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INAUGURAL DISSERTATION
ON
YELLOW FEVER,

AND ON THE
TREATMENT OF THAT DISEASE BY SALINE
MEDICINES.

By GEORGE FREDERICK BONE, M. D.,
ASSISTANT SURGEON TO THE FORCES.

WITH AN
APPENDIX

“ON THE PRINCIPLES TO BE OBSERVED IN PROVIDING BARRACKS
AND HOSPITALS FOR TROOPS IN THE WEST INDIES.”

By HUGH BONE, M. D.,
LICENTIATE OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON, AND INSPECTOR-
GENERAL OF ARMY HOSPITALS.

*For,
Sir George Hallingell M.D.
From the Author.*

EDINBURGH:
ADAM AND CHARLES BLACK;
LONGMAN, BROWN, GREEN, AND LONGMANS, LONDON.

MDCCCXLVI.

TO

HUGH BONE, M. D.,

LICENTATE OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON,
AND INSPECTOR-GENERAL OF ARMY HOSPITALS,

This Essay

IS DEDICATED

BY HIS AFFECTIONATE AND GRATEFUL

SON.

TO
SIR JAMES M'GRIGOR, BARONET, K. C. T. S.,

M. D., F. R. S. LONDON AND EDINBURGH,
DIRECTOR-GENERAL OF THE ARMY MEDICAL DEPARTMENT,

&c. &c. &c.

This Essay

IS, WITH MUCH RESPECT, INSCRIBED BY

THE AUTHOR.

PROGRAMME OF THESIS.

	Page
I. Etymological meaning of the name yellow fever,	1
II. Definition of the disease,	2
III. History of the symptoms,	3
IV. Diagnosis,	7
V. Effects or events on the constitution,	9
VI. Remote causes of the disease, which may be subdivided into	11
The predisposing or antecedent,	11
The occasional or procatartetic,	11
The fanciful cause—contagion,	26
VII. Morbid appearances,	28
VIII. Prognostic symptoms,	30
IX. Proximate causes,	33
X. Ratio symptomatum,	35
XI. Method of cure, noticing	35
The indications,	43
And the remedies,	51
XII. Prophylactics,	

APPENDIX.

I. Hospital accommodation in proportion to the number of troops,	55
II. Space for patients in hospital and for men in barracks,	55
III. Conveniences which an hospital requires and which a barrack requires,	56
IV. Construction and ventilation of hospitals and barracks,	61
V. Position of out-buildings,	64
VI. Drainage and sewerage,	65
VII. Trees and walks,	66
VIII. Supply of water,	67
IX. Encampment,	69
X. Causes of disease,	69
Letter to the Military Secretary, Barbados,	70
Letter to Sir James M ^c Grigor, Bart. Inspector-General,	71
Extract from Dr Bone's Quarterly Report,	73
Letter to the Inspector-General of Hospitals, West Indies,	74
Proceedings of a Board of Officers,	76
Letter to the Inspector-General of Fortifications,	77
Copy of Inspector-General's Minute referred to,	78
Letter to R. Byham, Esq. &c. &c.,	81
Do. Do.	

CORRIGENDA.

- Programme, line 3 from bottom, *for* inspector *read* director.
Page 3, line 7 from bottom, *for* bilious *read* mucous.
Page 4, line 14, *after* the majority *insert* of fatal cases.
Page 14, line 20, *for* cases *read* causes.
Page 16, line 14, *for* St George *read* Fort King George.
Page 29, line 3, *for* cured *read* cared.
Page 35, line 11 from bottom, *for* a lattice, jalousie, or window, *read* a latticed or jalousied window.
Page 37, the weights in columns 2 to 3 are pounds.
Page 37, line 4 from bottom, *for* 1815 *read* 1818.
Page 38, line 9, *for* 20 *read* 16.
Page 38, line 11 from bottom, *for* omne *read* omni.
Page 40, line 2 from bottom, *for* Ammonia ii. *read* Ammonia ii. oz.
Page 42, line 14, *for* toast water *read* toast and water.
Page 46, line 10 from bottom, *for* or *read* of.
Page 46, line 8 from bottom, *for* in them *read* in the capillaries.
Page 47, line 3, *for* least *read* lest.
Page 52, lines 7 and 9, inverted commas not required.
Page 85, line 6, *for* 36 *read* 39 ; line 8, *for* 41 *read* 42 ; line 19, *for* 47, 47, *read* 49, 49.

to the disease I have selected to be the theme of my Inaugural Dissertation.

The name yellow fever is not exempt from objections, for neither yellowness nor increased heat are universally symptoms of the disease, but yellowness is a common symptom, and may, with better reason, give a name to it than the country of its fancied origin, or the colour of the fluids vomited.

The name yellow fever is certainly more appropriate for the disease than Mal de Siam or vomito prieto.

P R E F A C E.

PREVIOUS to my graduation in Edinburgh on the 1st of August 1845, I submitted to the Faculty of Medicine a Thesis on Yellow Fever. This Thesis I have since corrected and enlarged, and now venture to publish. The labour of writing it was not great, for the materials furnished to me by my father were abundant.

The original copies of his manuscripts are deposited in the Army Medical Board Office in London, and may be seen by any member of the profession.

The plan of my Thesis is taken in part from a manuscript copy of the Lectures on Medicine delivered by the late Dr John Gregory in the University of Edinburgh in 1770-1771.

The Appendix contains a Report by my father on the Principles to be observed in providing Barracks and Hospitals for Troops in the West Indies, dated Barbados 1844; and many of these principles have since been adopted by Government.

FORT PITT, CHATHAM,
December 1845.

ON
YELLOW FEVER,
AND ON THE
TREATMENT OF THAT DISEASE BY SALINE
MEDICINES.

I
MEANING OF THE NAME YELLOW FEVER.

THE term Fever is derived from *fervere* to be hot, and is the name that has been given by the Latins and moderns to a class of diseases, and the nearly synonymous term *pyrectica*, from *πυρ*, fire, was given to these diseases by the Greeks.

The term *yellow* signifies a colour well known, and is applied to the disease I have selected to be the theme of my Inaugural Dissertation.

The name yellow fever is not exempt from objections, for neither yellowness nor increased heat are universally symptoms of the disease, but yellowness is a common symptom, and may, with better reason, give a name to it than the country of its fancied origin, or the colour of the fluids vomited.

The name yellow fever is certainly more appropriate for the disease than *Mal de Siam* or *vomito prieto*.

II.

DEFINITION OF THE DISEASE.

YELLOW fever is a continued disease, beginning with cold shivering, or with cold chills; to which succeed increased heat of skin, and frequency of pulse; pain of the head, loins, limbs, and præcordium; restlessness; loss of strength and of spirits; vomiting; redness of the eyes, and of the tip and edges of the tongue; sensation of burning in the throat when swallowing liquids; and on the second, third, or fourth day, yellowness of the eyes and skin, and frequently hæmorrhages from the mucous membranes, and vomiting of dark-coloured fluids, not bilious, but occasionally like coffee-grounds, the black vomit of authors; and during the whole course of the disease there is stopping in the formation of the natural secretions.

This definition is not brief, and is perhaps redundant, but it is reciprocal with the disease defined, for whoever has these symptoms has yellow fever, and if I have failed in making this definition, I have failed in a bold attempt, for neither Dr Good nor Dr Jackson attempted to define yellow fever.

III.

HISTORY OF THE SYMPTOMS.

THE first symptoms are a cold fit, or cold chills, or coldness of the limbs or loins, continuing two, three, or four hours, and pain above the eyes, a usual symptom of disordered stomach, then follow increased heat of skin, and frequency of pulse, prostration of strength, nausea or vomiting, flushing, or a livid colour of the face, redness of the eyes, pains of the legs, loins, and pain of the epigastrium on pressure, and frequently tension of the hypochondria.

The vomiting continues to the close of the disease. The fluids vomited are stated by Dr Bone, in his Report, dated Barbados 1822, to have different appearances, qualities, and sources; and he notices the following varieties of fluids vomited:

1. The contents of the stomach as at the beginning of the disease.
2. The fluids drunk and mixed with bile.
3. The fluids drunk without any admixture or change.
4. A fluid similar to solution of indigo or China ink.
5. A brown fluid similar to urine.
6. Brownish blood, not flaky, proceeding from the fauces and gums, and partly from the stomach.
7. Flaky blood mixed with mucus, usually the precursor of the true black vomit.
8. The true black vomit, which also is blood, altered by passing through the bilious coat of the stomach. It is most frequently ejected by gulps, and in large quantities, but sometimes it is ejected with force, as from an engine, and also in large quantities.

The vomiting of black vomit does not begin till near the close of the disease, usually the third, fourth, or fifth day, but sometimes the seventh or ninth.

The quantity of the fluids vomited is so much greater than the quantity of the fluids swallowed, that the patient very frequently remarks the disparity. Assistant-surgeon Donelly of the Royal Ordnance Department died of yellow fever in Barbados in 1820, and he remarked that a pint of fluid taken produced a quart of black vomit in no time.

The vomiting is primary or secondary. The primary dislodges the contents of the stomach, and is reiterated with straining, and if bile flow the vomiting ceases. The secondary vomiting usually begins on the second or third day, and is reiterated with less straining, but sometimes projecting the fluid with great force, sometimes with moderate force, and sometimes only throwing it from the mouth.

The majority vomit at some period of the disease but not all; the proportion varies in localities and in epidemics.

Fifty-five soldiers affected with the gastric disease called yellow fever were received into the Naval Hospital, Barbados, in 1821; 17 of these vomited, 33 did not vomit; 11 of them died; and of these six vomited and five did not vomit.

When the yellow fever is prevailing, many persons die suddenly, and these do not vomit or do not vomit black vomit; and when yellow fever is prevailing in a marshy country like British Guiana, the vomiting is equally frequent as in the dry island of Barbados, but the vomited fluids are not black except in certain seasons and localities, when the disease tends rapidly to putridity.

Yellow fever terminating in the vomiting of black vomit is a severe, continued, putrid, gastric disease, whether in Barbados, British Guiana, or other locality; but the endemic yellow fever of a marshy country is a continued disease with slight remissions and less tendency to putridity, and *never* terminating with the vomiting of black vomit. This disease may be named remittent fever, (p. 8.)

The eye at an early period of yellow fever, sometimes in twelve hours from the beginning of the cold fit, is red and suffused, and the eyelids are slightly tumid and partly closed, but are not painful.

The tongue at an early period of the disease is covered with a cerate-like crust, and has red edges, and in the course of the

disease it sometimes becomes dry and brown or black; but when the vomiting is incessant the tongue although red is moist and not thickly coated. When there is hæmorrhage from the mouth and nose, the tongue is dry and red, and the teeth are covered with a black crust.

The face has frequently a dark-red or livid colour; like the colour of a person suffering strangulation.

The patient is restless, often leaving his bed for the floor, and breathes oppressively, but without pain of chest.

At the close of the ardent state the urine is thick, brown, and scanty or not secreted.

In some stations and epidemics the head and stomach are principally affected, and then there are hæmorrhages, coma, and death on the third or fifth day.

Frightful moaning and groaning are sometimes marked symptoms, but the mind is commonly unaffected.

The yellowness appears first in the eye, and under the ears, and on the neck, and then gradually on the whole surface of the body. It appears on the second, third, fourth, or fifth day at the close of the ardent state, and the patient then is often free from pain.

All who die of this disease are not yellow, and many are yellow who do not die, and many persons during an epidemic yellow fever have slight yellowness of the eyes, although free from fever and following their usual occupations.

Six of the Pyramus's sailors who died in the Naval Hospital, Barbados, in 1821, were yellow before death; five were not yellow before or after death.

Fourteen men died of putrid gastric disease in the Hospital, Trinidad, in 1818; six of these were yellow before death, and eight were not yellow before death. Six of those who were yellow vomited black vomit, and four who were not yellow vomited black vomit.

Fifty soldiers affected with gastric disease were all, except three or four treated by Dr Bone in St Andero in Spain in 1813, they were all yellow, and they all vomited, but none of them vomited black vomit.

Twenty-one men of the 33d Regiment died of yellow fever in the Regimental Hospital, Barbados, from 1st October to the 15th December 1841; 18 of these were yellow before death;

three were not yellow before death; 18 vomited black vomit; three did not vomit black vomit; three were yellow but did not vomit black vomit; three vomited black vomit but were not yellow.

The yellowness is deep in proportion to the quantity of blood and of bile in the person. A pale thin person becomes lemon yellow; a plethoric person becomes livid and dark-yellow; and when there is a rapid tendency to putridity the colour is livid and dark-yellow; when there is less tendency to putridity, as in the St Andero and Guiana yellow fever, the yellowness is brighter, and when the disease prevails in some localities, many persons are slightly ill, or are cured at an early period of the ardent state and are not yellow, and some are only jaundiced.

The proportion of those who become yellow varies; perhaps one-fifth or one-tenth of those admitted for fever during an epidemic become yellow, but in certain localities, and in certain epidemics the proportion is higher.

IV.

DIAGNOSIS.

THE diagnosis of yellow fever is uncertain at the invasion of the disease. Hence in Barbados in 1820, every fever patient was first admitted into a separate ward, and if symptoms called malignant or suspicious appeared, was sent to the quarantine hospital.

When the disease prevails, it is the safest way to put every person on medical treatment who is affected with symptoms of fever, or who has a cold fit, for if the symptoms are not severe the cure will easily be effected; and if the symptoms are severe the patient will have the best chance of being cured.

