took three phials, of between three and four ounces each, and into each poured an ounce of recent urine made by a person in health; to one, I added five grains of salt of hartshorn (as being of a more constant strength than the spirit, which so much varies according to the manner of preparation, and the time it is kept); to another, I added as much of that salt which is sold in the shops for *sal absinthii* (but which, in fact, is a thoroughly calcined lixivial salt, drawn from the ashes of any of the common vegetables;) to the third, I joined nothing, reserving it for a standard. These phials, being corked, were placed in a closet of a southern aspect; so that considering the season they stood moderately warm. Upon the first mixture, the phial with the salt of hartshorn had scarce any other smell but that of the volatile salt. The phial with the salt of wormwood, upon shaking, became turbid, and of a whitish colour, without any effervescence, but with that disagreeable smell which I have always found upon mixing animal substances with the lixivial. Next day the standard was not so fresh as at first; the phial with the salt of hartshorn smelled as before; and that with the fixed alkaline began to smell of a volatile salt, but less disagreeable than that of stale urine. In two or three days longer, I could scarcely distinguish between the smell of the urine which contained the salt of hartshorn, and that with the salt of wormwood; and this resemblance continued for twenty-four days, after which I examined those

phials no longer. With regard to the standard, it remained all that time with a sickish offensive smell, neither like that of salt of hartshorn, nor that of corrupted flesh or blood; and for some days before I ceased to examine it, I observed a mouldiness upon its surface.

In the beginning of September following, to an ounce of recent urine, poured into a wide-mouthed phial, I added six or seven grains of fixed alkaline salt as before; and into another phial, I put as much urine, without any addition, to serve for a standard. These phials were set in a place somewhat damp, open to the air, but under cover, to prevent any rain from falling into them; for they were not corked. The mixture with the fixed salt, upon shaking the phial, became turbid as before, and afterwards dropped a whitish sediment; which ought to have been taken notice of in the first experiment. The smell of this phial, upon the mixture, was disagreeable as before; the next day, it was less so; and on the third day, the smell began to change to that of salt of hartshorn, which gradually increased, with some degree of rankness, like that of common stale urine. The standard, for about eight days, had no smell of volatile salt, but was otherwise offensive, and upon its surface I perceived a mouldy scum thicker than that in the former experiment. I took no further notice of these phials till about the thirteenth day, and then I found them both smelling like salt of hartshorn;

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but the standard, that is, the urine by itself, ranker or more offensive than the other. At the same time, I found the contents of the standard of a deeper colour, which I considered as another proof of its higher degree of corruption. For I have constantly observed, that urine becomes of a browner cast in proportion to the time it is kept, till it be thoroughly putrid; and in this case the *criterion* is the surer, as the fixed alkaline salt, when the urine settles after the mixture, makes it darker than natural; that is, on the second day of this experiment, the water with the fixed alkali was not so pale as the standard, but was paler than it on the thirteenth.

After this I made no further trials, being satisfied that I had not been in the wrong about the general antiseptic power of the fixed alkaline salts, and that I had discovered the cause of Dr. DE HAEN'S error. It is well known, that urine not only contains some of the corrupted parts of the humours (which nature throws off by the kidneys, as well as by the skin) but likewise a large quantity of a salt of the Ammoniacal kind, that is, one compounded of a volatile alkali and an acid. Now, this acid having a greater affinity with the fixed alkaline salt used in these experiments, than with its own volatile salt, abandons it, and, cleaving to the fixed salt, suffers the other to evaporate; much in the same manner as we produce a volatile urinous smell, upon adding salt of wormwood, or salt of tartar, to a solution of *sal Ammoniacus*. Only
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in the case of urine, the combination of any fixed alkali with the acid of the urine, and the evaporation of the volatile salt of the urine consequent thereupon, is slow, on account of an oily or mucous matter, with which that fluid is likewise impregnated. It does not therefore follow, because putrefying urine always lets go its volatile salt, that all urine parting with this salt, is in a putrid state. For the same kind of salt, with its volatile smell, rises from the most recent urine upon distillation; and, without that process, instantaneously, upon mixing some quick-lime with it. Nay, a fixed alkaline salt will immediately disengage the volatile, and thereby give the stale smell, if the fixed salt be dissolved in fresh urine made boiling hot. Even within the body, an animal process will separate this volatile alkaline salt, as I had once an occasion to find in a person who had been long under a course of Mrs. STEPHEN'S medicine, that is, of taking large doses of lime and a fixed alkaline salt. This gentleman's urine, when quite recent, had not only that volatile smell which I mentioned, but strongly effervesced with the common acids. This experiment he shewed me, immediately after making water, upon my seeming to doubt whether he had not been mistaken.

I therefore suspect that Dr. DE HAEN, not reflecting on this chemical principle, has been deceived by the volatile saline smell of the urine (occasioned by the mixture of a fixed alkali) which he mistook for the putrid *fætor* of that fluid; and that though convinced,

convinced, from his own experiments, of the strong antiseptic quality of salt of hartshorn, yet he could not thoroughly free himself from the common error, of confounding the volatile saline with a putrid smell. But this distinction, between an alkaline salt and putrid matter (in an animal substance falling into a state of resolution) which I attempted to explain in the preceding work, is at present set in the clearest light by the learned M. GABER of Turin; of whose experiments, and just reflexions upon them, I shall now take notice.

IV. Some time ago, I received from that gentleman the present of a book, lately published, called, *Miscellanea Philosophico-Mathematica Societatis Privatæ Taurinensis*, accompanied with an obliging letter; of which, I hope, he will excuse me for giving the following extract: *Ex tuis experimentis mea nata sunt, quorum aliqua in hoc libro perlegere possis; reliqua, quæ nondum ita absoluta sunt ut publicam lucem mereri videantur, in posterum, si libenter feras, tibi communicabo. Hæc autem experimenta, cum plerumque tuis consentanea fuerint, in ea tamen re a te me dissentire cogunt, quod alcali existentiam in corruptis humoribus dubiam reddidisti; rationes propterea proposui quibus eventuum dissimilitudinem adscribendam putavi, quas tu ipse facilius, quam ego assequi poteris, si tuam experiundi methodum cum mea comparare volueris.*

The point in question relates to my first experiment, which shews, “ that bodies, by putrefaction,

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“ become

“ become little, if at all, alkaline.” But the ingenious author, in the paper which he alludes to in his letter, clearly proves, “ that the marks of alkaline
 “ lefcence, in putrefying animal fubftances, are
 “ greater or lefs, or none at all, according to the
 “ time in which the experiment is made, after the
 “ putrefaction begins; that fuch fubftances, upon
 “ their firft putrefaction, do not effervefce with
 “ acids; that afterwards they effervefce manifefly
 “ with them; but, that at length they ceafe from
 “ doing it, though the putrefaction ftill continues.”
 The experiments proving thefe facts being repeated with fo much clearnefs and precision, leave me no room to doubt of the truth of what M. GABER fufpects, *viz.* “ my having made the trials of effervefcence upon putrid bodies, either before they
 “ were fufficiently corrupted, or after the volatile
 “ alkaline falt was wholly evaporated, though the
 “ procefs of putrefaction ftill went on.”

At this diftance of time I cannot fufficiently recollect the circumftances of my experiments, whereby to judge, whether the acid was dropped into the putrid liquors before, or after the exhalation of the volatile falt; but as I am fatisfied, that it might have been the one or the other, I muft fubmit to Mr. GABER’S correction, and allow, that whilft animal fubftances are in a ftate of putrefaction, there is a time when they will afford marks of an alkaline falt, by their manifef effervefcence with acids. And I am the more inclined to yield to
 his

his opinion, as I can now produce a case somewhat parallel to what he mentions, relating to the effervescence of morbid bile with acids.

A gentleman of thirty-six years of age, who died of a dropsy following an obstinate jaundice, was opened about twenty-four hours after his death. The liver, by its tenderness, seemed to be in a corrupted state. The gall bladder was full of bile, and three times larger than is common. The *ductus communis* was so closely stopped at its entry into the *duodenum*, that no bile could be squeezed out of the bladder into that gut. As the examination was made by candle-light, I could not then well judge of the colour of the bile, but the next morning Mr. FORBES, the surgeon who had opened the body, returned to the house, and at my request made the following experiment upon that liquor, which had been kept all night in a tea-cup, in a room without a fire, in the winter-season. He divided the bile into three portions; to one, he added some fixed alkaline salt, but that occasioned no change in the colour, which was of a dark green; into another, he dropped some spirit of vitriol; into the third, some common vinegar; and he observed in both these a manifest effervescence, with a change of the colour to a light green. The experiment was pursued no further; but I doubt not, that had the bile been allowed to corrupt longer, the effervescence would have appeared less and less, and at last have intirely ceased, by the

separation of the alkaline from the corrupted parts; agreeably to the observations of M. GABER. But from all this it appears more and more evident, “ that the volatile salt, in animal substances, is “ very different from the putrid part; that an ani- “ mal substance may abound with this volatile “ alkali, and yet not be the more corruptible; “ and, on the other hand, be highly putrid, with- “ out any mark of alkalescence; finally, that the “ volatile alkaline salts are all of an antiseptic “ nature.” These principles, which I endeavoured to establish, have been more fully demonstrated by M. GABER; and I must set the greater value upon his labour, as it has satisfied the illustrious M. DE HALLER, who, in the second volume of his Physiology, makes several objections to my opinion, about the distinction to be made between putrid and alkaline substances, but afterwards, whilst his book was still in the press, having seen M. GABER’S paper upon that subject, in the last page he candidly acknowledges, that the experiments of that gentleman had fully reconciled him to my sentiments on those matters.