In 1831, in Demerara, when yellow fever prevailed in the 25th and 65th regiments, every soldier in the garrison who was taken ill was immediately sent to hospital, whether the illness appeared to be ague, or the effects of drunkenness, or to be slight or severe, for in a marshy country the first disease may be ague, two or three paroxysms; but if the sweating is stopped the disease may become yellow fever of the remittent kind or of the putrid continued kind; and as many of the men on guard became severely ill, they were inspected daily by a medical officer.

The symptoms that portend a severe disease are a cold fit not followed by sweating, redness of the eyes, vomiting not bilious, severe headach; and in the progress of the disease, vomiting and yellowness, jactitation, hæmorrhages from the mucous outlets; and at the close of the disease, coma or stupor, and vomiting of black vomit are certain diagnostics of yellow fever.

Fever is not in the West Indies at present called yellow fever, except when the skin is yellow or when the epidemic yellow fever is prevailing. The common continued fever in Bar-

bados is nearly the same as the common continued fever in England; it is a slight disease, usually the sequence of checked perspiration, and can easily be cured in two or three days by salts or seidlitz powders; but if the season is sickly and yellow fever prevailing, the disease frequently terminates in yellowness and black vomiting.

The disease called remittent (p. 4) is also yellow fever; it is based on ague and has slight remissions. This disease prevails in Lincolnshire, Walcheren, Guiana, and in all marshy countries in the summer and autumn, and in Guiana at all seasons. The disease is non putrida, or little putrid, although after death the mucous coat of the intestinal canal peels off easily. But in some of these countries in very sickly times the real putrid yellow fever with black vomit prevails, and the disease is continued without distinct remissions. Probably in these countries the more or less of putridity is the chief difference between yellow fever called remittent, and the yellow fever with black vomit.

Dr Fergusson in his essay says what is very true, that the soil does not emit the marsh poison when it is covered with water, but yellow fever where there is no miasm from marshy land should not be called remittent, for ague does not prevail there, and the aguish base is wanting; any considerable remissions only occur on the aguish base; but the nomenclature of febrile disease is uncertain, and every medical man gives the disease what name he pleases.

Yellow fever is not typhus, for the heat and putridity make short work of the patient—but the symptoms might be called typhoid.

My father has never seen buboes in this disease, but DePortes mentions having seen them in St Domingo.

The diagnosis of the disease is assisted by knowing the characters of the prevailing epidemic.

V.

EFFECTS OR EVENTS ON THE CONSTITUTION.

WHEN the disease is slight or stopped in its course by mild remedies, or, although severe, has been treated by mild remedies, the patient is soon restored to health; but whether the disease has been severe or slight, if the patient has been treated by severe bleeding, or by large doses of calomel, or of quinine, or of both, and by blistering, or by the brandy ad libitum practice, the convalescence is tedious, and often the constitution is permanently injured.

The blood becomes more serous, the eye assumes a clear white pearly appearance, the bloom of Europe fades in the countenance, the digestive power fails, the muscles become feeble and flaccid, the habit is in some degree that of the tumid cachectic, the patient assimilates to the tropical native, and then is pituitous; and although he does not enjoy an immunity from the disease, yet is he less liable than previously to gastric disease, for the pabulum of hæmatic disease, a large quantity of rich blood in the arteries and veins, is wanting, but his tenor of life is not on that account certain, for dysentery, erysipelas, thrush, dropsy of the membranes, and the cachexia tumida, and failure of the powers of nature oft await in these climates, and at no distant period the best constitutions, particularly in Trinidad and in Guiana.

Relative to the cachexia tumida, Dr Bone offered the following definition of that disease in his report, dated Barbados 1818: "Cutis palor subflavus, anasarca, polysarcia, anæmia corporis, exercitatione palpitatione dyspnœa." The hearts of such persons are flabby and often very small, the lungs are hepatized, and often there is water in the chest and in the belly, and in the cellular tissue; and they appear tallowy, flabby, and are pot-bellied, and

are unable to run a hundred yards without being evidently oppressed and out of breath, and in danger of falling down. The French name for this disease is mal d'estomac, but all who have this disease do not eat dirt. This disease is not so common now in Trinidad or in Guiana as it was in former years, for the depleting, mercurial, and Brunonian practice, which increased the disease, is now less frequent, and the troops are more frequently removed from these stations.

A person who has recovered from yellow fever in a marshy country like Guiana is likely to be attacked with ague in his convalescence, but in dry stations, as in Barbados, is not likely to be attacked with ague, but may again with yellow fever.

VI.

THE REMOTE CAUSES OF THE DISEASE MAY BE
SUBDIVIDED INTO,

1. THE PREDISPOSING OR ANTECEDENT.
2. THE OCCASIONAL OR PROCATARTIC.
3. THE FANCIFUL CAUSE—CONTAGION.

1. THE predisposing causes of the disease are a florid complexion, large diseased viscera of the abdomen, a fat, bloated, or drunken habit, low spirits, dread of the West Indies and of yellow fever, great fatigue, broken constitution, belief in the contagion of yellow fever, late arrival in the West Indies.

A short residence in the country is also a predisposing cause of the disease, even when the person has been previously in the country, for no length of residence in the country gives security from the disease.

The persons least predisposed to the disease are the thin and lathy of temperate habits, who rise early in the morning, keep the head cool and the belly open, and are neither afraid of contagion, nor neglect prudent measures for preserving themselves in health; and it is certain that women and children are less liable to the disease than men; but this may in part be owing to their greater temperance and less exposure to the exciting causes of the disease.

2. The occasional or procatartic causes are heat and moisture and a state of the atmosphere not well understood, perhaps an undue proportion of certain elements of the air or of the water dissolved in the air; too much carbon or too much hydrogen, or too much or too little of these or of the other elements of air and of water. "When air is left in contact with moist wood its oxygen is removed and replaced by an equal volume of carbonic acid. This is one chief source of the insalubrity of marshy dis-

tricts, and the effect is seen still more strikingly in the case of houses which have been submerged in an inundation which are very unwholesome as long as the wood is moist."—(Gregory's Outlines of Chemistry, p. 502.)

The states of the weather favourable to this disease are stagnant air, south wind, dry weather followed by strong winds and heavy showers, and perhaps a deficiency of the electric fluid.

The places where the causes principally prevail are the vicinity of foul drains, the leeward of foul marshes, the banks and channels of "dry rivers"* the leeward openings of gullies, and crowded and ill-ventilated rooms and ships with foul holds.

"Crowding in barracks and hospitals has been the principal cause of the mortality of the troops in the West Indies, especially when aided by the suffocator window.† Climate, rum, bleeding, and mercury, each have killed their thousands in the West Indies, but crowding and the suffocators their tens of thousands. Is it astonishing that the soldier should die when allowed only twenty-two inches of wall for his hammock or bed, in a room hermetically sealed by the shut suffocator or with the suffocator open and a current of air blowing upon his heated body? The astonishment is that he could live.—(From Dr Bone's Guiana Report, dated June 1829.)

According to Dr Bone (Report on the Diseases that affected the Troops in Trinidad in 1818) a soldier in his barrack room requires at least 1000 cubic feet of space for locomotion and of air for respiration, but at that time, and to a great extent even at present, the men were crowded in barracks without regard to this principle, as the following table of barrack accommodation, drawn up by Dr Bone, and inserted in that report, will very clearly show.

* That is, rivers of which the channels are dry at certain periods.

† That is, a window of boards hinged at the top and opening outwards.

Barrack and Hospital Accommodation in Trinidad in 1818.

Name of the Barrack or Hospital.	How many Rooms.	Length of each Room in feet.	Breadth of each Room in feet.	Height of each Room in feet.	Cubic feet of space contained in each.	Cubic feet of space contained in them all.	Number of doors in each.	Number of windows having jalousies in each.	Breadth of gallery.	Allowing 1000 cubic feet for each Room could accommodate.	Allowing 1000 cub. ft. of space for each person how many all the rooms could accommodate.	According to barrack allowances, how many should it accommodate.	Number of windows not having jalousies in each.
Orange Grove Bk.	10	55	27	11	16335	163350	4	2		17	170	500	12
Fort George Bk.	2	76	27	11	22672	45144	2	2		25½	45	200	
St. Joseph's Bk.	1	130	27	11	38618	38610	1		10	32	38	190	
Sea Fort Shed, the shed	1	16	15	7	1680	1680	1			1½	1½	14	1
O. D. No. 3.	1	18	8	14	2016	2016	1						
O. D. No. 2.	1	21	18	22	5292	5292	1			5	5	18	3
O. D. No. 1.	1	32	14	24	8064	8064	1			8	8	16	4
A. Leeward Room in Orange Grove,	½	21	27	11	6237		1			6	6	18 or 20	6
Or. Grove Hosp.	1	150	27	11	44550	44550	2			44	44	70	24 or 26
St. Joseph's Hosp.	1	abt. 30	abt. 27										

In that year (1818) 34 officers, and 435 men of the Royal York Rangers were quartered in Trinidad; 130 of the men died, and principally from yellow fever; but none of the officers died. The disease was caused by suffocation in the crowded barracks, with suffocator windows, and by faults in managing the non-naturals.

In the barrack of Orange Grove, Trinidad, the band of the Royal York Rangers in the windward end of a barrack-room were healthy, while the Royal Artillery in a partitioned-off part of the leeward end of this room were unhealthy, and from the 26th August to the 26th November 1818 six of them died of yellow fever. The band were moved from the windward room, and the Royal Artillery were put into it and immediately became healthy. But women and children succeeded the Royal Artillery in the leeward room, and these in a few days became sickly. These occurrences were represented by Dr Bone to the Commandant; the partition between the rooms was knocked down on the 8th December, and the women and children were all well on the 11th December, and from that period the room, although not white-washed, continued to be as healthy as any room in Orange Grove.

That the mortality of the Royal Artillery in the leeward room in Orange Grove barrack was owing to crowding and suffocation

is evident from the healthiness of the band of the Royal York Rangers in the windward end of the barrack-room, when the artillery were dying in the leeward end of it, from the immediate healthiness of the artillery when removed from the leeward to the windward end of the room, and from the immediate restoration to health of the women who succeeded the Royal Artillery in the leeward room so soon as the partition wall was knocked down, and the pure breeze admitted to sweep through it.

The injudicious situation, on the brink of a dry river, bad construction and crowding of the barrack in Orange Grove, were evidently causes of sickness to the Royal York Rangers in the sickly season of 1818, and the hospital gorged with sick, and without conveniences, and bearing the name of slaughter-house, was perhaps the head quarters of death. That some or all of these causes were effective in producing sickness at Orange Grove is proved not only from the known uniform effects of these causes, but from the instant stop to the disease among three of the companies when removed to Fort George, and the early stop to it among the other three companies when removed to St Joseph's; but even these posts were not without their cases of sickness.

Crowding of human beings will cause disease and death in Great Britain or in any locality, and in a hot country in certain seasons yellow fever. Crowding was the cause of the mortality at the Oxford Assizes, and at the Old Bailey Sessions, and in the black-hole of Calcutta; and those who were confined in the black-hole of Calcutta, and did not die there, became affected with putrid fever.

The most frequent immediate *exciting cause* of the disease in the West Indies is exposure of the body, especially of the back and sides, when heated, to strong currents of wind. At the Oxford Assizes the persons most severely affected were those exposed to a draught from an open window.

Some of the officers in Fort George, Tobago, in 1818, when heated by walking from Scarborough to the Fort, stripped off their coats and sat across the guns of a battery to cool themselves, and all these died.

Sleeping in the draught of a window has been fatal to many officers, and is a common source of sickness and of death to soldiers. Exposure to wetness or to currents of air when in the

state of collapse after the drunken paroxysm, is also a frequent exciting cause of the disease.

Yellow fever prevails on Brimstone Hill, St Kitt's, when the strong north winds that have swept foul ground on Mount Misery impinge upon the persons in the ill-constructed barracks and out-buildings on that hill. And in Tobago, Dominica, Grenada, St Vincent's, and in all the hilly uncleared islands of the West Indies, strong north or east winds and rain impinging upon the troops and their families in ill-constructed barracks are causes of the disease.

From Dr Bone's Tobago Report, dated 1820, the following extracts are taken:—

“In a small room in the south-east corner of an old building, opposite Captain Fletcher's quarter in St George's barrack, Tobago, seven servants, in March and April 1820, were taken ill in succession, and died of yellow fever. These persons were Lofts, Brown, Garrett, Clarke, Rocket, Sergeant of the 4th regiment, and a coloured boy. I blamed the room for the death of these servants, and requested Captain Fletcher to give his servants the subaltern's quarter next his own; and to give them bedsteads and bedding, and to cause them to keep the north door and north window of their room always shut. These recommendations were acted upon, and his servants, 20 days after when I left the Island, continued healthy.

“The carpenters worked below the men's barracks, and were exposed to strong draughts of air that rushed through the arches on which the barrack was built. Many of them had died; six of the windward arches were boarded, upon my recommendation, and the carpenters worked comfortably, and were healthy in their sheltered situation.

“The hospital had an open gallery, the window sills were only 18 inches above the floor and only two feet apart, and consequently the patients were exposed, when in bed, to strong draughts of air, which checked perspiration, prevented cures, and caused relapses. Two feet of the lower part of each window was boarded up, and the patients were more speedily cured and less liable to relapse.

“Many men were taken ill in a guard room of similar construction with the servant's room, and in the same exposure.

The old mess-room was fitted up with a guard bed and made a guard-room, and the guard continued healthy.

“The artificers of the barrack department lived in miserable rooms, having easterly exposures, and holes in the side walls and floors, and were nearly exterminated; the few of those who remained alive were removed to better quarters, and became healthy.

“From these facts and unnumbered others, I conclude, that north and east winds excite disease, not alone in proportion to their impetus, nor alone in proportion to the quantity of poison they carry, but in proportion to the combination, the momentum with which the poison impinges against the body; the product of the quantity of poison multiplied by the velocity of the wind that carries it.”—(Tobago Report, dated 1821.)

In the middle of the epidemic any severe injury to health may cause yellow fever. In 1820, Serjeant Murphy, the porter of the Naval Hospital, Barbados, was sent to look for a place in a garret above the stables to quarantine Lord Combermere's gardener, suspected to have touched some person who had yellow fever. He ascended by a ladder, but was old and paralytic of one leg; he fell from the ladder, dislocated his left shoulder, broke his left thigh, and hurt his side. His thigh and his belly swelled, and he became yellow, and vomited black vomit and died in less than three days.

3. *Contagion*.—It has been stated by the contagionist, that yellow fever is a new and specific disease, imported lately from Africa, and only produced by emanations from persons affected with the disease, or by fomites containing these emanations; that neither Celsus nor Hippocrates was acquainted with the disease; and that it affects a person once in life only.

The importation of the disease from a people not liable or little liable to the disease is abundantly curious. How could ague be exported from Barbados? Accordingly, the tracing the disease from ships or from Africa always failed; but reference for its origin to Africa, or to any other country, is surely not necessary, when almost every year the disease is observed to originate in the West Indies, and when the principal prophylactic measures recommended by medical men are those that are intended to prevent the generation of the disease.

Negroes are liable to yellow fever in the West Indies, but they are not so liable to yellow fever as the whites, especially in close hot weather or in foul localities, but in stormy situations they are very liable to yellow fever. In Africa they are probably not liable to the disease, for there they live upon vegetable food, and are not suffocated nor imprisoned in air-tight cells, nor exposed to currents of air in crowded houses.

Yellow fever affects all persons at certain times in certain localities, and so does “remittent” in Guiana; but the diseases are different, for remittent is based on ague.

That Celsus and Hippocrates were well acquainted with a gastric disease marked by yellowness and the vomiting of dark-coloured fluids is evident from their writings.—(Vide Deportes, p. 205.)

Celsus states, “*vomitus sinceræ pituitæ, vel bilis, periculosus; peiorque, si viridis, aut niger.*” (L. 3, C. 4.) *Vomitus niger* is in English black vomit.

“*Quibus in febre morbus regius supervenit ante septimum diem, malum est.*” (Aph. 62, Sect. 4.)

“*Morbis quibusvis incipientibus si bilis atra vel sursum, vel deorsum prodierit, lethale.*” (Aph. 22, Sect. 4.)

“*Quibuscumque ex morbis acutis aut ex diuturnis . . . bilis atra, vel sanguis niger prodierit, postridie moriuntur.*” (Aph. 23, Sect. 4.)

And my father writes to me as follows: “Having been seven years in the Ionian Islands, in the medical superintendence of the British troops, I can certify that gastric fever marked by yellowness, hæmorrhages, and vomiting, and which in the West Indies would be named yellow fever, frequently occurs in Corfu, Cephalonia, Zante, and Santa Maura.” “Celsus and Hippocrates mention black bile, but the black fluids vomited were not chemically examined by the ancients, nor by the moderns till lately, and the first clear proof that black vomit is not bile is given, I believe, in my Trinidad report, dated 9th August 1820. The air is very dry in Athens in the summer and autumn, and hæmorrhages and yellowness are to be expected to mark the gastric disease of people crowded, ill fed, and desponding. The plague of Athens may not have been perfectly similar to yellow fever in the West Indies. It was stated to have been imported

from Æthiopia, but the Peloponnesians in the fields round Athens, flushed with victory and spoiling Attica, continued healthy, while the Athenians, cooped up in their city, were perishing. I believe that the rural Greeks have at all times lived much in the open air, and did not like to be cooped up in houses. You may remember that when we travelled in the Morea in the autumn of 1838, we observed that many of the rural people slept in the open air."

The contagionist traces yellow fever on low foul ground—in low and ill-ventilated huts—in ill-constructed buildings, and in seasons when the disease is prevailing. He never pretends to trace it on healthy ground, the encamping ground at Gun-hill, Barbados, for example, and there are proofs unnumbered that foul air generates yellow fever in ships at sea and in buildings on shore. Air that has been breathed, and exhalations from the skin and lungs, are probably more poisonous than the stench of privies and drains, but both are injurious to health.

Were the disease propagated from persons, how could removal to a healthy situation stop this propagation? The contagionist says by dilution; but there was sufficient dilution in the room that was fatal in less than two months to the seven servants, and the successors of these servants, placed in quarters that protected them from the dilution of the strong winds, continued healthy, and the artificers became healthy when protected from the diluting strong breeze.

It is not then the diluting breeze that stops the spread of yellow fever, but the removal from foul air, whether stagnant or rushing with great force. That this plan is successful is proved by the following examples among many that might be quoted.

The white troops in Saint Kitt's were removed from Brimstone Hill and encamped on healthy ground in August 1840, and in February 1843, and in July 1844, and uniformly the yellow fever stopped making progress among them.

The white troops, except 13 men of the Royal Artillery, were brought from Saint Kitt's to Barbados in August 1844, and did not import the disease into Barbados.

The 33d regiment were moved from the Stone-barrack, Barbados, to Gun-hill encampment ground, on the 3d December 1841, and immediately became healthy.

Yellow fever prevailed in Berbice garrison in August 1843; the troops were moved to Demerara and Mahaica, and soon became free from yellow fever, and did not import the disease to these stations, and were soon after brought to Barbados, and did not import the disease into Barbados. And in 1844 the 46th regiment, having lost many men from yellow fever in Berbice, were brought to Barbados, where they soon became healthy, and did not import the disease into Barbados.

The same principle applies to a foul ship; the crew should be removed from her to a healthy situation, and the vessel should be thoroughly cleaned.

Yellow fever prevailed in the fleet of steamers on the Barbados station, and in the other stations in the West Indies, in 1841 and 1842; but the mortality on the Barbados station was not great, for the sick were instantly landed from the steamers, and some of the steamers were cleaned out, and in the out stations the sick troops were encamped or brought to Barbados, and no instance in favour of the contagionists occurred. (I refer to Dr Bone's Official Reports.) The small steamers are hot ovens between the tropics; and these vessels are not scientifically ventilated; and the oosing from the boilers and the bilge water collecting among the filth, tar, sulphur, ashes, and slush in the hold, cause a poisonous and suffocating atmosphere.

In the autumn of 1813, sporadic cases of yellow fever appeared in the Depot Barrack in St Andero in Spain, and after the Christmas holidays became numerous. The barrack was inspected by Dr Erly and by Dr Bone, and was supposed, from the foul state of the sewers and privies, to be unhealthy. The troops were removed to a healthy situation and soon became healthy. But the removal of the troops attracted the notice of the Spanish authorities; their board of health inspected the British hospitals, and pronounced the disease to be yellow fever, and contagious. The British medical officers were unanimously of opinion that the disease was not contagious; but the patients who were yellow were selected and put in quarantine in moveable hospitals in a healthy situation. Dr Bone was in charge of the quarantine hospitals. Fifty of the patients were yellow, and eleven of them died, and were all carefully dissected by him or by his assistants, yet none of them caught yellow fever, nor any of the other pa-

tients in the quarantine hospital, nor any of the hospital servants or washerwomen, nor any of the patients or servants in the hospital from which the yellow patients were taken. He calculated that 700 persons had been exposed to the influence of the disease, yet none caught yellow fever. The cordon of troops did their duty, the British strictly, the Spanish with ferocity, but could not prevent all intercourse with the quarantine hospital. One evening, when one of his assistants, Mr Williams, assistant surgeon 23d regiment, made his visit to the female ward, he discovered that one of the female patients had her sweetheart, a sergeant from the depot, in bed with her. She was then yellow as an orange, and the disease was running its course, but the sergeant did not catch yellow fever. There was in the same ward another female who contrived to see her sweetheart while she was affected with the disease, and he did not catch yellow fever.

In the Casa Blanca Hospital, where 200 patients were then under Dr Bone's care, eight of the yellow fever patients, by covering their faces, lying on their sides, and pretending to be asleep or to be quite well, escaped being taken to the quarantine hospital. They were put into a separate room partitioned off from one of the upper wards. When the Spanish board of health inspected the hospital, which they regularly did every morning, the door of this room was shut; and when the board left the hospital the door was opened, and the communication with the ward was restored. None of these patients died, and no patient in the hospital caught the disease from them; and the number of the patients was about 200.

The president of the board of health had been a professor in one of the Spanish universities, and was learned, and, for a Spaniard, liberal and not bigoted. Having repeatedly and minutely examined the yellow fever patients in the quarantine hospital, he changed his opinion, and declared the disease to be non-contagious or little contagious, and in many cases only jaundice. The junta fined him for altering his opinion; he carried on a paper war with them; the argument was in his favour, but the power was against him, and they levied the fine; but the British officers in St Andero, thinking it unjust that the professor should be fined for declaring the truth, raised the sum by subscription,

and presented it to the professor, with a kind and well-penned letter by Dr Ery, and the professor was compensated for the persecution of his bigoted countrymen. The medical officers in St Andero subscribed four dollars each, and the Commandant, Major Cimitiere, subscribed, and Sir James Macgrigor subscribed eight dollars.

In hospitals that are well constructed, and where a correct hospital discipline is enforced, the attendants of yellow fever patients are not liable to the disease.

The Naval Hospital, Barbados, was built by Admiral Cochrane, and was well constructed; each orderly employed in the wards had a sleeping-room partitioned off from the ward. The sick of the *Pyramus* frigate and of detachments were treated in that hospital in 1821 and 1822. The total number of persons treated in the hospital from 21st June 1821 to 22d February 1822 was 243. Of these, 101 were fever patients and 38 were convalescents from fever. None of the patients under treatment for other diseases caught yellow fever; none of the servants, 38 in number, or of the other persons employed in the hospital, 53 in number, were affected with yellow fever. Twenty-two persons died of yellow fever, and were all, except one or two, carefully examined after death by Dr Bone or by his assistants, Dr Bain and Mr Campbell, and none of them caught yellow fever.

But is there any danger in entering an hospital where there are patients with yellow fever? Yes, if that hospital be filthy, crowded, ill-ventilated, and the patients lying on the bedding they have soiled; for the air must be vitiated, deprived of its oxygen, charged with azote, and other pernicious gases, and therefore unfit for respiration; and the sight is shocking and the groans of the dying frightful; but were the patients affected with any other disease, or, on admission, with no disease, and similarly circumstanced, the danger from breathing the vitiated air among them would be equal.

In 1818, 1819, and 1820, Inspector of Hospitals Green, supported by the general officer commanding, and by the commander-in-chief, and by the principal contagionists in Great Britain, attempted to introduce in the West Indies the quarantine regulations then used in Malta; but notwithstanding the zeal and

ability of Inspector Green, the contagion doctrine was strongly opposed by Dr Bone in many essays given to Inspector Green, and sent to the Medical Board in London, and was strongly opposed by a great majority of the medical department in the West Indies, and died a natural death in 1821, when Inspector Green left the West Indies. The agitation of this question may have been useful as inducing attention to the true causes of the disease, and to the statement of facts that damned the doctrine for ever.

In 1820 and in 1821, yellow fever prevailed in St Ann's garrison, Barbados; quarantine regulations were enforced in 1820, but not in 1821, and the disease stopped in both years at the same season, the beginning of February of the following year. Dr Bone was employed in both years as physician to the forces in the garrison of St Ann's, and observed that the disease was not in any instance propagated by contagion.

In April 1820 Dr Bone was sent off at an hour's notice from Barbados to Tobago, in consequence of the sickness of the garrison. He was in charge of the sick 43 days, and in that time 13 of them died, and of these 12 were opened after death and carefully examined by him, without any assistant medical officer, and he did not catch the disease. He was not in quarantine, and did not infect any other person with the disease. The people in Scarborough were healthy while the disease was prevailing in the garrison. The troops were encamped while he was there, and with advantage, but too near the fort. In 17 months, 99 from 144 persons died in the garrison, although the quarantine regulations were enforced, and six officers died. The causes of this havoc were the wretched state and bad construction of the buildings, and the prevalence of strong blasting winds, and the depression of the mind by quarantine regulations.

The contagionist doctrine, that yellow fever, of which black vomit and yellowness are diagnostic symptoms, affects a person once in life only, as a general rule, is true, for very few persons recover who have vomited black vomit, and of these few, it may not be possible to discover any who have subsequently vomited black vomit; but if it is argued that a person who has been affected with fever in one epidemic of yellow fever is not susceptible of fever in another epidemic of yellow fever, or in the same

epidemic, the argument is altogether wrong; and in proof I shall adduce some examples noted and reported by Dr Bone in his Report on the Epidemic of Tobago in 1819-20.

1. John Gale, 4th regiment, died of yellow fever with black vomit on the 14th May, after four days' illness, and had been twice previously treated for the disease since the 2d June 1819.

2. John Algar, 4th regiment, died of yellow fever with black vomit on the 6th May 1820; had been twice treated for the same disease since 4th August 1819.

3. William Westlocke died of yellow fever with black vomit on the 9th July 1820, in his second illness of the same disease since 4th August 1819. He was an orderly in the hospital, and rubbed the patients with mercurial ointment, and boasted of the quantities of blood he had lost, and of mercury he had taken, and that he was yellow fever proof, having passed through the disease.

4. James Pigott, 4th regiment, died of yellow fever with black vomit on the 28th May 1820, in his third seizure with the disease since the 30th April 1819.