A GENERAL INDEX.

[The *Arabic* numbers refer to the Observations; the *Roman*, to the Appendix.]

A.

A *Ascesses*, in the brain, account of some, 301, & seq. Upon the parotid glands, how to be treated, 317, & seq. In the lungs, 163. In the intestines, 238.

Absorbents, what kinds of, promoters of putrefaction, xxxv, & seq. and of alimentary fermentation, lxxi. See also *testacea*, *chalk*, *septics*.

Absorption, by the pores, if productive of colds, 6.

Acid, predominating, the cause of what disorders, xxxv, lxxii. Species of the scurvy, ill founded, xciii. How corrected, xliii, lxx.

Acids, proper in putrid disorders, 77, 111. In inflammatory cases, 112. In consumptions, 165. In the hospital-fever, 310. Powerful antiseptics, xi. Prevent camp-diseases, 112. Produced by the fermentation of various substances, xliv, & seq. Retard the fermentation of food, lxxviii. Mineral. See mineral.

Ague. See fever intermittent.

Ague-cake, what, 182.

Air, causes of its corruption, 3, & seq. 84, & seq. How affected by frequent rains, 5, 82. Moisture of, more owing to certain winds than rains, 82. and to marshy countries, 2, & seq. Cold and moist, productive of inflammatory disorders, 83. Moisture of, when owing to heat, 183. Putrid, productive of what distempers, 6, & seq. 84. See putrefaction. Putrid, how prevented, 101, & seq. Stagnation of, the cause of what diseases, 85, 190. Fresh, its use in hospitals, 104, & seq. Seldom too dry, 83. Its bad effects, when too moist, 2, & seq. 82, 183. Promotes putrefaction, 184. Of

I N D E X.

Hungary, why unhealthful, 188. Pure, how necessary in the dysentery, 286. In pestilential fevers, 306. Impure, cause of pestilential fevers, 320, & seq. and of the plague, *ibid.* Stagnating, a cause of putrefaction, xxxi, xxxii, lxxxiv, & seq.

Air, fixed, generated by fermentation, xliv. By putrefaction, lxxxvii, & seq. Separates from the blood in deep scurvies, lxxxix.

Alexandria, to what diseases liable, after the recess of the Nile, 194.

Alexipharmac, decoction, 313.

Aliment, ferments in the stomach, lix, & seq. Cause of this, *ibid.* See diet and fermentation.

Alkalescent plants, retard the fermentation of the aliment in the stomach, lxvii. Approach nearest to the nature of the saliva, *ibid.* Do not cure the scurvy by correcting an acid, *ibid.* and xciii. Fermentable, lvii.

Alkaline, quality, confounded with putrid, iv, & seq.

Alkaline salts, volatile, when useful, 160, 313. Their antiseptic quality, vii. & seq. fixed, likewise antiseptic, x, xvii, xxvii. Proper in dropsies, 215; and in the jaundice consequent on intermittents, 216. Do not offend the nerves, xcii.

Aloe, antiseptic, xix.

Alum, antiseptic, xvii.

Amber, salt of, antiseptic, xvii.

Ammoniacus, sal, crude, antiseptic, xii, xvi. Given with the Bark, 205.

Anasarca swellings. See dropsy.

Angelica, antiseptic, xxi.

Angina. See quinsy.

Animal substances, putrefaction of. See putrefaction. Preserved by antiseptics. See antiseptics. Putrid, prove a true ferment, xxiv. See fermentation. Ferment with bread and most vegetables, xliii. & seq. Make a proper part of diet, lix, lx, lxix.

Antimonial emetics, in the dropsy, 216. In the jaundice, *ibid.* In the dysentery, 260, & seq. In the autumnal fevers, 201, & seq.

Antiscorbutics, all probably antiseptics, xxxiv. Some retard the fermentation of the food, lxviii. Assist in digestion, lxix.

Antiseptics,

I N D E X.

- Antiseptics*, camomile-flowers, xii. Wine, 315, 333, 338.
 Acids, tea, sugar, 334, xxi, xl. Greens, fruit, 334.
 Camphire, serpentaria, the Bark, 338, xii. Fixed
 alkaline salts, x, & seq. Spirit and salt of hartshorn,
 vii, & seq. Neutral salts, xi, & seq. Resins and gums,
 xii, xviii. Various vegetables, xx, & seq. Spirits,
 spices, &c. xxi.
- Antwerp*, the moisture of its air, 37.
- Ardent fever*. See fever ardent.
- Army*, diseases of, divided, 71, & seq. Causes, 78, & seq.
 Prevention, 94, & seq.
- Aromatics*, retard the fermentation of food, lxviii. Use in
 digestion, lxix.
- Arthritis*, in what sense used by the ancients, 155.
- Asa foetida*, given after the hospital-fever, 318. Antiseptic,
 xix.
- Ascites*. See dropsy.
- Affizes*, at Oxford, the sickness of, 329.
- Astringents*, in the dysentery, 281, & seq. Powerful antiseptics,
 xxi, xxix.
- Atmosphere*. See air.
- Augustus*, fort, healthful, 49.
- Autumn*, a sickly season, 74, 75, 117, & seq. Particularly
 for an army in the field, 74, 75.
- Autumnal disorders of armies*, 72. To what owing, 74.

B.

- Bark*, Peruvian, why proper in putrid diseases, xxiii,
 xxix. In the hospital-fever, 312, 313, 318, 319. In
 a rheumatism, 161*. In a consumption, 167. In the
 autumnal fevers, 204, & seq. In the peripneumony,
 144. In the dysentery, 274, 275. Why successful in
 gangrenes, xxiii. and pestilential fevers, *ibid*. Remarks
 concerning its antiseptic virtue, xxix.
- Barracks*, damp, unhealthful, 13, 37, 81, 96. How cho-
 sen, 96.
- Bathing*, warm, why forbidden in time of the plague,
 326.
- Bedding*, what, proper for a camp, 95, 97.

I N D E X.

- Bergen-op-zoom*, its situation in regard to health, 58. An account of an encampment in the lines of, *ibid.*
- Bile*, how it operates in digestion, lxx. Differs in most qualities from vegetable bitters, *ibid.* But corrects acidities, *ibid.* How far the cause of fevers, 186.
- Bilious* diseases, what so called, 7, 74, 77, 168, 186, 257, 258.
- Bilious* fever, what understood by that term, 168.
- Bitters*, their use in dropsies coming after intermittents, 215. Retard fermentation and putrefaction, lxvi, lxxviii, lxx. Prevent acidity, lxx. Differ from the bile in several qualities, *ibid.*
- Blankets*, see bedding.
- Bleeding*, in inflammatory disorders, 76, 126, & seq. Rules concerning it, 126. In the phrenitis, 133. Angina, 137. In the pleurisy and peripneumony, 140*. Inflammation of the liver, 146. Inflammation of the stomach, and intestines, 150. In the rheumatism, 157, & seq. In the sciatica, 161. In coughs, 164. In the phthisis pulmonalis, *ibid.* In the cure of wounds, 167. In the autumnal fever, 200, 208. In the dysentery, 260. In the hospital fever, 307.
- Blisters*, when used in inflammatory fevers, 130. In the phrenitis, 134. In the ophthalmia, 135. In the angina, 137. In the pleurisy and peripneumony, 141. In the inflammation of the liver, 146. In the inflammation of the stomach and intestines, 146, 150. In the rheumatism, 159. In the sciatica, 162*. In the autumnal fever, 206. In the hospital-fever, 316.
- Blood*, Crassamentum of, soon putrefies, v. The serum long in putrefying, vi. The serum, how preserved sweet, xxvii. How affected by testaceous powders, xli. Experiments upon its putrefaction, lxxv, & seq. When putrid, how affected by acids, lxxvi. Experiments on its colour, lxxviii, & seq. Sometimes putrid when recently drawn, xc. How preserved from putrefaction in the body, xci. Air generated from it, lxxxvii.
- Bloody* flux, see dysentery.
- Bodies*, dead, what parts soonest putrefy, lxxxiv, & seq.
- Bois-le-duc*, its situation in regard to health, 62, 63.