5. Thomas Cornwall, 4th regiment, died of yellow fever with black vomit on the 15th June 1820, in his second illness with the disease since 18th September 1819.

6. Sergeant-Major Richardson died of yellow fever with black vomit on the 25th June 1820, in his fourth illness with the disease since 16th May 1819.

These people were attacked with the disease at Fort George in Tobago, a station where ague does not prevail nor the remittent of Cullen's Nosology. When Dr Bone arrived in Tobago he named the disease typhus icterodes. It was previously named remittent fever.

Other instances might be adduced in proof that yellow fever may affect a person repeatedly; but this doctrine is now believed in the West Indies; and were any person not to believe this doctrine he might lose his life like William Westlocke.

The notion of the contagiousness of the disease and of its attacking the same person once in life only was claimed by Sir William Pym as a discovery, but the following passage from the lectures delivered by Dr John Gregory, the father of the late Dr Gregory, in the University of Edinburgh in the years 1770

and 1771, show the sources from which this doctrine might have been derived.

"This fever, the South Carolina fever, was remarkably contagious, which distinguished it from the yellow fever of the West Indies, which was not probably contagious. It was remarked that it seized persons but *once* in their life, though it appeared *four* times in Carolina; perhaps in this it resembled the plague. It neither seized children nor *negroes*. Its progress was stopped by the *cold* weather." These are the principal doctrines supported by Sir William Pym; but the refutation of this doctrine is also contained in Dr Gregory's lectures of that period; for he says, "strangers were mostly seized with it; and though it was often carried from the town to the country, it did not spread there as in town. Those confined to small hot rooms were worse than the rest;" and he adds, "we should be cautious in trusting the early authors on West India diseases, for they did not *understand* them.

The disease called by Dr Gregory Carolina fever was true yellow fever.

Very few medical men in the West Indies believe now that yellow fever is propagated by persons affected with the disease, or by emanations from them, and now the sick are not abandoned to ignorant Africans. The terror and long faces of the contagionists have been succeeded by the pleasant look recommended by Celsus, and the terrifying phraseology "*suspicious looking cases*," "*malignant disease*," &c., and the use of oil-skin gloves, and of oil-skin gowns, and the burning of bedding and clothes, and the tracing of yellow fever from person to person, and all the quarantine plagues, are now regarded in the West Indies as superstitions of other times.

Quarantine laws are not given up by prejudiced persons, or by those who have good fat quarantine situations, but from the pressure of those in commercial business, aided by the science and writings of liberal reasoning medical men.

Quarantine has in effect been discontinued by the wise Austrian in his principal sea-port, Trieste. The nominal period of quarantine is three days, the day of arrival and the day of departure included; say one hour of the arrival day, and one hour of the departure day, twenty-four hours between these times, total

twenty-six hours; and to satisfy the contagionist the passenger takes a warm bath and changes his clothes, and breakfasts, and dines, and passes the day pleasantly, and then proceeds on his way rejoicing. The bath is good, and the twenty-six hours are passed pleasantly.

But if yellow fever be not contagious, nor imported into the West Indies, in what way can it be generated in the West Indies? Easily and by the following receipt:—

"Take of soldiers lately arrived in the West Indies any number, place them in barracks in a low wet situation, or in the mouth of a gully, or on the brink of a dry river, or on the summit of a mountain, and to leeward of a swamp or of uncleared ground, and where there is no water, or only bad water, give them each only twenty-two inches of wall in their barrack room, let their barracks be built of boards or of lath and plaster, and have neither galleries nor jalousied windows, but close window shutters, and a hole or cellar under the flooring for containing mud and stagnant water, and holes in the roof for the admission of rain, and the windows only eighteen inches from the floor, that they may be obliged to sleep in the draught of air, and let them have drill every morning on wet ground, and when fasting, guard mounting and all kinds of fatigue, not in the morning or evening, but during the hottest time of the day, when on sentry, no shed to keep off the direct rays of the sun, bad bread, putrid meat, few vegetables, plenty of new rum, especially in the morning, discipline enforced by terror and punishment, not by mind and prevention, an hospital similar to the barrack room, without offices, always crowded, plentifully supplied with rum, scantily with water, and so ill regulated that the men dread to enter it, a firm belief in the doctrine of contagion, and a horror of approaching any person affected with yellow fever. Let these directions be attended to in Trinidad, or even in Barbados, and especially when the air is stagnant, or charged with noxious vapours subsequent to long drought, the soldiers will soon die, some of them yellow, some of them with black vomit, and those first in the rooms where these directions have been most carefully observed."

This receipt for generating yellow fever is given by Dr Bone in his report on the epidemic in Trinidad in 1818, and was given by him to Dr Chevrin on the 14th June 1822.

VII.

MORBID APPEARANCES.

THE post mortem appearances vary according to the person, the period of the disease, and the part chiefly affected.

I.—EXTERNAL APPEARANCES.

When a plethoric person dies on the second or third day of the disease, the undermost parts of the body are dark-livid, the uppermost parts are livid and yellow, and often the abdomen is tumid.

When the person is plethoric and has vomited black vomit, the upper surface is yellow or yellow and livid; the under surface is livid.

When the person is lymphatic and of thin habit, the colour is pale yellow.

II.—INTERNAL APPEARANCES.

1. *Head*.—If the person was plethoric, and died on the second or third day, the blood-vessels are full of black blood, and the brain is sometimes soft.

If the person was plethoric, and lived till the fifth or seventh day, the blood-vessels are less gorged, but the brain is softer.

If the person was not plethoric, the morbid appearances are not remarkable, except the softness of the brain.

2. *Thorax*.—If the person was plethoric, the posterior parts of the lungs are gorged with black blood; the auricles contain black blood; the ventricles are empty or contain a small quantity of black blood.

3. *Abdomen*.—The stomach very frequently contains black vomit, and sometimes black particles of the vomit adhere tenaciously to parts of the villous coat; the cardiac portion of the

stomach is dark-red, and the mucous coat is readily parted from the muscular coat.

The small intestines are dark-coloured and often gangrened. The large intestine is dark-coloured; the caput cœcum coli is often gangrened. Black vomit is frequently found in the intestines, and is sometimes very similar to tar.

The liver is friable and yellow, and the gall-bladder very frequently is full of black thick bile.

The spleen is soft, and like raspberry jelly or lees of wine.

The pancreas is frequently red.

The kidneys are little changed.

The vessels of the vena portæ are full of black blood, and frequently the arteries contain black blood.

The bladder is empty, or contains a small quantity of red urine.

The serous membranes are not obviously diseased.

If the person was thin before being ill with the disease, the quantity of blood in the veins and capillaries is less, and the colour is less dark. The villous coat of the stomach is uniformly soft and easily parted from the muscular coat; in many cases it is gangrened, but is pale if the disease was protracted and the person not plethoric.

VIII.

PROGNOSTIC SYMPTOMS.

I.—UNFAVOURABLE SYMPTOMS.

A severe and long *cold fit* at the beginning of the disease.

The *eyes* red and eyelids swelled.

The *tongue* tremulous or scarlet at the sides, and covered with a cerate-like crust, or black and dry, or black and slimy.

The *pulse* 120 in the minute, soft, feeble, and undulating, or weak and scarcely perceptible.

Heat mordant or much diminished.

Skin dry or in a clammy perspiration; yellow on the second or third day; livid or purple.

Position.—Lying on the back straight or motionless like a log, lying with the body and limbs exposed, gliding to the foot of the bed, getting out of bed, jactitation, lying comatose or in a sleepy state, and when roused saying, "I am very well," or "I am much better."

The *breathing* great and imperfect, especially if with moaning and heaving of the chest.

Sensations.—Feeling cold or very hot, with the skin dry, the absence of pain, giddiness of the head, pain of the head, pain of the epigastrium on pressure, or swelling and tension without pain.

Vomiting incessant, and of every thing swallowed, especially after the first day, and if not bilious. Vomiting of blood or of black vomit; but the absence of vomiting is no proof of safety.

Habits.—Full of rich blood, drunken, fat, great eaters of animal food, debauched, a newcomer not creolized, having the viscera of the abdomen large and not healthy.

Mind irritable, melancholy, desponding, depressed by misfortunes, dreading yellow fever, and believing it to be contagious,

thoughtless or fool-hardy, and not careful to avoid the real causes of the disease. Delirium is unfavourable, but the mind is most frequently sane in this disease.

Occurrences immediately preceding the attack.—Great fatigue, great exertion of the body, dining out, sitting in wet clothes with the back to the wind, lying naked in a draught of air, living in an unhealthy quarter, and without conveniences, and without the means of being well cured.

Remedies.—No remedies used first 12 hours, or first 24 hours, or only rough remedies used, or blood extracted, or perspiration stopped.

Attendance.—No attached female attendant, nor any skilful nurse, but the attendant an ignorant Congo, provided by the contagionist.

Crisis.—There is no regular crisis in yellow fever; the patient becomes gradually worse or gradually better, a change is often to be observed on the third or fourth day, and the disease is sometimes stopped on the first day. The most common favourable crisis of yellow fever in a marshy country is usually by perspiration, which often is most profuse.

II.—FAVOURABLE SYMPTOMS.

Having stated these unfavourable symptoms, I may observe, and thus save space and time, that the absence of these is favourable, unless some other unfavourable symptom be present.

When bile is vomited, the disease usually stops. Continual moisture of the skin, free passage through the bowels, absence of a cold fit at the beginning of the disease, free flowing of the urine, the complexion and appearance little changed, and generally the mildness of all the symptoms, and a sound mind in a sound body, are favourable.

IX.

PROXIMATE CAUSES.

THE disease is general, and neither the simple nervous disease of Cullen, nor the gastro-enterite of Broussais, nor disease of the fluids alone, as imagined by some physicians. Whether the poison or febrile cause acts first upon the nervous system or not can be of small importance to discuss, since, ab initio, the *whole system* is affected.

"Fever," says Dr Fordyce, "is a disease which affects the whole system; it affects the head, trunk, and extremities; it affects the circulation, absorption, and the nervous system; it affects the skin, the muscular fibres, and the membranes; it affects the body and it affects the mind; it is therefore a disease of the whole system in the fullest sense of the term." (Dissertation on Fever, p. 28.)

The proximate causes, therefore, are to be looked for in the sentient principle, fluids, solids, and primæ viæ.

The *sentient principle* is injured and debilitated; indeed, "the first symptoms by which idiopathic fever can in general be recognised are strictly affections of the nervous system." (Alison's Pathology, &c. p. 441.) The *capillaries* of the entire frame stop work, or work unhealthily, and the *vital chemistry* is not performed in the capillaries nor in any part of the body, and hence the *fluids* become diseased.

The perspiration, urine, bile, saliva, pancreatic juice, &c., are not separated from the blood, and the secreting, excreting, and absorbent processes are not performed, or not healthily performed; and hence it follows that the mass of the *blood*, neither freed from impurities by parting with healthy secretions and healthy perspiration, nor supplied with healthy materials, soon becomes unhealthily, and when extracted does not separate into serum and

crassamentum. This diseased state of the blood in yellow fever was fully noticed by Dr Bone in his third Tobago Report, dated 9th June 1821. "According to my observations and many experiments I have made, the blood at an early period of yellow fever is altered in its texture and appearance; it uniformly has little serum, and commonly none; it never cups; it is never buff-coloured; its surface is level in the cup; it is soft, black, and loose in texture, and is in fact putrid and rotten; and when a physician sees it in this state he will be wise to give a guarded prognosis. The tenacity of the blood is greater in the yellow fever of Sant Andero than in that of Barbados or Trinidad, and this tenacity seems to have some connexion with the purity of the air in which the patient lived. The blood extracted from a patient affected with dysentery, pneumonia, rheumatism, or phthisis pulmonalis, shows the crassamentum separated, cupped, buff-coloured, adhesive, and the serum in large quantity—a half or one-third of the mass;" but the black putrid state of the blood in yellow fever is not the *exciting cause* of the disease, it is the *effect* of the non-action or unhealthy action of the nerves and capillaries.

The alterations which have been hitherto ascertained to take place in the blood have by no means been proved to precede the fever; they are distinct, at least only after the disease has prevailed for some length of time; they certainly become greater and greater as the disease advances, and consequently the presumption is that they are its *effect* and not its *cause*.—(Christison on the General Doctrines on Fever, Lib. of Med. p. 118.)

The healthy interchange of principles is not effected by the living chemistry in the capillaries; the blood stagnates, and is black in the capillaries and in the veins, and especially in the system of the vena portæ. Accordingly the *solid* parts that most evidently suffer are the villous coat of the stomach and of the intestines, and the parenchyma of the spleen and of the liver; but the rottenness of these parts and the softness of the brain are the *effects* and not the *exciting causes* of yellow fever.

The diseases of internal organs and textures in tropical climates may, in a curative point of view, be divided into those tending to putridity and those tending to new formations; the former are the diseases of sickly years; the latter those of

healthy years. In the former class of diseases the blood is without buff, and has little serum and slight adhesion; in the latter it has buff occasionally, and has serum and tenacity. In the former the pain is inconsiderable, but hæmorrhages and putridity of mucous textures and putridity of the internal structure of organs are produced; in the latter the pain is often acute, and the mucous membranes are affected with catarrh, inflammation, or ulceration, and serous and fibrous membranes inflame and suffer the consequences of inflammation. The cure of the former is to be conducted on principles immediately to be described; the cure of the latter requires less science, they bear bad practice better, and many of them require merely the comfort of an hospital.

X.

RATIO SYMPTOMATUM.

THE explanation of the symptoms will be understood from the explanation of the proximate causes and of their effects.

The rigors, chilly feelings, and soreness of the whole body, and the prostration of strength are caused by the diseased action of the nerves of sensation and of voluntary motion.

The headach is symptomatic of the disordered state of the abdominal viscera, and is removed when the diseased state of these parts is removed.

The hot dry state of the skin is caused by the want of evaporation from the skin.

The redness of the eyes and the lividity of the skin are caused by the stagnation of blood in the capillaries of the blood-vessels.

The vomiting is not caused by inflammation of the stomach, but by consent of the nervous system. Sea sickness is not caused by inflammation of the stomach. The swelling of the abdomen is caused by gases in the intestine and by putridity of the intestine.

The yellowness is caused by bile, and the stagnation of the blood in the capillaries causes the colour to be livid yellow.

The hæmorrhages are caused by the paralyzed and dying state of the capillaries and dissolved state of the blood.

In yellow fever the action of the heart is not increased; it is diminished; and the pulse, though frequent, is feeble and soft. What is to cause increased action of the heart when the blood vessels are filled with black blood without serum? The poor heart is as feeble as the capillaries or the muscles.

The delirium, convulsions, and coma are caused by the unhealthy quality of the blood, the retained secretions, bile, urine,

&c., acting as poisons; and not by the quantity of blood in the brain, although there is stagnation there.

Dr Bone, in his quarterly report for Guiana, dated September 1831, makes the following remarks on the fits of convulsions, &c.—“The fits that preceded death very frequently commenced suddenly and unexpectedly; the character of the fits varied; sense and the power of voluntary motion were often lost, the action of the heart and lungs remaining; frequently the patient was convulsed as in epilepsy, and frequently his jaws were locked as in trismus; the pupils were generally dilated; the muscles not tense as in tetanus, but loose and flabby; the carotids and temporal arteries visibly throbbing, yet the pulse was seldom full or strong, and bleeding and every other remedy tried were useless. Examination of the head after death gave very little satisfaction with regard to the immediate cause of these fits; no effusion of blood, vascularity not remarkable, and effusion of serum was rarely observed. The cause of the fits, I believe, is to be sought for in the abdomen and not in the head; the state of the stomach, liver, and spleen must prevent the free action of the cæliac artery, and the pressure of the tumid viscera of the abdomen may press upon the descending aorta and ascending vena cava, and thus cause the flow of blood to be principally directed to the head; or the black venous state of the blood may cause the fits, or the diseased state of the stomach and bowels. Mason Good states, that confirmed drunkards are peculiarly subject to epilepsy, and all the men who had these fits were confirmed drunkards. But the *urine* was nearly suppressed during the disease, and according to the authority of Sir Henry Hallford, retention of the urinary elements is often followed by coma and death, in fifty or sixty hours; therefore, the retention of the urinary elements may have been aiding as a cause of the fits; and hence the utility of saline purgatives, and pure water, and low diet remedies that promote the secretion of urine and of all the secretions.”

XI.

OF THE METHOD OF CURE.

THE curative indications are suggested by the symptoms described, and by the remote and proximate causes, and by the experience of the remedies that have been found useful.

The following are indications for curing the disease:

1. To remove the remote causes.
2. To evacuate unhealthy materials from the primæ viæ and from the systems of vessels; and to excite the action of the capillaries of the intestine and skin.
3. To supply materials for the formation of healthy fluids.
4. To excite the action of the excreting and secreting organs.
5. To support the *vis vitæ* during the disease.
6. To palliate uneasy symptoms.

These are not the only indications, nor are they all distinct from each other, nor all applicable to every stage of the disease, but they are of very general application.

1. The first indication is to remove the remote causes, and is effected by cleaning the patient, and placing him in a well-ventilated room supplied with pure atmospheric air; not in large, few, and strong currents, as from a common glass window, but in numerous pencils or in thin plates, as from a lattice, jalousie, or window.—(Vide Report on Barracks, &c.)

The patient should also be provided with a careful and skilful nurse. In nursing is included not only the exhibition of the medicines prescribed, but the making and exhibiting of grateful ptisans, soups, broths, jellies, or whatever is grateful to the patient, and keeping him clean. If the nursing be bad, however judicious the prescriptions of the physician, the patient may die. Careful nursing in this disease has saved a far greater number than physic.

2. The second indication is to excite the action of the capil-

laries of the intestine and skin, and is effected by aperients exhibited by the mouth or by purgative injections, and by diluents and warm bathing.

The patient is to be placed in the tepid or warm bath; and free evacuations from the bowels must speedily be procured, and frequently 12 or 20 stools are necessary to fulfil this indication.

The whole innervation is diseased, and the disease may kill or become incurable in 24 or in 12 hours, or in less time, from the beginning of the cold fit. The medicines, then, that are useful must operate more quickly than the disease: they must speedily calm the innervation and excite copious discharges from the capillaries.

Saline medicines, says Dr Billing, by "repressing the expenditure of nervous influence, cause the heart to struggle less and take repose. At the same time the action of the capillaries throughout the frame being increased by the constringing property of the sedative circulated to them, the nervous system recovers power (p. 168) to resecret that influence, the power of doing which is diminished by the poison, and without which it cannot impart energy to the organs."—(Principles of Medicine, p. 165.)

Yellow fever is a putrid disease, and therefore antiseptic aperients are to be preferred; the stomach is fastidious and irritable, and therefore pleasant aperients are to be preferred. Any mild aperient may be employed; but saline aperients are preferred because they are antiseptic, and are grateful to the taste and operate quickly.

The medicines should be given in a fluid form and not in pills, for these are vomited, or lie six or twelve hours in the stomach, or pass without being dissolved; and the disease is often incurable if the bowels have not been freely unloaded within the first twenty-four hours.

In 1817 Dr Bone, guided by these principles, began to use Cheltenham salts and seidlitz powders for the cure of gastric fevers in Barbados, and from that time these powders have been used commonly by him, and by many of the army medical officers in the West Indies. These powders, and other saline aperients, were the principal remedies he used for the cure of yellow fever in 1818 in Trinidad, in 1820 in Tobago, in 1820, 1821,

1822 and 1823 in Barbados, and again from 1828 to 1834 in Barbados and British Guiana, and again in Barbados from 1841 to 1845; and the practice was and is called "Dr Bone's seidlitz practice;" and his reports recommending that practice, and opposing the bleeding, blistering, and mercurial practice, were widely circulated in the West Indies, and were also deposited in the Medical Board Office in London, where they now are, and may be seen by any member of the profession. The modesty, therefore, of any physician forcing himself into notice by adopting my father's doctrine, that the blood is black in yellow fever, and that saline medicines are the best remedies for curing the disease, is abundantly obvious.

TABLE showing the quantity of certain medicines and of wine issued to the hospitals in the Garrison of St Ann's, Barbados, from 1811 to 1823 inclusive, and also the number of deaths and average strength.

Year.	Magnesæ sulphatis.	Sodæ sulphatis.	Sodæ tartarisatæ.	Seidlitz powders.	Mercurial.			Wine gallons.	Total deaths.	Average strength.
					Calomel-anos.	Pilulæ hydrargyri.	Unguent. hydrargyri.			
1811	568	388			5.1	8	111.8	3289	249	2040
1812	1034	86	1.8		9.8	1.7	47.8	2240	132	2481
1813	951	473	2		11.5	14	53.	2496	170	2804
1814	590	69.9	1		10	8	41.	1404	113	2587
1815	1357	692	6	3	20.3½	4.4	34.	3383	279	2706
1816	725.8	324	24	11	17.14½	4.9	53.	3155	162	1998
1817	458	503	10.8	26	18.4	4.10	31.	1768	92	1860
1818	495	427	8	55	10.14	6.10	12.	1935	77	1871
1819	342	370	23	30	10.2		9.	2535	73	1658
1820	427	311	6	91	11.8	2	16.8	2801	103	1664
1821	818	305	45	70.8	12.2½	6.5	25.8	2344	88	1406
1822	544	251		64	13.0	5.13	29.	1891	48	1303
1823	327	124	5	58	5.1	1.12	9.	674	33	1462

This table shows an immense reduction in the use of mercury and of wine, and in the number of deaths. Nor is it to be disregarded that seidlitz powders, the first of the best medicines for curing the gastric diseases of this climate, were not used in this garrison till 1815, nor generally in the hospitals of this garrison till 1815, and then principally in the naval hospital and by officers.—(Dr Bone's Annual Report, dated Barbados, 20th December 1823.)

The saline aperients chiefly used by Dr Bone are, seidlitz

powders, Rochelle salts, Cheltenham salts, Epsom salts, and cream of tartar, but other mild saline aperients might be used.

These saline solutions are bulky, and assist the intestine to contract by the stimulus of distension they afford.

The seidlitz powders may be given every hour, or every half hour, or after every fit of vomiting. In the early days of the fever, six or eight powders daily are about the number usually required. In many cases Dr Bone trusts entirely to them, and to some patients has given twenty of them in a day. Many of them are vomited, but the vomiting is easy, especially if tincture of opium be occasionally given with them.

In place of the patent seidlitz powders this formula may be used:—

R. Acidi Tartarici ℥ii. *in pulverem subtilissimum.*

R. Sodæ potassio Tartratis ℥ii.; *Sodæ Sesquicarbonatis* ℥ii. *Misce. Tere bene fiat pulvis subtilissimus.*

The powders dissolved separately in four ounces of water, and the solutions added together and drunk during effervescence, are remarkably grateful to every taste. This solution may be repeated every hour or every half hour during the first twenty-four hours, or until the bowels have been freely unloaded.

Four ounces of Rochelle salts dissolved in thirty-two ounces of water, with or without two grains of tartar-emetic added, and taken in doses of three or four ounces of the solution every half hour within the first twenty-four hours, are also a pleasant and effectual purgative.

For hospital practice the sulphate of magnesia combined with tartar-emetic may be employed.

R. Sulphatis Magnesicæ ℥iii.; *Antimonii Potassio Tartratis* gr. ii.; *Aquæ puræ* ℔b. ii. *Capiat uncias quatuor omne hora vel secundis horis.*

If this quantity is not sufficient to give twelve or twenty stools within the first twenty-four hours, a second equal quantity of the medicine may be given; and should the vomiting be distressing the tartar-emetic may be omitted.

Cream of tartar water sweetened with sugar, or with syrup of ginger, is a pleasant aperient and diuretic; and the pod of the Cassia fistula bruised and infused in boiling water, with or without tamarinds added, is a pleasant purgative ptisan; the squeeze of a lemon renders the infusion more grateful.

During the first twenty-four hours the aperients and diluents are to be assiduously and skilfully urged until twelve or twenty stools are procured, or until the stools become nearly the fluids drunk; and usually from two to four ounces of the neutral aperient salts, and from one to two gallons of diluent liquors, are about the average quantities necessary to produce a solution of the disease.

In the great majority of cases the disease is cured or rendered easily curable in twenty-four hours; but it may run its course, the force of the disease being however broken, till the fifth, eighth, or eleventh day. If the symptoms are not relieved by the third or fifth day, the spleen probably is becoming rotten, and also the liver and parts of the small intestine, and the ultimate cure is doubtful. But even when the portal system and villous coat of the intestine are severely diseased, and death in the ardent state, or subsequently in the gangrenous state, is apprehended, the same principles, the promotion of the natural evacuations, are to be held in view, and the practice to be employed is the same.

The cure of the disease depends greatly on the scientific management in the first 24 or 30 hours from the commencement of the chilly feelings. The subsequent treatment is of less importance, although it is important, for if it is improper the fever may return and become incurable.

In the stages of the disease after the first 24 or 30 hours, the aperients are to be continued in quantity sufficient to produce four, five, or six stools every day during the first three or four days of the disease, and for this purpose a seidlitz or a dose of salts in the morning, and one, or two, or three cathartic pills in the evening are in general sufficient.

The purgatives are to be given during the whole course of the disease until the tongue cleans, the intention being to clean the intestinal canal of foul matters, the cause or consequences of the disease, and to prepare the system for the more effectual action of diaphoretics. And very frequently the skin becomes moist immediately that the bowels have been moved.

A favourite cathartic pill is the following:

R. Extracti Colocynthis Compositi ℥i.; *Pululæ Aloes et Myrrhæ* ℥i.; *Antimonii Potassio Tartratis* gr. ii. *Fi-*

unt pilula xxx. Dose 1, 2, or 3, at bed-time or at some other time.

The composition of the pill may be varied, as may the form of the medicine. One patient takes 10 or 15 grains of compound extract of colocynth; another takes a powder composed of rhubarb and of carbonate of potash or of soda; another trusts exclusively to seidlitz powders, and these are both elegant and effectual; and to another patient the physician may prescribe, if it pleases him or the patient, blue pill and rhubarb, or any mild evacuant medicine. The pills of colocynth and hyoscyamus of the Edinburgh Pharmacopœia are good and mild in operation, and might be used.

After the fifth or sixth day the pills may be omitted, but by no means the seidlitz or equivalent of Epsom or of Rochelle salts till the urine has resumed its natural colour and appearance.

The morning dose of Epsom salts may have this composition,

R. Sulphatis Magnesiæ ℥ii.; Infusionis Rosæ ℥ii.; Acidi Sulphurici diluti M. x. Fiat haustus.

This mixture may be given every hour till it operate. "The sulphuric acid covers the bitter taste of the salt; makes it sit easier on the stomach; counteracts its refrigerant effect; does not impair its energy; removes its tendency to gripe or irritate the rectum, and even prevents it from interfering with the appetite and digestion."—(Vide Christison's Dispensatory, p. 617.)

During fever there is a want of evaporation from the skin; that is a principal *part* of the disease; and if the emanation from the skin is restored, all the other secretions are restored, and the patient recovers.