Bones,

I N D E X.

- Bones* carious, why so offensive, lxxxvi.
Borax, its antiseptic quality, xvii.
Bowels. See intestines.
Brabant. See Netherlands.
Brain, inflammation of, when most frequent, 73, 133.
 Cure, 133, 316. How affected in those who died
 of the hospital-fever, 301, & seq. Abscess of, perhaps
 not always mortal, 318. In what manner, putrefies,
 lxxxv.
Bread, ferments with animal substances, xliii, & seq. Ef-
 fects of that action, ibid.
Bruges, its damp situation, 13.
Brussels, its healthful situation, 27.

C.

- Cabbage*, antiseptic, xxxiv.
Cairo, Grand, diseases occasioned by its stagnating canals,
 193.
Calomel, with rhubarb in the dysentery, 262. For worms,
 211.
Camomile-flowers, for a vomit in the hospital-fever, 309.
 In an electuary, or in infusion, in the tympanites, 214, &
 seq. Their antiseptic virtues, xii, xxviii. Used in the
 dysentery, 272.
Camps, endemic diseases of, 10, 18, & seq. 72, & seq. Causes
 of the diseases, 78. Proportion of the diseases, in 1743
 115, & seq. Dryness of, healthful, 32. The most health-
 ful in general, 98. in the Netherlands, 35. Diseases
 of, increased by foul straw and privies, 21, 97, 288.
 Division of their diseases, 72, 217. Grounds proper,
 98. When to be shifted, 99.
Camphire, given in inflammatory fevers, 129. In the hos-
 pital-fever, 310, 316. Antiseptic, xii.
Cantharides, not septic, xxxv.
Carminatives, in the tympanites, 214, 215. Improper in
 the dysentery, 272.
Carrots, antiseptic, xxxiv.
Carious bones, fœtor of, to what owing, lxxxvi.
Castor, Russian, not septic, xxxv.
Cathartics, when used in the autumnal fevers, 201, 213.
In

I N D E X.

- In inflammatory fevers, 131. In the ascites, 216. In the dysentery, 262, & seq.
- Cavalry*, less subject to camp-diseases than the foot, 18, 92, 172.
- Celery*, antiseptic, xxxiv.
- Chalk*, its septic power, xxxvi, & seq.
- Chalk julep*, when used in a diarrhœa, 208. In the dysentery, 273, 284.
- Cholera*, the cause of, 8, 10, 74. Frequent in moist countries, 8.
- Cleanliness*, advantages of among soldiers, 92.
- Clysters*, in the inflammatory fever, 131. In the autumnal fevers, 204. In the hospital-fever, 310. In the ileus, 151. Mucilaginous and anodyne in the dysentery, 271, 272. Antiseptic, in the dysentery, 275.
- Cochelearia*, not septic, nor a corrector of acidity, but fermentable, lvii, lxvii, xciii. Assists the action of the saliva, lxvii, lxix.
- Gold*, the cause of what diseases, 73, 79. The preservatives from, 95.
- Colds*, what disorders produced by them, 10, 14, 18, 41, 80, 81. The remedies proper, 125, & seq.
- Colewort*, antiseptic, xxxiv.
- Colic*, inflammatory. See ileus.
- Colica biliosa*, the impropriety of that term, 149.
- Constantinople*, why so subject to the plague and pestilential fevers, 325, & seq.
- Consumption*, a consequence of a neglected cold, 15, 73. In what respect inflammatory, 163. How to be treated, 163, & seq.
- Contagion*, Kircher's system, 258.
- Contagious diseases*, of the army, what, 78.
- Contrayerva-powders*, given in fevers, 129, 310. Root, an antiseptic, xx.
- Copenhagen*, an epidemic fever there described, 189.
- Cardials*, when to be given in the hospital-fever, 313, & seq. In inflammatory fevers, 131.
- Cork*, city of, why subject to bad fevers, 327.
- Corpora pinguis*, what, 229.
- Corruption*. See putrefaction, and septics.
- Coughs*, most incident to winter, 14. To what owing, 73. In what respect inflammatory, 163. Neglected, end in a con-

I N D E X.

a consumption, *ibid.* How treated, 163, & seq. Two sorts in a consumption, 165.

Crab's eyes, their septic nature, xxxvi, & seq. Hasten alimentary fermentation, lxxi. See also testaceous powders.

Crassamentum of the blood; putrefies sooner than the serum, v.

Critical days, in general, rejected, 140, 172. When admitted, 297, 315.

D.

Damps, why so bad in Zealand, 3. Constant in camps, 81, & seq. Diseases from, *ibid.* How prevented and corrected, 96, & seq. Cold and hot distinguished, 83.

Delirium in fevers, how treated, 133, 206, 315, & seq. See also phrenitis.

Diaphoresis, how promoted in various fevers, 127, & seq. 201, 206, 308.

Diarrhœa, how to be checked, in inflammatory fevers, 131. How, in the autumnal fevers, 207. In the hospital-fever, 316. At the end of the dysentery, how treated, 281, & seq.

Diet, when too putrescent, 4. Diseases arising from errors of, 86, & seq. When improper, how to prevent diseases arising from it, 110, & seq. Of officers, how regulated, 113. When most to be attended to, *ibid.* Celsus's rule, *ibid.* In inflammatory fevers, 132. In the dysentery, 276, & seq. 283, & seq. In the hospital-fever, 314. After the autumnal fevers, 210. More antiseptic now than formerly, 333, xl. and the change thereby made in distempers, *ibid.* Practical rules, lx, lxix, lxxiii. Vegetable, when proper, lx. A mixture of animal and vegetable food, when best, *ibid.* The time for acids, bitters, aromatics, acrid antiscorbutics, and wine, lxviii, & seq.

Dissections, of those who died of the dysentery, 237, & seq. Of one who died of the autumnal fever, 172. Of one who died of a tympanites, 215. Of several who died of the hospital-fever, 300, & seq. Of those who died of the phthisis pulmonalis, 163.

Diversions, in camp to be encouraged, 115.

Diureticus,

I N D E X.

- Diureticus, sal, antiseptic, xii.*
Dropsy, after obstinate intermittents, 182, 214. How treated, 215.
Dysentery, frequent in moist countries, 8. When most frequent in the army, 20, 55. Description, 217, & seq. The seasons, 76, 79, 217. Uniformity in its appearance, 223. Bad signs, 236, 237. Bodies opened, 237, & seq. Contagious, 20, 55, 254. Causes, 19, 20, 21, 55, 251, & seq. Not owing to fruit, nor bile, 20, 257. Prevented, 100, 101, 102. Cure, 258, & seq. Frequently ends in a tenesmus, or diarrhœa, 279, & seq. Infection, how it spreads, 254. Nature of the infection, 255, & seq.

E.

- Ecthymata of the ancients, what, 296.*
Effluvia, putrid, precipitated by rain, 5. Contagious, 103. Preservations from, 101, 102.
Egg, new laid, why of slow digestion, lxxiii. Yolk of, does not soon putrefy, liv, vi. The white still flower, ibid.
Elixir of vitriol, in the convalescent state of fevers, 132. For checking sweats in the phthisis pulmonalis, 165. In the autumnal fevers, with salt of wormwood, 204.
Emetics, in the autumnal fevers, 201, & seq. 209. In the peripneumony, 144. In the jaundice, 216. In the dysentery, 260, & seq. 266, 269. In the hospital-fever, 306, 308. What season requires them most, 50.
Encampment. See camps.
Epidemics, of marshy countries, their periods, 6, xxiv.
Epispastics. See blisters.
Exercise, errors in, 113. How to be regulated, 114. Excessive, the consequences of, 119. Soldiers have too much, or too little, 91.
Expectorants, when to be used in the pleurisy and peripneumony, 143, & seq.
Eyes, inflammation of, see ophthalmia.
Eye-lids, inflammation and ulcers, how treated, 136, 137.

F.

I N D E X.

F.

- Fæces*, when infectious, 85, 254. Why not always infectious, *ibid.* lxxviii.
- Fæcal acid*, what, lxxviii.
- Farinaceous* vegetables, how far antiseptic, xxxiv. Ferment with animal substances, xliii, & seq. Produce little acid without fermenting with animal substances, lxiii.
- Feet*, warm fomentation of, when proper, 135, 306.
- Ferment*, in what sense this term applied to putrefaction, 337, 338, xxxii, xxxiii, xciii.
- Fermentation*, vinous, in vegetables, excited by putrid animal substances, xliii, xlv, & seq.
- Fermentation*, various experiments concerning it, xliii, & seq. In milk, lviii.
- Fermentation*, action of, in digestion, lix, & seq. How far necessary, *ibid.* How far assisted by the saliva, xlvi, & seq.
- Fermentation*, alimentary, retarded or suppressed by acids, wine, beer, spirits, bitters, aromatics, and the acrid antiscorbutics, &c. lxv, & seq. Not suspended by scurvy-grass, lxvii. Nor by bile, lxx. Hastened by a certain proportion of sea-salt, and by the testacea, lxxi, lxxii. Made more tumultuous by the same, *ibid.* Moderated and perfected by the saliva, xlvi, & seq. lxi, lxii. and by the antiscorbutic plants, lxvii. Promoted by tender meats not quite fresh, and by pounded and roasted meats, lxxii. Not proceeding, occasions the sense of heaviness of the aliment, lxxiii. Acetous, how produced in the stomach, lxii, lxiii.
- Fermented* liquors, when most proper, lxix. The means of suppressing putrid diseases, 333, & seq.
- Fever*, ardent, defined, 180. How classed by Hippocrates, *ibid.* When most incident, 7, 65, 180. A species of the autumnal fever, 7, 64, 180.
- Fever*, autumnal remitting, and intermitting, where epidemic, 6, 7, 10, 23, 24, 187, & seq. Why called the gall-sickness, 7. What season most liable to it, 6, 73, 74, 168. The symptoms, 169, & seq. Its causes, 2—8, 62—66, 85, 183, & seq. Incident to
camps,

I N D E X.

- camps, as well as to marshy countries, 10. Instances of it in camps, 23, 24, 31, 51, 56, & seq. 65, & seq. That of the camp, described, 169, & seq. That of low and marshy countries, described, 6, & seq. 173, & seq. Of different countries compared, 187, & seq. The cure, 200, & seq. When productive of obstructions of the viscera, 214.
- Fever*, bilious, what, 7.
- Fever*, hectic, diminished by small bleedings, 164, 167.
- Fever*, hospital. See hospital-fever.
- Fever*, jail. See jail-fever.
- Fever*, inflammatory, distinguished from others, 73. When most incident to an army, 73, 75. To what owing, *ibid.* and 124. How treated, 125, & seq.
- Fever*, intermitting. See fever autumnal, remitting and intermitting.
- Fever*, malignant, an improper term, 320.
- Fever* of the marshes, symptoms, 173. Cure, 208.
- Fever*, miliary. See miliary.
- Fever*, nervous, what, 339.
- Fever*, pestilential, how far different from the plague, 192, 319, & seq. Its nature and causes, 319, & seq.
- Fever*, putrid, what, 186.
- Fever*, remitting. See fever autumnal.
- Fever*, yellow. See yellow-fever.
- Fibres*, relaxed by heat, 9. By a moist atmosphere, 184. By putrefaction, lxxxii, & seq.
- Fish*, ferments with bread, lii.
- Flanders*. See Netherlands.
- Flatulence*, in the dysentery, how corrected, 272.
- Flesh*, preserved by antiseptics. See antiseptics. How recovered from a putrid state, xxii. Ferments with vegetable substances, xliii, & seq. And thereby preserved sweet, *ibid.* Corrupted, becomes green, lxxx.
- Flux*. See diarrhœa, and dysentery.
- Fogs*, putrid, the cause of autumnal fevers, 64, 79. Their effects on the human body, 64. See also damps, and marshes.
- Fomentations*, of the feet and legs, in the phrenitis, 135. Of the belly, in the dysentery, 272.

I N D E X.

Food, its fermentation in the stomach accounted for, lix, & seq. Various experiments concerning it, xliii, & seq. See also diet.

Foot. See infantry.

Frankincense, burning of, proper in hospitals, 109.

Fruit, not the cause of camp-diseases, 20, & seq. 88, 89. When improper, 90. Preserves from putrid diseases, 334.

Furnes, one of the sickly towns in Flanders, 2.

G.

Gall. See bile.

Gall-sickness, what, 7.

Galls, their antiseptic virtue, xx:

Gangrene, in the dysentery, 238, & seq. In the hospital-fever, 303. How cured by the Bark, xxiii.

Garlick, antiseptic, xxxiv.

Garrison-diseases. See winter-diseases.

Gemmæ, sal, its antiseptic virtue, xvi.

Ghent, its situation in regard to health, 11.

Ginger, antiseptic, xx.

Gout, anciently confounded with the rheumatism, 155. When depending on an acid in the stomach, how relieved, lxxii.

Grand-Cairo. See Cairo.

Green colour, in flesh, owing to corruption, lxxx. Also that of the serum of the blood, lxxx, lxxxii.

Greens, preservative against putrid diseases, 334. The present consumption compared to that of former times, *ibid*. See vegetables.

Gripes, one of the symptoms of the dysentery, 218. How remedied, 272.

Ground-ivy, antiseptic, xxi.

Guajacum, gum, its use in the rheumatism, 161, & seq.

Guinea, its rainy season, 196. What diseases most frequent there, *ibid*.

Gums, antiseptic, xix, & seq.

Gun-powder, burning of, in hospitals, 110.

I N D E X.

H.

- Hartshorn*, salt, and spirit, in the rheumatism, 160, 161*.
 In the inflammatory angina, 138. In the hospital-fever, 313. Are antiseptic, vii. & seq. x, xvii, xxvii.
- Heart*, its growth, in the plague, accounted for, lxxxiii.
- Heart-burn*, to what owing, lxi. The remedy, *ibid.* In the dysentery, 272.
- Heat*, following heavy rains, prejudicial to health, 5. What diseases occasioned by it, 79, 80. and how to guard against them, 94, & seq. Causes of putrefaction, xxxi. Animal, to what owing, *ibid.*
- Hemitritæa*, why epidemic in ancient Rome, 192.
- Hepatitis*. See liver.
- Horse-radish*, antiseptic, xxi. Moderates alimentary fermentation, lxxvii. and therein acts like the saliva, *ibid.*
- Hospitals*, camp, division of, 107. Their bad air, 107. General, infection of, how prevented, 33. Further rules concerning them, 102, 107, & seq. Regimental ones, their use, *ibid.* & 105, 106. What places proper, 104. With what provided, 105. Necessary in camps and winter quarters, *ibid.* Winter, rules concerning them, 108.
- Hospital-fever*, the same with the jail-distemper, 15, 16, 46, 47. Frequent in armies, 16, 25, Contagious, 25, 26, 39. Precautions, 45, 46. Causes, 319, & seq. What places most liable, 68, 287, 288. Not properly a camp-disease, 289. Belongs to the pestilential class of diseases, 304, 319, & seq. Symptoms, 290, & seq. Prognostics, 298, & seq. Dissections, 300, & seq. Prevention, 103, & seq. Cure, 305, & seq. See also jail-fever.
- Hospital-ships*, subject to the hospital-fever, 288.
- Humours*, animal, which soonest corruptible, v. How affected by antiseptics, xxvi, & seq. By putrefaction, lxxix.
- Hungaricus*, morbus, described, 187, & seq.
- Hungary*, its climate, 188, & seq.

I N D E X.

I.

- Fails*, often the cause of pestilential-fevers, 46, 329, & seq.
- Fail-fever*, the same with the hospital-fever, 47, 287, 320. See hospital-fever.
- Jamaica*, account of its fevers, 197.
- Japan earth*. See terra Japonica.
- Java*, account of its seasons, 194. What diseases epidemic, 195.
- Faundice*, sometimes in the autumnal fevers, 214. How treated, 216.
- Ileus*, what, 147. How cured, 149, & seq.
- Indies-west*, account of the seasons, and epidemic diseases, 196.
- Indigestions*, from various causes, lxi, & seq. lxxviii, & seq. lxxiii. How to be remedied, lxi. And by substances most resembling the saliva, lxi, lxxix. Occasionally by acids, bitters, wine, spirits, ibid. When by aromatics, lxxviii, & seq. and lime-water, lxxii. See also diet, and stomach.
- Infantry*, why less healthful than the cavalry, 91, 92.
- Infarctions*, of the lungs, owing to cold, 41. Require large and repeated bleedings, ibid.
- Inflammation* of various parts, how to be treated, 133, & seq.
- Inflammatory disorders*, in an army, what, 73, & seq. When most frequent, 14, 18, 30, 73, 123, 124. The effects of colds, 30, 73. Disappear in June, 75. Include the vernal intermittents, 124. Cured 125, & seq. Prevented, 94, & seq. See likewise fever inflammatory.
- Influenza*, what, 16.
- Intermittent*, irregular after the hospital-fever, how treated, 318.
- Intermitting fever*. See fever autumnal.
- Intestines*, inflammation of, how treated, 146, & seq. Which most affected in the dysentery, 232, 238, & seq. 248. Mortifications, 238, & seq. 303. Why corrupt so quickly after death, lxxxiv.

I N D E X.