A gentle moisture of the skin is therefore to be obtained and maintained if possible during the whole course of the disease, or until the tongue becomes clean. The means are the warm or tepid bath, the Turkish vapour bath, hot hand and foot baths, and antiseptic saline diaphoretic medicines. The patient should be placed in the warm bath once in the day at least. When there is much restlessness, the warm bath is sovereign. If the patient is in bed, the seidlitz powders are good diaphoretic medicines, or the following formula may be exhibited.

R. Liquoris Acetatis Ammonia ii.; Syrupi ℥i.; Aquæ ℥iv.; Vini Opii ℥i.; Spiritus Ætheris Nitrici ℥ii.; Spi-

ritus Lavandulae Compositi ℥i. Capiat uncias duas, secundis horis.

For hospital practice Dr Bone frequently employed the following formula, with or without tartar emetic, to excite perspiration and allay irritability of stomach:

R. Sulphatis Magnesiæ ℥i.; Tinct. Opii ℥i.; Antimonii Potassio Tartratis gr. i.; Aquæ puræ ℔ i. Dosis ℥ii. secundis horis.

Sometimes neither the opium alone nor the salines alone stop the headache and vomiting, but together they often act like a charm, and promote perspiration; and if a copious perspiration flow, the prognosis is favourable.

When the stomach is irritable, medicines to be useful, even to be not disgusting, must be well made and pleasant to the palate. The diaphoretic mixture made by one person shall be disgusting and excite violent vomiting; made by another it shall be cordial and pleasant to the taste, and curative of disease like a charm; hence the absolute necessity of good apothecaries and of good cooks to assist the physician.

In severe fever the perspiration may be continued for eighteen or twenty-four hours, and if the fever returns the remedies are to be repeated.

When the patient cannot or will not swallow medicine he must be treated by warm baths and purgative injections of Glaubers salts or of Epsom salts, in the proportion of two ounces of the salt dissolved in half a gallon of tepid water, and the whole or the half of this quantity injected into the colon by means of Read's syringe. The injections are to be repeated as often as may seem necessary. Many of Dr Bone's most successful cases were treated in this mild way, and by ptisans and warm baths, and he believes that the disease might be cured in that way without giving medicine by the mouth.

3. The third indication is to supply materials for the formation of healthy fluids, and is effected by grateful ptisans and diluents, and well-cooked and easily digestible food, and a plentiful supply of pure atmospheric air; but the patient should not be placed in a current of air.

The tender secreting tunic of the intestine is to be bathed and encouraged to discharge, and is to be furnished with healthy fluids for absorption, and the unhealthy fluids are to be removed,

and healthy fluids furnished to supply their place. And as the free flow of water in trenches keeps them clean, so the free flow of pure fluids in the canals of the living body preserves it in health, and promises the most hopeful means of restoring it to health when diseased: while stagnation of the fluids and secretions is a very frequent cause of the disease, and hence the use of aperients, diaphoretics, diuretics, tonics, and nutritious food and pure diluents, and hence the injury of blood-letting, which empties the canals of the body, but does not promote a current in them, and removes the source from which the secretions and exhalations are derived and enfeebles the system.

The diluents and ptisans that may be used are barley water, rice water with cinnamon and sugar, imperial water, tea, lemon grass tea, cocoa-nut water, toast water; but the best drink is pure water.

If the nurse recommends a favourite ptisan of her own which is good and safe, it is well that she be allowed to prepare and give it, for by reposing in her this confidence she thinks she is trusted, and of importance; and if the patient cannot use her ptisan then she with greater willingness gives one of those recommended by the physician.

The late Dr Cleghorn of Glasgow taught that every addition to water tended to spoil it as a drink for patients, and the authority of so great a master of the healing art ought not lightly to be disregarded. Does not the call of nature for cold water, when the patient is vomiting, hot, and restless, indicate the propriety of using bland medicines, and are not strong medicines, as rum, brandy, ether, quinine, calomel, &c. hurtful when the villous coat of the stomach is pulpy, red, irritable, and demands cold water?

4. The fourth indication is to excite the action of the secreting and excreting organs, and will in general be effected by the means already described.

When a free current is established in the intestine, then a free discharge can be excited from the skin, and by and by the liver and gall-bladder send bile into the intestine, and a seidlitz or other mild aperient sends the bile out of the intestine, and the patient becomes well, and better, and stronger, and clearer in the complexion, than before he was taken ill.

Epsom salts, says Dr A. T. Thomson, stimulate the gall ducts and bring down a large portion of bile into the first gut, which

is carried downwards rapidly by the aid of diluents. (Vide p. 255 of Domestic Management of the Sick-Room.)

The urinary secretion is liable to be suppressed, and the small quantity of it that flows is often of a dark colour. Hence the utility of saline purgatives, pure water, and low diet, remedies that clear the urine and restore all the secretions.

Generally in cases that recover, all the secretions are restored at once, and in fatal cases none are restored, for black vomit is blood altered by passing through the mucous coat of the intestine.

5. The fifth indication is to support the *vis vitæ* during the disease, and is best effected by relieving the *primæ viæ* and portal system from unhealthy matters, and by giving the system rest and time to recover force, not by stimulation with large doses of rum, wine, or drugs, which are dangerous, and may extinguish the feeble flame of life.

“Optimum remedium quies est.”

If a physician is not certain what he ought to do, surely he will act most judiciously and honestly by doing nothing, or nothing that can possibly injure the patient.

6. The sixth indication is to palliate particular symptoms, and is in general fulfilled by fulfilling the indications already noticed, or it may be attempted by acting on the affected part.

The headach is symptomatic of the diseased state of the abdominal viscera, and is cured when the central stagnation is removed by purging and sweating. It may also be relieved by leaves applied to the brow to excite perspiration; and the hands and feet may be placed in warm water; and ice may be applied to the head, but not when there is a tendency to perspiration; or hot fomentations of equal parts of vinegar and hot water may be applied to the temples and shaved scalp, as recommended by Dr Graves.—(Vide Clinical Medicine, p. 117.)

When the vomiting is distressing, it may be relieved by the solution of Rochelle salts, or by seidlitz powders, or by a dose of laudanum given in tea, or in a diaphoretic draught. Sometimes the vomiting is obstinate, even from the commencement of the disease, and must be allayed by a large dose of tincture of opium, e. g. 40 or 60 drops, to prepare the system for the more effectual application of the principal remedies. A pint of tepid water, repeated as often as necessary, is also a good anti-emetic.

The warm bath, and especially the Turkish vapour bath, and the warm hip and hand baths, are elegant means for soothing uneasy sensations and promoting perspiration; but the restlessness and jactitation are only effectually to be relieved by curing the disease.

The pain and tenderness of the abdomen may be relieved by leaves applied to the abdomen, or by warm fomentations, or by warm poultices, to excite local perspiration, or the liniment of soap and opium may be used.

The shirt and sheets of the patient should be changed when they are wet with perspiration, especially if they begin to feel cold.

The patient often complains that fluids passing down the œsophagus burn like a ball of fire, hence the necessity of mild diluents. The pain and burning heat of the œsophagus felt during gastric disease, especially on swallowing, is very common, although not much noticed by authors; but the patient does not express an abhorrence of fluids. When the patient refuses to swallow medicine, he must be treated by purgative injections of saline medicines, and by warm baths and ptisans.

In treating this disease it will be observed that the chief reliance is placed on mild evacuant remedies, and the safety and efficacy of the plan is supported by the most enlightened and successful physicians. Dr Gregory, father of the late Dr Gregory of Edinburgh, treating of yellow fever, says, "a constant diarrhœa is to be kept up, and on this the cure usually depends." Dr Hamilton and Dr Baillie were practical and successful physicians, and they cured diseases principally by purgative medicines; and this was the practice of Pringle and of unnumbered other physicians who were successful in practice.

M. Deportes, a physician of science and veracity, who practised in St Domingo from 1733 to 1748, never thought the patient effectually cured of the mal de Siam until some notable evacuation by the *natural evacuants* had taken place. The doctrine inculcated by him was, "that of all medicines the simplest are always the best."

Dr Billing, in his Principles of Medicine, p. 178, states, "In the commencement of fever the saline antimonial mixture of tartar emetic and Epsom salts should be given every half-hour till nausea or vomiting is produced, and then every two or three

hours in diminished doses, so as to keep up the sedative influence." This has been my father's practice for the last quarter of a century, but he endeavours to excite purging and sweating, and not nausea and vomiting.

Yellow fever is a severe disease, but, if it be not *ab initio* mortal, the patient can very generally be cured very simply and very easily, following the principle of "assisting nature, not of subverting her laws and efforts;" but it is essential that the patient be placed under skilful medical treatment immediately that the disease begins, not after it has continued one, two, or three days, and the spleen has become rotten, and the nervous system, blood, and fluids, incurably diseased.

The principal indications for the cure of the disease on Dr Bone's plan are to restore secretion, and excretion, and absorption. The means have been already detailed: they are to clean the outside of the body by tepid or hot baths, and the inside by mild antiseptic saline aperients and diaphoretics, and copious dilution, with grateful and slightly cordial ptisans; to act on the capillaries, and not on the trunks of the obstructed vessels. On this plan, first, the capillaries of the intestines act, then by sympathy the capillaries of the skin, and then the weak heart begins to act, and the fluids move and become healthy by the renewed chemical changes, and the spleen does not become rotten, nor the mucous coat of the intestine gangrenous.

Purging one day, purging and sweating another, and sweating a third cures permanently, quickly, and certainly the gastric disease of Barbados.—(Dr Bone's Report, dated 1822.)'

The advantages of this plan of cure are thus stated by Dr Bone in his Report, dated Guiana 1829.

1. It produces its effects quickly, safely, and pleasantly.
2. It does not accumulate medicine in the system, and the effects it produces can be increased or diminished, or stopped as the physician pleases.
3. It increases the strength of the patient, promotes the excretions and secretions, and is the most perfect purificator of the juices and of the whole system. It diminishes the period of convalescence: the patient, if a soldier, is in two or three days fit for duty, and therefore it increases the effective force of armies.
5. It is the best cosmetic and the best sweetener of the breath.


6. It is the best means of preserving health in the West Indies or in any climate.

It now only remains for me to notice some of the medical powers that have been, or that might be employed for the cure of this disease.

1. *Emetics* might be used at the beginning of the disease to evacuate the foul contents of the stomach, but when the vomiting continues till death, the patient and his friends blame the practice.

2. *Bleeding*.—It might be imagined a priori that the removal of a mass of unhealthy blood from the system could not do harm, and might be useful to the patient, but, says Dr Bone, my experience during many years does not confirm this notion. In 1820, in Tobago, I employed the bleeding practice: it failed totally, and since then I discourage the abstraction of blood.

Bleeding depletes principally the valved veins of the extremities, and only in a small degree the unvalved veins of the vena portæ and brain, and these are the parts in which there is the chief amount of stagnation; and on examining, after death, the bodies of those who have been profusely bled, the valved veins are found nearly empty, but the unvalved veins of the brain, vena portæ, and the posterior parts of the lungs contain a fair quantity of blood.

If the blood is obstructed in the extremities, of this figure , the plan is to remove the obstructions of the extreme vessels, and the blood flows; but if the main trunk be emptied, the blood never flows, and the small quantity that remains stagnates and becomes black and unhealthy, not being changed by the living chemistry in the capillaries.

The indications for the cure of the disease, as already explained, are to evacuate retained excretions and secretions, and thus excite the living chemistry in them and in the whole system, and put the stagnant blood in motion; the removal of the pabulum that supplies the excretions and secretions, and supports the action of the brain and muscles, and renovates the system, must therefore be unscientific and wrong, and especially when the system is unable to assimilate and to form pure blood.

The blood in this disease is not increased in quantity, and therefore does not require to be diminished; but it is vitiated in

quality, and therefore requires to be purified, and the most effectual means of purifying it are to remove vicious secretions from the intestine least they be reabsorbed, and to excite perspiration and the various secretions, and to supply pure fluids to the absorbents, for example seidlitz powders, solution of Epsom salts, or of Rochelle salts, tea, pure water, &c.

Local bleeding.—Leeching the temples, cupping the nape of the neck, &c. are not necessary measures, as may be understood from the observations already made. The cause of the headach is in the abdomen, and only secondarily or by sympathy in the brain; it is therefore to be cured by acting principally on the bowels by purgatives, and on the skin by diaphoretic medicines; but leaves applied to the brow to excite perspiration are useful, and the hands and feet may be placed in hot water.

The application of cold lotions to the head when the skin is perspiring is dangerous; and wetting the bed makes the patient's bed uncomfortable.

Cupping or *leeching* the epigastric region can scarcely be supposed to be of much benefit to the stomach or duodenum, for the colon is very generally inflated and lying over the stomach. *Leeches* can be of little use in curing a rotten spleen.

3. *Croton oil*.—Two minims of croton oil dropped on the tongue are not a bad purgative at the beginning of the process, but in pills are not to be depended upon. Oil of turpentine one ounce, with or without castor oil one ounce, is an active purgative and vermifuge, and may be given to strong persons at the beginning of the disease, but is rough and disgusting, and in this disease the stomach is very irritable and very fastidious.

4. *Blisters* are not to be recommended, because the blistered parts become gangrened, and the dying persons pick the raw-blistered surface, and because blisters are always pernicious for the treatment of a putrid disease.—(Conspectus Gregorii de Epispasticis.) Blistering the head or any part in the early days of fever adds greatly to the irritation of the patient.

5. *Cold affusion* may sometimes be used when the patient is burning hot, especially when the fever is of the "remittent" kind, but the glow of heat and flow of perspiration seldom in the West Indies follow its use.