- Inundations*, the cause of autumnal remitting and intermitting fevers, 2, & seq. 37, 62, & seq. 85, 174, & seq. of ardent fevers, 2—7, 64, 174, & seq. of pestilential fevers, 193, 194. of fluxes, 37, 85. when most to be dreaded, 6, 63, 82. Less dangerous than marshes, 62, 82. See also marshes.
- Joints*, inflamed, how to be treated, 161*.
- Ipecacuanha*, with tartar emetic in the autumnal fevers, 202. In the dysentery, 261, & seq. How given by Piso, 261.
- Ischias*, a species of arthritis, 155. How to be treated, 162*.
- Issues*, their efficacy accounted for, lxxxii. Use of in consumptions, 165.
- Itch*, contagious, 15, 92, 340. To what owing, *ibid.* 344. Confounded with a miliary eruption, 341. What places most liable to be infected, 93, 340. Cure, 342.
- July*, a healthful month for the field, 76.
- June*, the most healthful month of a campaign, 75.
- Juniper*, burning of, in hospitals, 109.

K.

- Kettles*, of the hospital, what care to be taken of them, 278.

L.

- Lakes*, putrid effluvia of, the cause of pestilential fevers, 321.
- Laudanum*. See opium.
- Laxity* of the fibres, occasioned by putrefaction, lxxxii.
- Leeches*, when to be used, 133, 136, 159, 207.
- Lenticulæ*, what, 296, 328.
- Lepra*. See leprosy.
- Leprosy*, different from the itch, 343. Confounded with the scurvy, 48. Of the Greeks, the impetigo of Celsus, 344. Symptoms of, distinguished from the scurvy, *ibid.* Of the Arabians, a putrid disease, xl. Why less frequent than formerly, xl, lxi. General remedies, 345.

Leyden,

I N D E X.

- Leyden*, its situation in regard to health, 190.
- Lientery*, the consequence of a dysentery, 237. Cured, 283.
- Lime-water*, for checking colliquative sweats, 165. Resists putrefaction, how far, xlii. Its virtues, xlii, xliii, lxxii. In what agreeing, and disagreeing with fixed alkaline salts, and the testacea, lxxii. Neither hastens alimentary fermentation, nor makes it too strong, *ibid.*
- Liver*, inflammation and suppuration, 145. Inflammation of, how treated, 146. Its size in the plague accounted for, lxxxiii, & seq.
- Lixivial* salts. See wormwood, salts of.
- London*, why so free from pestilential diseases, 334, 335.
- Loch Nefs*. See Nefs.
- Low-Countries*. See Netherlands.
- Lungs*, infarction of. See infarction. Inflammation of. See peripneumony. How affected in the phthisis pulmonalis, 163. Why so speedily corrupt after death, lxxxv. Send off part of the perspirable matter, xci.

M.

- Maestricht*, healthful, 55.
- Mahometans*, why so liable to the plague, 325, 326.
- Manna*, with salts, in the dysentery, 266, 267.
- Marches*, how regulated, 113.
- Marrow*, not easily corrupted, lxxxv. Does not occasion the fœtor of carious bones, lxxxvi.
- Marshes*, exhalations from, putrid and insalutary, 2, 62, 84, & seq. 173, 323, 324. Occasion autumnal fevers, 62, & seq. 173, & seq. Sometimes pestilential diseases, 321, & seq. Their bad effects, how prevented, 9, 62, 99, & seq. See also effluvia, inundations.
- Marsh-fever*, a species of the autumnal fever, 173, & seq. See fever autumnal.
- Matter*, or pus. See pus.
- Mercury*. See calomel.

I N D E X.

- Messes*, recommended in armies, 87, 110. Rules concerning them, 111, & seq.
- Miasma*. See effluvia, ferment, putrefaction.
- Miliary*, fever, different from that of the hospital, xcv. & seq. Eruption, not to be confounded with the itch, 341.
- Milk*, when to be used in the dysentery, 284. Ferments with putrid animal substances, lviii.
- Mindereri*, spiritus, its qualities, 128. Its antiseptic power, xvi.
- Mint*, antiseptic, xxi.
- Mixture*, saline, its antiseptic power, xvii. In the act of effervescence corrects putrefaction, lxxviii. Its effects in pestilential fevers accounted for, ibid.
- Moisture*, diseases occasioned thereby, 6, & seq. 12, 17, 37. How prevented, 96. Of the air, how estimated 82. Transpires from subterraneous water, 3, 63. Its effects on the human body, 83.
- Morbus Hungaricus*. See Hungaricus.
- Mortification*. See gangrene.
- Musk*, tried in the hospital fever, 310.
- Mustard*, its antiseptic virtue, xxi. Diuretic, 216. Moderates alimentary fermentation, lxvii. When useful in digestion, lxviii, lxix.
- Myrrh*, a powerful antiseptic, xii, xviii.

N.

- Nastiness*, promotes pestilential diseases, 324, & seq. 328, & seq. Stops perspiration, 92. Makes the poor more liable to putrid diseases, 252. Of the streets, unwholesome, 336.
- Nausea*. See stomach.
- Nervous* fever. See fever nervous.
- Ness*, Loch, description of, 48. Why it never freezes, ibid. Quality of its water, ibid.
- Netherlands*, the climate, 1, & seq. Epidemic diseases, 6, & seq.
- Neutral* salts how far antiseptic, xi. Excepting sea-salt, never septic, xxxix. A table of their power in resisting putrefaction, xvi, xvii.

Newgate,

I N D E X.

Newgate, prison, its bad air, 330, & seq. Of the jail-distemper from thence, *ibid.*

Nitre, its antiseptic power, xvii. Does not long preserve gall, xxvii. With gall, emits much air, *ibid.*

Nitrous, medicines, in inflammatory cases, 128, & seq.

O.

Obstructions of the viscera, consequent on autumnal fevers, 214, & seq. How treated, *ibid.*

Officers less subject to camp-diseases than the common men, 67, 183. Their rules of diet for preventing camp-diseases, 112. How to keep their tents dry, 97; warm 98; and well aired, *ibid.*

Oily medicines, for coughs, 143, 164.

Old-Bailey, sessions, fatal, 330.

Onions, antiseptic, xxxiv.

Ophthalmia, how treated, 135, & seq.

Opiates, when used in inflammatory fevers, 132. In the hospital-fever, 306, 317. In the dysentery, 263, & seq. Used with caution, after pulmonary inflammations, 144. In the rheumatism, 162. In the phthisis pulmonalis, 166. With squills in disorders of the lungs, 144.

Opium, resists putrefaction, xix.

Ostend, a healthful town, 3, 36.

Ox's gall, how preserved from putrefaction, xxvii. With nitre, its effects, *ibid.*

Oxymel of squills, used as an expectorant, 143. As a corrector of opium in the phthisis pulmonalis, 166.

P.

Parotid glands, how affected in the pestilential fever, 298. Abscess upon them, how to be treated, 317, & seq.

Pepper, antiseptic, xx.

Peripneumony, one of the most common diseases of the inflammatory class, 73. When most frequent, 75. The cause, 80. How treated, 140, & seq. See also *Pleurisy*.

I N D E X.

- Perspirable* matter, septic, 184, & seq. Or the cause of putrefaction, if retained in the blood, *ibid.* & *xc.* Consists of the more volatile or putrid parts of the blood, 74. Most putrid during hot weather, 10, 19, 74, 184, & seq. Flies quickly off from the serum, *lxxvi.*
- Perpiration*, stopped, by what changes in the air, 6, 10, 18, 19, 31, 73, & seq. 79, & seq. 83, 93, 184, & seq. *xc.* Produces, in winter and spring, inflammatory diseases, 72, 73, 81, 83. In summer and autumn, fevers and fluxes, 6, & seq. 10, 19, & seq. 55, 73, 74, 79, & seq. 83. In Britain, less dangerous in summer than in hotter climates, 185.
- Pestilential* fever. See fever pestilential, and the plague.
- Petechiæ*, frequent in the hospital-fever, 296. Different eruptions have got that name, *xcviii.* & seq.
- Phrenitis* described, 133, 294. See delirium.
- Phthisis pulmonalis*. See consumption.
- Plague*, how far different from pestilential fevers, 320. What kind frequent in ancient Rome, 192. Hospital-fever, a species of it, 320. To what causes owing, *ibid.* & seq. Constantinople, why so liable to it, 325. Preservatives, 333, & seq. Why less frequent than formerly, 332.
- Plantations*, their effects on the atmosphere in low and moist countries, 4, 85.
- Plants*, several kinds of, antiseptic, *xx.* *xxi.*
- Pleurisy*, to what owing, 73. Where most frequent, 14, 123. How treated, 140, & seq. Not to be distinguished from the peripneumony, 142.
- Poppy*, white, antiseptic, *xxi.*
- Pork*, why forbidden in camps, 112.
- Prisons*. See jail-distempers.
- Privies* of a camp, the fomes of the dysentery, 21, 85, 254. Spreads, *ibid.* How and when most infectious, 85. How to be regulated, 101.
- Pulse*, its sinking after bleeding, one of the signs of the hospital-fever, 291.
- Puncticula*. See petechiæ.
- Purges*. See cathartics.
- Pus*, how formed, *lxxx.*

Putrefaction,

I N D E X.

Putrefaction, its nature, xxx. Of what the effluvia chiefly consist, lxxvii. An instrument of Nature, xxx. An inquiry into it recommended by Lord Bacon, iii. Necessary for preparing the aliment, xxx. Deficiency the cause of diseases, *ibid.* Crisis of fevers may depend upon it, *ibid.* Likewise animal heat, *ibid.* and xxxi. Concoction, resolution, and suppuration, species of it, xxx, xxxi. The humours rendered thinner by it, lxxxii. An exception, lxxv, lxxvi. The fibrous parts relaxed by it, lxxxii. What substances promote it, xxxv, & seq. And what do not, xxxiii, xxxiv. Differs from fermentation, xxxiii. Yet strongly excites fermentation, xxxiii, xlvi, & seq. Has different effects in a dry or moist atmosphere, 324. Generates air, lxxxvii. The cause of flatulence, 231. How prevented and corrected. See antiseptics.

Putrefaction, in the air, to what owing, 3, 4, 84, & seq. xxiv, xxxii. The cause of several distempers, *ibid.* How remedied, 99---111. See also air. In great cities, the antidotes to, 336.

Putrefaction, of the body, what parts soonest corrupt, lxxxiv. & seq. Of the humours, the cause of remitting and intermitting fevers, 7, 8, 85, 184, & seq. xxiv. The cause of the dysentery, 252, & seq. 324. The cause of pestilential fevers, 319, & seq. The cause of the true scurvy, 8, 9, lxxxviii. & seq. Of the lepra Arabum, xl. Frequently owing to a stoppage of perspiration after hot weather, 10, 19, 55, 79, 80, 184, & seq. See also blood, humours, perspiration.

Putrifiers. See septic.

Putrid, confounded with alkaline, iii. & seq. xcii.

Putrid blood, steams of, occasion the dysentery, 324. A case thereof, 255. Various experiments upon it, lxxiv, & seq. See also blood.

Putrid ferment. See ferment and septic.

Putrid diseases, the reason of their present decline, 332, 333.

I N D E X.

Q.

- Quarters*, cold, of what disorders productive, 42, 81, 82.
Damp, their bad effects, 13, 81, & seq. How to be chosen, 96.
Quinsy, inflammatory, disease frequent in armies, 29.
 How treated, 137, & seq. Ulcerous, what gargle proper, 139.

R.

- Radish*. See horseradish.
Rains, when the cause of purifying the air, 5, 56, 82, 184. Of corrupting it, 5, 82. See also inundations and marshes. Cause of camp-diseases, 19, & seq. 56. 92. Moist and rainy seasons, their difference, 5.
Refrigerants, their antiseptic quality, xxi.
Regimental-hospital. See hospital.
Remittent, or remitting fever. See fever.
Resinous substances, antiseptic, xii.
Resins, their strong antiseptic virtues, xix, & seq.
Returns, what, 2.
Rhenish wine, recommended in the jail- or hospital-fever, 314.
Rheumatism, a disease incident to winter, 14. and the beginning of a campaign, 29. Its common causes in armies, 14, 34, 73, 80, 81. Anciently confounded with the gout, 155. The term, by whom first used, 156. Method of treating it, 157, & seq.
Rhubarb, in a tympanites, 214. Joined to the bark in the autumnal fevers, 205. Joined to calomel in the dysentery, 262, 269. And for worms, 211. Is antiseptic, xxi.
Rome, subject to marsh-fevers, 192. To the hemitritiæ, ibid. To pestilential fevers, ibid.
Roses, red, antiseptic, xxi.
Rusting of metals, an ambiguous sign of a moist air near the sea, 195.

S.

- Saffron*, an antiseptic, xx. Less so with serum, than with flesh, xxvii.

Sagapenum,

I N D E X.

- Sagopenum*, gum, little antiseptic, xix.
- Sage*, antiseptic, xx.
- Sal*, Ammoniacus. See Ammoniacus. Catharticus amarus in the ileus, 151. In the dysentery, 267, 270. Cornu cervi. See hartshorn. Diureticus. See diureticus. Gemmæ. See gemmæ. Succini. See amber.
- Saliva*, resists putrefaction, xlviij, l. Moderates alimentary fermentation, xlviij, lii. Makes it vinous, *ibid.* Necessary in digestion, lxi, lxii. By what substances assisted in digestion, *ibid.* and lxvii, lxviii, lxix. Putrid, its effects in alimentary fermentation, li, lx. How corrected, lxviii.
- Salt*, common, or sea-salt, its antiseptic power compared with other salts, xvi. In what circumstances septic, and antiseptic, xxxvii, & seq. The only septic salt, xxxix, xl. In aliment, acts as a septic, xxxviii. Of wormwood. See lixivial salts, and saline mixture.
- Salted* meat, less a part of diet than formerly, 334. One of the causes of putrid diseases, *ibid.* xl. Of the sea-scurvy in particular, xci.
- Saline* mixture, used in the autumnal fever, 204. That of Riverius, recommended in vomitings, 152, 308. Its sedative quality accounted for, lxxviii.
- Saline* purges, in the dysentery, 266, 267, 270.
- Salts*, their comparative antiseptic power, xvii. Lixivial. See lixivial.
- Scabies*, of the ancients, different from the itch, 343. Confounded with the scurvy, *ibid.*
- Sciatica*. See ischias.
- Scurvy*, true, a distemper more peculiar to marshy countries, 9. Or to a cold and moist air gradually checking perspiration, xci. Or to the air of unventilated ships, *ibid.* Or to salted provisions, *ibid.* Properly but one species of it, *ibid.* Arises only from a putrid cause, 9, xci. Symptoms, lxxxii, lxxxiii, lxxxix. The present decline, to what owing, 333, & seq. Symptoms, accounted for, lxxxix, xci, xcii. False, or what is commonly reputed, a species of the lepra, 48, 344, 345.
- Scybala*, hard, the cause of irritation in the dysentery, 229. How to be carried off, 279.

I N D E X.

- Sea-air*, its good effects, 3. Not the cause of the scurvy, 9. Exhalations, less from thence than marshy grounds, 3. Not putrid, 9. Salt. See salt.
- Seasoning*, of troops, 120, & seq.
- Seasons*, compared, with relation to the health of an army, 115, & seq. Which the most healthful in the field, 75, 76, 116. Which the most sickly of a campaign, 74, 75, 117, & seq. Which most dangerous in marshy countries, 6, 183, & seq. Moist and rainy, seasons different, 5, 82, 83. Moisture of, not to be estimated by the quantity of rain, *ibid.* Moisture after great heats most dangerous, 83. Hot, their bad effects in marshy countries, 5, 65, 188, & seq. Bad for the wounded, 55. Cold and sharp, the disorders of, 43, 44. What, productive of the autumnal fever, 74. What, productive of the dysentery, *ibid.* What, productive of inflammatory diseases, 73, 75.
- Septics*, the same with putrifiers. What, xxx, xxxi. Real, few discovered, *ibid.* What substances erroneously reputed such, xxxiii, xxxv. Three principal, xxxv, & seq. Their use, xxx, xxxi, xlii. Hasten alimentary fermentation, lxxi, lxxii.
- Septic*, effluvia, how they affect the blood, 337. How they affect the nerves, 338. Ferment, 337. What, and how it operates, xxxii, xxxiii. See also effluvia, ferment, putrefaction, putrid.
- Sena*, antiseptic, xxi.
- Serpentaria*, root of, used in the hospital-fever, 311, & seq. In the dysentery, 274. A powerful antiseptic, xii, xx, xxvi, xxvii. but with little astringent, xxx.
- Sessions*, at the Old Bailey, fatal, 330.
- Ships*, transport, apt to breed the jail-fever, 68, 86, 287.
- Sieges*, the cause of pestilential-fevers, 328.
- Setons*, used in consumptions, 165. Their efficacy accounted for, lxxxii.
- Simaruba* root, its use in the dysentery, 282.
- Sluys*, one of the most sickly towns in Flanders, 2.
- Snake-root*. See serpentaria.
- Solids*, how affected by putrefaction, lxxxii.
- Spasms*, caused by putrid effluvia, xcii.

Spirit,

I N D E X.