Cold applied to the head or to any part of the body, when the

skin is perspiring, checks the perspiration and increases the disease.

In severe fever, says Dr Alison, the cold affusion checks the circulation on the surface and aggravates the central congestion.—(Practice of Medicine, p. 454.)

6. *Mercury*.—The practice of giving calomel with intent to salivate has been tried and failed, and is not defensible on principle, for those who die in three days cannot be salivated, and many have died when salivated, and many who had only slight original disease have lost their teeth, and been ruined in constitution by the mercurializing system; and if the patient can be salivated he is but slightly ill; and those who recover after being salivated might have been cured more speedily without mercury. Dr Copland observes, (Dict. of Medicine, p. 928, 929,) "I have tried to effect the system in the most malignant forms of fever in warm climates without succeeding, and when I have succeeded there was every reason to believe that recovery would have taken place nevertheless; and that mercury possesses no *prophylactic* influence against fevers has been satisfactorily shown by several able writers and by my own experience."

Salivation neither cures nor prevents yellow fever, but, on the contrary, by rendering the body more sensible to impressions from currents of cold air, *predisposes* to yellow fever.

Yet there are authors of reputation who support the employment of mercury in immense doses for the treatment of almost every kind of febrile disease in every climate, and especially in the putrid gastric disease of the West Indies; but they do not contrast the mercurial with other modes of treatment, nor explain satisfactorily in what mode the perceptible effects produced by mercury can possibly be curative of the disease. "I have seen the practice," says Dr Bone, "and am not more certain that sulphate of soda is purgative than I am that large doses of calomel are worse than useless for the treatment of tropical gastric diseases of all kinds and of all seasons."—(Report dated 1823.)

Dr Rush gave 10 grains of calomel and 15 of jalap as a purgative, and it is not a bad medicine if it remained on the stomach, but it is a rough medicine, and its purgative action is neither certain nor speedy. Saline antiseptic aperients and diapho-

retics are safe and mild and speedy in operation, and their effects can be moderated as the physician pleases. They enter the circulation, and act directly upon the fluids, villous coat of the intestine and vessels of the skin, the principal seats of the disease.

Calomel is a medicine uncertain in its effects; in a dose of five grains or of ten grains, or of a scruple, it may produce a state of melancholy or of low spirits from which the patient does not recover for several days, or it may prove emetic or purgative, or it may salivate, or cause "tormina and tenesmus and scalding of the rectum,"—(vide Latham, Clinical Medicine, p. 203,) or it may lodge in some part of the mucous texture of the intestine, and produce inflammation and ulceration, or it may pass off without producing any sensible effect.

The notion entertained by some practitioners that calomel in scruple doses acts as a gentle opiate, and that a drachm of it is milder in operation than a grain, is altogether erroneous. The sinking of the nervous system, and the mortal faintness caused by large doses of calomel, intended to be curative of yellow fever and of other diseases, are in truth the first symptoms of the poisonous action of this strong medicine. Mercurial ointment was formerly much used in the West Indies for the cure of yellow fever, but is not used now.

During an epidemic season the secretion produced by large doses of mercury is blood from the nose, mouth, and anus; and during a healthy season the following are some of the effects of the mercurial practice—stinking breath, swelling of the gums and tongue, salivation, rottenness of the mouth and gums, abrasion of the villous coat of the intestine, paralysis of the intestines and occasionally of the arms, loss of teeth and of alveolar processes, and even of parts of the jaw bones, sinking of the præcordia, a state of melancholy, tormina, dysentery, dropsy, cachexia tumida, tedious convalescence, and ruin of the constitution for life.

7. *Quinine*, or some other tonic, may be given during convalescence if the patient like it; but is not very useful, and on the mild plan of treatment recommended in this essay, there is no tedious convalescence, the patient soon becomes well and does not relapse.

The quinine should be given in small doses, and in solution, and not in the form of powder or of pill, which is a waste of the

medicine. Given in solution it acts with certainty on the mouth, throat, stomach, and intestine.

There is a terrible practice in Guiana and in other places in the West Indies: it is to give calomel a scruple, and quinine a scruple, or twenty-five grains every four hours, or every six hours, or twice or thrice a-day, without much regard to present symptoms, until a hissing noise is heard by the patient in his ears, or until he is blind or deaf.

The calomelanists and quininists sometimes give castor oil, and it is useful if it stay in the stomach and then expel these poisons from the primæ viæ; but the vomiting is frequently incessant, and will expel the calomel and quinine and castor oil. Saline aperients given along with the quinine answer rational indications for curing the disease and diminish the injury which quinine might otherwise do to the patient.

8. *Water cure.*—It is probable that the water cure might be useful for the cure of yellow fever, but it is not practicable in the West Indies for want of means. The sweating process in wet sheets would be good.

9. *Stimulants.*—Except when the disease is exhausting and protracted stimulants are not required, and the patient loathes them. He demands cold water, and it is the best application to a red pulpy irritable and almost gangrenous stomach.

Rum or brandy ad libitum, or poured down the patient's throat, prescribed profusely as a remedy for yellow fever, or for any form of violent or rapid febrile disease in the West Indies, aggravates the disease, and may send the patient to the other world in a state of raging madness. But when the patient wishes to have any particular stimulant it may be given to him, and is safe and even useful; but the liquor should be exhibited in the presence of the physician, for very often the attendant reports that the patient wishes to have wine, brandy, or porter, and the drilled patient assents, but when the liquor is offered to him rejects it with loathing; yet if the physician trusts to the attendant he will believe that the patient drank the liquor and liked it, and was cured by it or at least comforted.

XII.

PROPHYLACTICS.

ONE part of the exciting cause of the disease is, very frequently, the remora of the ingesta, and of the secretions of the glands of the mucous tunic of the intestine, and preventing this remora is the surest means of preserving health in any climate, and is also the surest means of curing nine-tenths of tropical diseases. Preservation of health, therefore, depends very greatly on removing from the intestine unhealthy accumulations; but not only is the previous accumulation in the intestine to be removed, and the flow of the alvine secretions to be kept constantly moving downwards, but the increase of secretions, the means of nature for effecting the cure, is to be encouraged and augmented by the aid of aperients.

Dr Bone, in his report dated Barbados 1822, states, "I maintain that by purgatives and diluents the gastric diseases of this climate are to be cured; and I further maintain that, by the exhibition of purgatives, any person of sound stamina, who has the means of living comfortably in a healthy situation, may secure the enjoyment of good health. These principles I uniformly inculcate to all my friends, and to all my patients, and to all who talk with me relative to the prevention and cure of tropical diseases, and I can say, that since my arrival in the West Indies, no person whom I could convince of the truth of these principles has lost his own life, or if a medical man proved unsuccessful in practice.

"When officers going to Tobago or Trinidad have consulted me on the means of securing health, I have told them the following anecdote: 'A Scotch general who had been many years in the West Indies, and never sick, was asked one day in London how he continued to keep good health so long in so sickly a climate, he replied, 'I kept my head cool and my belly open.' And

whoever understands and observes this plan of the general's, need not trouble himself with systems of hygiene. Let him take a scidlitz, or a dose of salts, or a pint of pure water every morning, if his bowels are costive, and a pint of wine at dinner if he like it and can afford it, and he may live like a healthy man and not like an invalid."

"When the disease becomes epidemic in a barrack, or in a district, or in a town, a certain stop to its progress is made in a fortnight by removing the sickly people to a place where the people are healthy, and I have already mentioned instances of the success of this plan."

This was the plan acted on by Dr Bone during the last five years, the time he was in medical superintendence of the troops in the West India command.

On this principle Inspector Baillie acted in the West Indies in 1809, and 1810, and 1811; and the contagionists did not neglect this principle: they did not trust exclusively to their quarantine regulations.

Acting on this principle is so evidently correct, that the whole army in the West India command confidently trust to it. The encamping ground is selected by the commanding officer and the senior medical officer, and the tents are always in readiness, and the men are encamped forthwith when they become sickly in a barrack or in a locality. In Guiana, where encampment is impracticable, the sickly troops are moved from Demerara to Berbice, or from Berbice to Demerara, or from either station direct to Barbados.

The following are principal means for preserving the health of troops in the West Indies:—

1. Accommodations in barracks and hospitals, as required in the essay added to this thesis.
2. Good interior economy of the troops.
3. Good health, activity, and scientific practice of the medical officers.
4. The triennial change of troops in the West Indies finally adopted by government in 1841.—(Vide Dr Bone's letter to Lieutenant-General Maister, dated 19th August 1841.)

APPENDIX.

PRINCIPLES

TO BE OBSERVED IN PROVIDING

HOSPITALS AND BARRACKS FOR TROOPS IN THE WEST INDIES.

BY

HUGH BONE, Esq. M. D.,

INSPECTOR-GENERAL OF HOSPITALS, &c. &c. &c.

PRINCIPLES, &c.

First, Hospital Accommodation in proportion to the number of Troops.

THIS accommodation should be provided for the maximum number of troops, and for the maximum number of sick, and should be in the West India Islands for 15 per cent., and in British Guiana for 20 per cent. of the maximum number of troops, and in Barbados hospital accommodation should be provided for sick of the Royal Navy.

Second, Space for Patients in Hospitals, and for Men in Barracks.

This is to be calculated on three principles: the length along the wall, the square feet of floor, and the cubic feet of space, exclusive of the space opposite the doorways.

Space for Patients in Hospital.—By Her Majesty's Regulations for Army Hospitals, page 16, the bedsteads of the patients are to be two feet apart, and the hospital bedstead being three feet wide, each patient has five feet along the wall of the hospital; and supposing the hospital to be 26 feet wide, and 15 feet in height, each patient has 65 square feet of floor ($13 \times 5 = 65$ square feet,) and 975 cubic feet of space, ($65 \times 15 = 975$ cubic feet,) in the hospital. These calculations are for patients with slight diseases, but for patients with yellow fever, remittent fever, or other severe disease, 10 feet along the wall, 130 square feet of floor, and 1950 cubic feet of space are required, and the hospital is supposed to have a gallery, at least 10 feet wide, and jalousied all round.

Space for Soldiers in Barracks.—By the proceedings of a board of mixed officers, held in St Ann's, Barbados, on the 3d and 4th March 1842, and adopted by another board of mixed

officers, held in St Ann's, Barbados, on the 11th and 12th May 1843, a soldier is allowed in his barrack-room 3 feet 6 inches along the wall; for his bedstead is 2 feet 6 inches in width, and the bedsteads are to be a foot apart, and not placed in pairs, which is the same as giving one bedstead to two soldiers, and the space opposite the doorways, and the ends, and the middle of the barrack-room are to be clear of bedsteads, and the room is supposed to have a gallery 10 feet wide, and jalousied all round, and to be not less than 24 feet in breadth, nor less than 12 feet in height. In this room the soldier will have 42 square feet of floor ($12 \times 3\frac{1}{2} = 42$ square feet,) and 504 cubic feet of space, ($42 \times 12 = 504$ cubic feet.) But a better barrack-room is 26 feet in width and 15 feet in height, and gives the soldier $45\frac{1}{2}$ square feet of floor, ($13 \times 3\frac{1}{2} = 45\frac{1}{2}$ square feet,) and $682\frac{1}{2}$ cubic feet of space, ($45\frac{1}{2} \times 15 = 682\frac{1}{2}$ cubic feet,) in his barrack-room. The number of men a barrack-room can accommodate should always be determined by a board of mixed officers, the commanding officer and the P. M. O. being upon the board; and the berth of each man should be numbered on the wall of the barrack-room above his bedstead, for unless this plan is adopted, commanding officers and barrack-masters may unintentionally sanction crowding in barracks.

Third, Conveniences which an Hospital requires, and which a Barrack requires.

Conveniences which an Hospital requires.—A kitchen and a back kitchen, the floors of both flagged. The kitchen to be provided with two boilers for cooking for the patients; and with a thirty gallon boiler for heating water for baths; and with a kitchen range, or places for boiling saucepans; and with an oven; and with tabling of plank, 24 inches wide, placed round the wall, and with shelves, and a press, and with a coal-box, and a place for holding wood; and to be well ventilated, and supplied with water, conveyed to it by pipe.

The new kitchen of the stone barrack is well fitted up and does honour to the Royal Engineer Department, and will save many lives: the hospital kitchen might be fitted up on the same plan. The back kitchen should be fitted up with shelves and with a table.

A surgery fitted up with shelves, and with drawers, and with a counter; and a back surgery fitted up with shelves, and with a press, and with a table.

A surgeon's office and consulting-room fitted up with a table and two chairs, and with a press to hold books, and papers, and surgical instruments.

A bath-house and reception-room adjoining; one bath for every 25 patients; the baths to be sunk one foot in the floor. The length of the bath to be 6 feet.

breadth - - 2 feet 6 inches, or 2 feet 3 inches.
depth - - 2 feet.

The bottom to be concave, the ends circular. The bath-house to have a shower-bath, and a douche, and a pipe to convey hot water to the baths from the boiler in the kitchen, and a pipe to convey cold water to the baths from a cistern placed 12 or 15 feet above the floor of the bath-house.

A water-closet adjoining each ward, or near the dressing-room of each ward, as in the late Naval Hospital, Barbados; but in the military hospitals conducted on the regimental plan, it is almost impossible to keep the water-closets in good order, for the supply of water frequently fails, and the patients not being furnished with whited brown paper use grass or cloth in place of it, and thus obstruct the pipes that lead from the water-closet to the sewer.

A store for clean bedding, and for clean linen, and for men's packs, and to be fitted up according to the ordnance plan, and to be well ventilated.