- Spirit* of hartshorn, used in the rheumatism, 160, 161*.
- Spiritous* liquors, drinking of, not the cause of any general sickness in the army, 87. In moderation, tend to preserve from camp-diseases, 88. Reasons for using them in the camp, *ibid.* and 210. Regulations about their use, 88, 112, 211.
- Spiritus Mindereri.* See *Mindereri*.
- Spleen*, its increase in pestilential fevers accounted for, lxxxii, & seq.
- Spring*, a healthful season for an army, 75.
- Sputum*, in the pleurisy or peripneumony, how conducted, 140*, 144.
- Squills*, when proper in the phthisis pulmonalis, 164, 166. In the pleurisy and peripneumony, 143, 144.
- Starch*, in decoction for the dysentery, 273. In clysters, for the same distemper, 271.
- Steams*, of hot water with vinegar, in the pleurisy and peripneumony, 143.
- Stomach*, inflammation of it, how treated, 146, & seq. Sickness or disorder, a symptom of the autumnal fever, 169. Of the dysentery, 218. Sometimes of the pestilential fever, 295. Its actions with regard to digestion explained, lix, & seq. Some of its disorders accounted for, lxi, & seq.
- Stomachics*, various according to circumstances, lxi, & seq. See diet, digestion, fermentation, indigestion.
- Stoves*, why not used in hospitals, 108.
- Strangury*, on blistering the head prevented, 134.
- Straw*, foul, a fomes of the dysentery, 21, 85. To be often renewed, 97, 102.
- Stupor*, a symptom always attending the hospital-fever, 294.
- Sudorifics*, in time, prevent some fevers, 127, 306. When most proper in the hospital-fever, 306, 310. See also diaphoresis.
- Sugar*, antiseptic, xl. Prevents putrid diseases, 334, xl.
- Sulphur*, burning of, recommended in hospitals, 110. Specific in the itch, 342. How it acts, *ibid.*
- Summer*, what kind of season with regard to health, 73, & seq. 64, & seq. Diseases of, 73, 74. Dry, sometimes with a moist atmosphere, 183, 184.
- Suppuration*, a species of putrefaction, xxxi, lxxxii.

I N D E X

T.

- Tamarinds*, with manna and emetic tartar in the yellow fever, 203.
- Tartar*, emetic, used in the autumnal fevers, 201, & seq. In the dysentery, 261, 266, 277. Soluble, and vitriolated, their antiseptic powers, xii.
- Tea*, green, antiseptic, xxi. Concurs with other causes to suppress putrid diseases, 334.
- Tenesmus*, a constant symptom of the dysentery, 218. How treated, 275.
- Tents*, for soldiers, naturally damp, 81. How kept dry, 97. And warm, 98. Their straw to be often renewed, *ibid.* and 102.
- Terra Japonica*, antiseptic, xix.
- Testaceous* powders, of a septic nature, xxxv. Their effects on the human blood, xli. Why so much used formerly, *ibid.* When useful, lxii. Promote the fermentation of food, lxxi.
- Theriaca*, with sal c. c. as a sudorific, 127, 306. With rhubarb, in the dysentery, 269. With serpentaria, in the dysentery, 274.
- Thirst*, by what moderated in feverish disorders, 132.
- Throat*. See quinsy.
- Thunder*, its effect upon the air, 60.
- Trees*. See Woods.
- Turks*, why so subject to the plague, 325, & seq.
- Tremor* of the hands, one of the signs of the jail- or hospital-fever, 290.
- Trenches*, about soldiers tents, usefulness of, 97.
- Turneps*, antiseptic, xxxiv.
- Tympanites*, its cure, 214, 215.

U.

- Ulcerous*, sore throat, 139.
- Ulcers* in the lungs, 163, & seq. In the intestines, 220. Cancerous, a remedy for to be perhaps found among the antiseptics, xxix. Why weakening, lxxxii.

Unclean-

I N D E X.

Uncleanliness, checks perspiration, 92. Disposes to the dysentery, 253. And to the pestilential fevers, 288, & seq. 324, 325.

Urine, soon putrifies, vi. But its putrefaction not infectious, *ibid.* Spirit of, antiseptic, viii. Whence its colours in acute diseases, lxxx. And in the scurvy, *ibid.* Sediment, after long standing, of what nature, lxxxii.

V.

Valerian-root, wild, antiseptic, xxi.

Vapours, of stagnating water, in what respect noxious. See damps, fogs, inundations, marshes.

Vegetables, when most necessary in diet, III, 334. A necessary provision for camps, III. Esculent, though not farinaceous, also ferment with putrefying animal substances, lv. & seq. All alimentary ones, not over bitter or spicy, ferment with corrupted animal substances, lviii. Retarding alimentary fermentation, lxiv, & seq. Not retarding it, lxvi. Moderating alimentary fermentation, *ibid.* Which are the best stomachics, lxix. Coming more into diet, tend to suppress putrid diseases, 333, 334. The proportion between the quantity consumed now, and an hundred years ago, 334. See also diet, farinacea, greens.

Ventilators, their use in hospitals, 108, 109. And in transport ships, *ibid.* Description of one proper for field-hospitals, 108, 109.

Vernal, diseases of armies, chiefly inflammatory, 34.

Veterans, when least liable to camp-diseases, 32, 35, 37. When more sickly than new men, 120, 121.

Vinegar, steams of, good against infection, 109. In the pleurisy and peripneumony, 143. Used in the Roman armies, III. In inflammatory fevers, *ibid.* In the jail- and hospital-fevers, 310.

Vipers, dried, not septic, xxxv.

Viscera, how affected by great cold, 124. Obstructions of. See obstructions. Abdominal, corrupt soonest after death, lxxxiv.

Vitru

I N D E X.

Vitrum ceratum antimonii, powerful in the dysentery, 260.

Volatile alkaline salts. See alkaline salts.

Vomits. See emetics.

Vomiting, remedy for it in the ileus, 152. How stopped in the hospital-fever, 308, 309. See also emetics.

W.

Wards of hospitals, to be large and airy, 107, & seq. See hospital.

Water, for drinking, impure, aggravates the tendency to putrid diseases, 4, 90. Bad, has little share in producing the diseases of an army, 87, 90, 91. Of Zealand, bad, *ibid.* At Inverness, disposed to a slight looseness, 47. Was generally plentiful and good in the army, 91. To be qualified with acids, or spirits, 112.

Water, stagnating and corrupting, its bad effects, 2, & seq. 82. See also damps, effluvia, inundations, marshes.

Water, subterraneous, its effects in moistening the air, 2, 3, 62, 63. To be avoided in cantonments, 98. And in encampments, 82.

Wax, its use in the dysentery, 273.

Weather, diseases depending upon it, classed, 72, & seq. Cold, the cause of what diseases, 75, 80, 81. Hot, the cause of what diseases, 74, 79, 80. Moist, its effects, 82, & seq. Moderate, makes healthful campaigns, 32, 38. Especially as to heat, 38, 79. See also seasons.

West-Indies. See Indies.

Wind. See flatulence.

Winds, prevent a stagnation and corruption of the air, 3, 4, 58. Prevent the plague in hot climates, on the sea-coast, 196, & seq. Make situations open to the sea, though in a marshy country, generally healthful, 3, 58. The moist, and dry, in the Netherlands, 82. *ibid.* From the Carpathian mountains, their effects in Hungary, 189. See also air.

Wine, when most necessary in diet, 9, 113, *lxix.* When to be used in fevers, 131, 314, & seq. When improper in the jail- or hospital-fever, 316. Tends to prevent putrid

I N D E X.

trid diseases, 333. Retards alimentary fermentation lxxviii. In what cases assisting to digestion, *ibid.* Requisite for scorbutic or putrid habits, lxxix. Also for those whose stomachs are relaxed, *ibid.*

Winter, diseases, the same with those of garrisons, 72. Diseases, are mostly inflammatory, 73. A list of them, 14, 73. Owing to colds, *ibid.* Why they occur in the beginning of a campaign, 75. And in the end of a campaign, 76. How cured. See inflammation and fever inflammatory. How prevented, 95, 96. Expeditions, what proper precautions, 119. Hospitals, rules concerning them, 108. Quarters, the advantages of going early into them, 118, & seq.

Woods, when hurtful, 4, 63, 83.

Worms, round, in the bowels, to what owing, 8. Incident to the flux and the autumnal fevers, 24, 171. The cure, 211.

Wormwood, salt of, how used in jail- and hospital-fevers, 308, 309. Common, its antiseptic power, xxi. Infusion of, used in visceral obstructions after autumnal fevers, 216. Salt of, its antiseptic power, xvii. See also saline mixture.

Wounds, by broad-swords, why easily cured, 44. With what cautions treated with the Bark, xxix.

Y.

Yellow fever, of the West-Indies, 197, 198.

Z.

Zealand, why unhealthful, 2, 3. Its endemic fever called the gall-sickness, 7. The sickness of the British troops there, 57, & seq. 61, 85. See also Netherlands.

F I N I S.

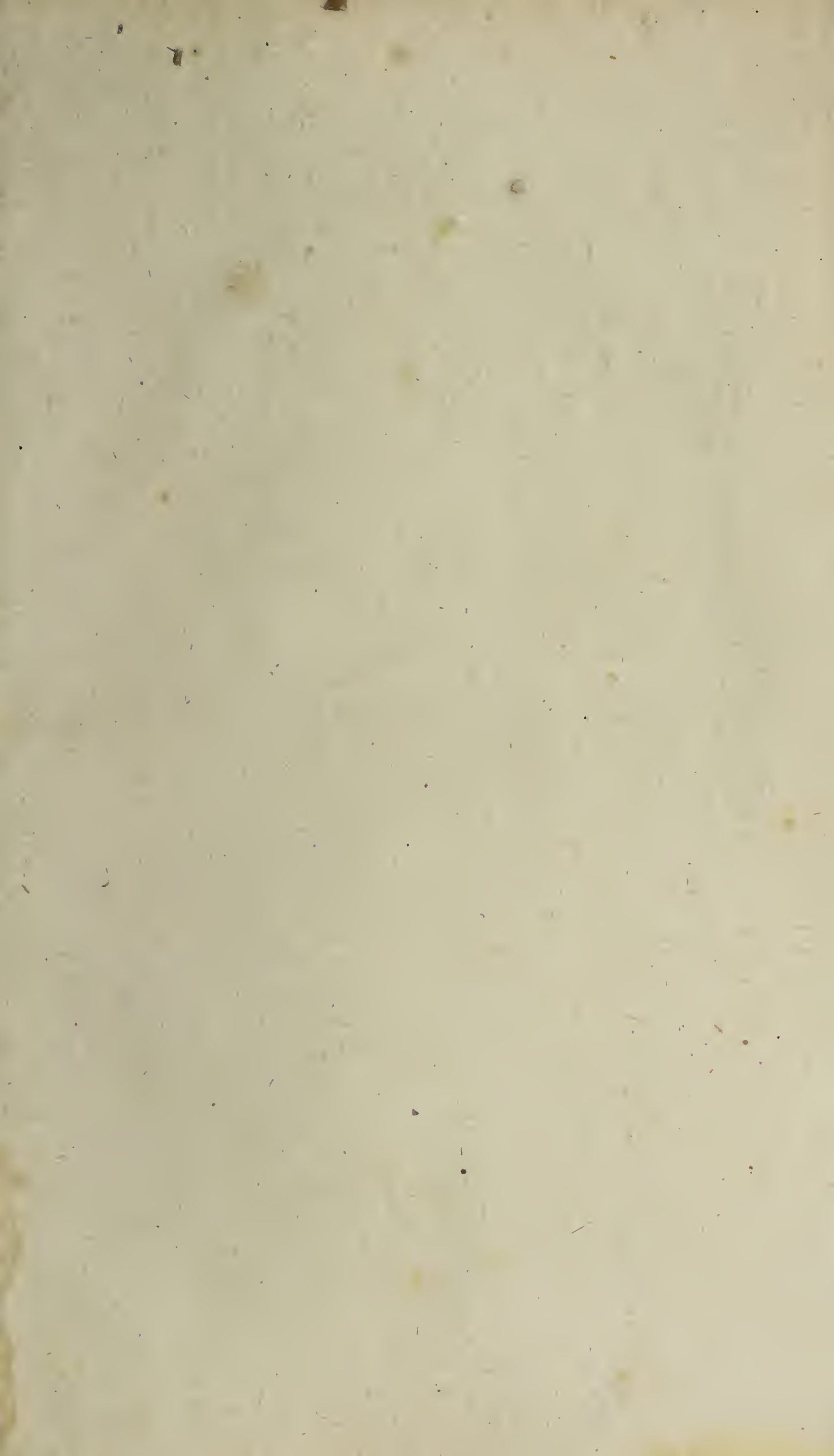
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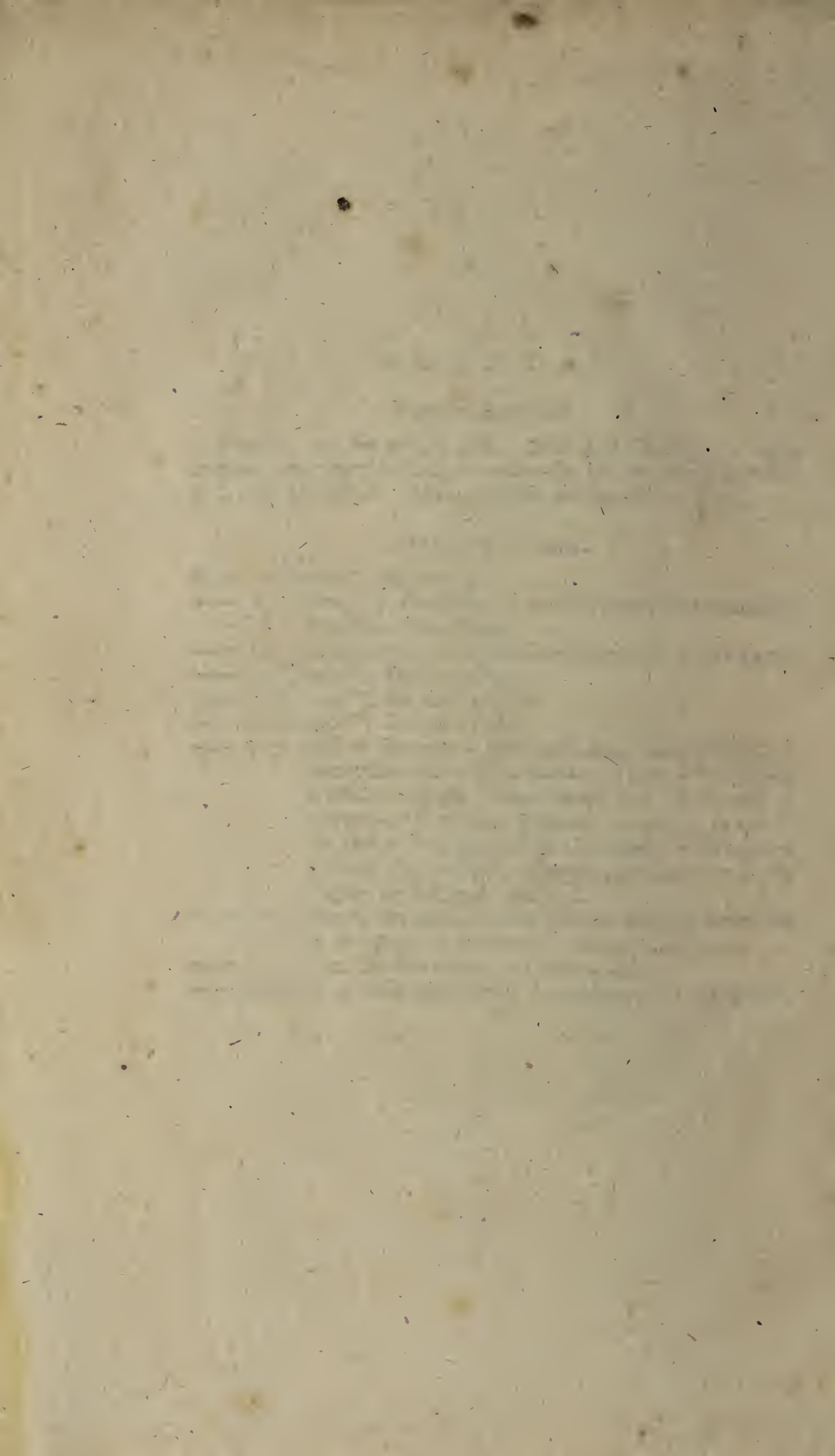
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After p. 127. for 228. r. 128. After 204. for *204. r. 205. and the next page, for 205. r. 206.—In the APPENDIX. After p. lv. for liv. r. lvi. After p. lxxvi. for lxxviii. r. lxxvii.

In the text and notes.

- Page 63. note *, for 2. r. 3.
—— 138. note, l. 7. for *added*, r. *added from the Observationes Medicæ of his father*.
—— 180. in the notes, l. 3. for GORRHÆUS, r. GORRAEUS.
—— 255. note *, for 125. r. 235.
—— 273. note *, for 207. r. 208.
—— 288. note *, for 36. r. 46.
—— 309. add to the note: *Since these sheets were printed, I have found in the Observations of RIVERIUS [Cent. i. Obs. xv.] the common proportion of the salt of worm-wood to the juice of lemons; to wit, a scruple of the former to a spoonful of the latter; which shews that my suspicion about the typographical error in the chapter de feb. pest. was just.*
—— 317. note *, for 207. r. 208. and for *like-wise mentioned in that page*, r. *mentioned in the preceding page*.
—— 320. l. 2. for MURDOCK, r. MORDACH.
—— lxxxii. l. 4. from the bottom, for *malignant*, r. *pestilential*.







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