A store for dirty linen and for dirty bedding; the floor to be flagged, the ventilation to be all round by spring jalousies.

A bed-room, an office, and a provision store for the hospital sergeant.

A receiving store and an issuing store for the barrack-master.

Bed-rooms for orderlies; one orderly is allowed for every ten patients. Therefore an hospital for 200 patients should have bed-rooms for 20 hospital orderlies. This provision is not made in the Hospital St Ann's;* and the orderlies not having sleeping places, except in the wards with the patients, very frequently die, and in sickly times cannot be replaced, and fatigue men are sent to attend the patients; a most objectionable plan. These miseries

* But has since been made.

happened in the Hospital, 33d regiment, St Ann's, in 1841; and often happen in other hospitals at other stations in this command, when sleeping-rooms are not provided for hospital orderlies.

A bed-room for the cook and for the orderly employed in the surgery; and in Barbados, a room for the apothecary's sergeant, and a room for the soldier employed as bathman.

A room for the military labourers attached to the hospital.

Urinals placed in convenient situations.

A dust-hole placed to leeward.

A privy with one seat for every 25 patients; the seats to be separated by partitions, the floor to be flagged, the ventilation by spring jalousies, and to be near the hospital.

A privy with one seat for medical officers.

A privy with one seat for women; and with one seat for children.

A dead-house and dissecting-house adjoining, the floors to be flagged, the ventilation by spring jalousies all round. The length of the dead-house, St Ann's, 24 feet, the breadth 18 feet; the length of the dissecting-room 18 feet, the breadth 12 feet, the height of the ceiling 15 feet. Three tables placed along the leeward wall of the dead-house and one table in the dissecting-room.

A strong-room in which a furiously mad patient might be confined.

A guard-room.

A quarter for the medical officer in immediate charge of the sick, and to be near the hospital, but not in the hospital enclosure; and to have a sitting-room, and a bed-room, and an office, and other accommodations according to his rank.

Conveniences which a barrack requires.

A kitchen, the form may be oblong, or may be octagonal, like the kitchen of the Brick Barracks, Barbados, and should be thoroughly ventilated, and have plank tabling, two feet or two and a half feet wide, placed along the walls, and a shelf, one foot wide, above the tabling; and an oven; and a kitchen range, or places for boiling saucepans and kettles; and the floor should be flagged. The new kitchen for the Stone Barracks, St Ann's, wants a kitchen range, or places for boiling saucepans, and an oven. Many soldiers in this command and in other commands are killed by the smoky ovens called kitchens.

A privy for the soldiers. It should be near the barracks, and

should have a paved covered way leading to it from the barracks, and should have one seat for every 50 men, the seats separated by boarding six feet in height from the floor, but open in front. Many soldiers are killed in this command and in other commands by the distance, construction, and state of their privies.

Rooms or sheds in which the soldiers could clean their clothes and accoutrements; and rooms or sheds in which they could wash their hands, faces, and feet; and these rooms or sheds should be provided with water, and with hand washing basins, tubs, and tabling of flag-stones or of plank. The use of water-troughs or of buckets, or of any large vessel, in which several men wash their faces and hands or their feet with the same water, should be prohibited, as being uncleanly, and causing and continuing ophthalmia in regiments.

Urinals placed in convenient situations.

A dust hole placed to leeward.

A tailors' room fitted up with a work board.

A shoemakers' room.

An armourers' room properly fitted up and properly ventilated.

A sentry-box for each sentry, size four feet square and eight feet in height.

A shed for the sentry, the length 24 feet, and breadth 12 feet, the length from east to west.

A guard-room, well ventilated, floor flagged; each man to have an iron bedstead or a bedstead of boards and trestles, and a block of wood for a pillow. This plan was adopted in 1836 by Sir Howard Douglas for the guard-rooms in the Ionian Islands Command, and with great benefit to the service. The guard-bed of wood and the boarded floor collect filth and harbour vermin.

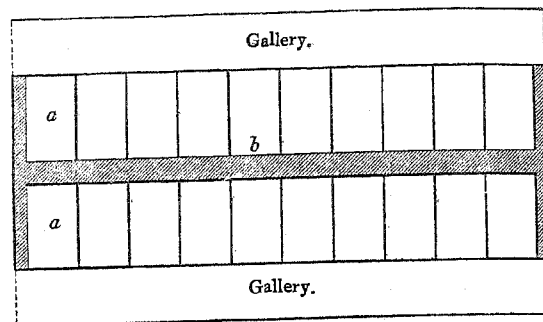
A prisoners' room adjoining the guard-room, and it should be flagged and have grated iron windows; for the men on guard should not be suffocated and annoyed by prisoners in the guard-room.

A dry room or defaulters' room for prisoners in temporary confinement by order of the commanding officer.

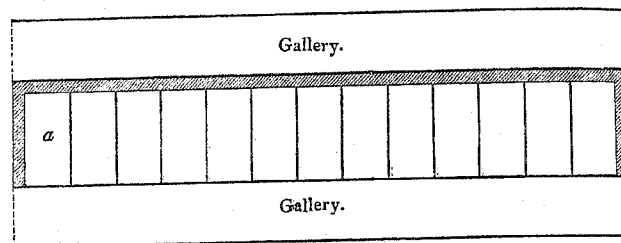
Prison* cells, well ventilated by iron jalousies or by iron grating:

Length of a cell, 12 feet.	} giving 600 cubic feet of space.
Breadth, . . . 5 feet.	
Height, . . . 10 feet.	

* See Note on Prisons, p. 81.

Plan with double row of Cells.

a. a. Cells. b. Middle wall of cells.

Plan with single row of Cells.

a. Cells.

The provost cells at St Ann's are seven feet in length; six feet 10½ inches in breadth; and frequently two prisoners are placed in some of them;* and they are not properly ventilated, and injure the health of the prisoners. The area of the floor, and the cubic feet of space, should be the same for a prisoner as for a man in barracks, for the prisoner is not sentenced to be suffocated.

A room for the band to practise in, and at some distance from the barracks; for the noise of the band practising is not pleasant to the non-musical.

A library room for the men, and to be fitted up with shelves, tables, and forms.

A school-room fitted up with desks, shelves, tables, and forms.

A sergeant's mess-room,

A sergeant's kitchen.

A room for each of the staff-sergeants, and for each of the pay-sergeants.

* This has since been prohibited by a general order from the Horse Guards.

An orderly room for the commanding officer and adjutant.
An office for the paymaster and his sergeant.
A store 30 feet by 20; an issuing store; and an office for the quartermaster.

A room and bed-room for the sergeant-major.
The officers, in addition to their barrack-rooms, require Servants' rooms.

Kitchens.

A mess-room and a room adjoining.

A library-room.

A billiard room.

Stabling.

A privy near their barracks, one seat for every six officers, each privy in a separate room, and every room well ventilated, and with the floor flagged.

Each married man and his wife with a corps should have a room for themselves, and for their children if they have any; and the husband might pay a small rent for the room or hut. This plan is adopted at Woolwich, and answers well.

The women should have a kitchen, and should have a wash-house well supplied with water. It is deplorable to see these poor people cooking with their little stoves, and washing in their little tubs, exposed to the sun, wind, and rain; the thermometer from 80° to 90° of Fahrenheit.

The women should also have privies for themselves, the seats separated, the floors flagged, one seat for every 10 women, and adjoining each seat for the women should be a seat for a child.

The number of women that now follows corps is very great, and cannot easily be diminished, but is a great evil.

Fourth, Construction and Ventilation of Hospitals and Barracks.

A ward may contain 12, 24, 36, or 48 patients; but a ward to contain 12 patients, and having an orderly's room adjoining, is to be preferred.

A barrack room may contain any number of men, but should be divided by railing or parapet walls, each division to contain a company or two companies, or 100 or 200 men.

The plan for an hospital, or for a barrack, should admit of enlarging the building. The form of a square or of a cross might be adopted, or the building might be in a line facing the

prevailing wind. Hospitals and barracks should be constructed according to the same principles. The exterior wall of these buildings should be the principal defence against the sun, wind, and rain. The barracks and hospitals in British Guiana are constructed according to this principle, and are comfortable to the troops, and cost comparatively a small sum of money. The hospital and barracks in Trinidad have Doric pillars and open galleries, in imitation of the Parthenon, and of the Temple of Theseus in Athens, and cost an immense sum of money, L.60,000 or L.80,000 I believe, and the hospital can accommodate only 38 patients, and the barracks can accommodate only 254 men. To put jalousies between the Doric pillars of these buildings would be barbarous; and without jalousies the galleries of these buildings are of little use. The cells in the Greek temples were to contain statues; but hospitals and barracks are to contain living persons, and should be constructed for that purpose. An hospital or a barrack with a narrow cell and open galleries affords little accommodation and little defence against the weather. The hospital and barrack in Berbice were constructed according to that plan, but were destructive to the health of the troops, and were consequently reconstructed, as recommended by a board of mixed officers, held in Canjée barracks, Berbice, on the 2d April 1831. A copy of the proceedings of that board is subjoined to this report.

The hospital and barracks in Berbice were reconstructed by Captain Tait, R. E., and immediately became healthy, and to this time have continued to be healthy. The plan for reconstructing these buildings was approved by the late Dr Baxter, and by Sir Charles Smith, commanding R. E., and by Sir Benjamin D'Urban, then commanding the troops in British Guiana, and by Sir James Lyon, then commanding the troops in the West Indies, and must have been approved by the Board of Ordnance.

The principles adopted for reconstructing these buildings should, in my opinion, be adopted for constructing hospitals and barracks in the West Indies. The exterior wall might be one-fourth or one-third of it masonry, or wood to please the architect; but the defence against the sun, rain, and wind should be the exterior wall. The interior wall should be a parapet wall $3\frac{1}{2}$ feet in height, and a range of pillars, but as the iron-bedsteads have head-plates the parapet wall is of little use. The

interior part of the building should be the bed-room for the soldier, the part between the exterior wall, and the parapet wall or range of pillars, should be the sitting room and eating room for the soldier. He would thus have a comfortable home in his barrack room, and would prefer his home to the canteen. All the partitions in the buildings should be railing or jalousied screens, or parapet walls ventilated by jalousied windows, and with the lower board of the parapet wall hinged to turn up.

An hospital and a barrack may be one story high, or two stories high, but the lower story should be raised from the ground 10 or 12 feet, and the ground under the building should be paved, and the space under the building should be appropriated to the men for promenading, sitting, cleaning, and for breakfasting and dining when the weather is fair, and should not be made stores, for these, unless paved and thoroughly ventilated, are injurious to the wood of the building and to the health of the troops.

These are the principles I recommend for constructing hospitals and barracks in the West Indies; but hospitals and barracks have already been constructed in the West Indies, not on these principles, nor on any fixed principles, and it is most important to make these buildings healthful. In many of these buildings the suffocator window is used; it should forthwith be replaced by the spring jalousied window of wood or of iron. This suffocator window and crowding have principally caused the sickness and death of the British troops in the West Indies, and at present this window is used in the Stone Barrack, Barbados; in the Bomb-proof Barracks, St Vincent;* and St Kitt's, and in some of the barracks in Dominica, Tobago, and Grenada.

The second measure required is to ascertain and mark on the door of the barrack the number of persons it can properly accommodate; and the third measure required is to give to the hospitals and barracks all the conveniences recommended for these buildings in this report. Officers' rooms, surgeries, libraries, and rooms where officers and clerks write, should have the windows glazed, and with jalousies outside and shutters inside. Wards, soldiers' barracks, and out-buildings should have spring jalousied windows; and galleries should have spring jalousies. The jalousies may be of wood or of iron.

* The windows in the Bomb-proof Barrack, St Vincent, have since been jalousied.

In every part of every barrack and of every hospital the air should be in perpetual motion, and should be admitted in thin plates through spring jalousied windows, or in small pencils through fine lattice work. The exterior wall should have the lower one-third solid wall with numerous spring jalousied openings immediately above the floor, and the upper two-thirds spring jalousies: or if the building have the exterior wall masonry, one-third of the middle part of the wall should have jalousied windows of height in proportion to the height of the wall, and immediately under the ceiling and above each window should be iron grating 18 or 24 inches in depth; and under each window should be iron grating 12 inches in depth. By this construction the air in the buildings would be in perpetual gentle motion laterally, and the persons in the buildings would neither be exposed to strong currents of air, nor suffocated from want of air.

Fifth, Position of Out-Buildings.

The out-buildings should not be to windward of an hospital or of a barrack. The water from the bath-house of the hospital should flow through the drain under the hospital privy. The privy, dead-house, and store for dirty linen should be to leeward of the hospital; and the privies, wash-houses, and stables for barracks should be to leeward of the barracks. In Demerara the out-buildings of the hospital are on the east, south, and west sides of a square, and the hospital is on the north side. In Berbice all the conveniences for the hospital, except the kitchen, bath-house, dead-house, and privy, are under the same roof with the wards. The late naval hospital Barbados was two stories high, and had four pavilions communicating by covered galleries, and was placed in the centre of the level part of the hospital enclosure, and its length was from north to south. The officers' quarters were to the east and north-west, and the conveniences were to the west of the hospital. The surgery, kitchen, and bath-house should be near the wards. In an hospital or in a barrack constructed as I have recommended few out-buildings are required; for the hospital orderlies are to be quartered in partitioned-off rooms adjoining the wards, and the sergeants of companies may be quartered in partitioned-off rooms adjoining their companies; and married soldiers may be quartered in a long building divid-

ed into rooms by jalousied screens, or by parapet walls, or by paling; and in another building similarly constructed may be offices and stores, and quarters for staff-sergeants. In selecting the positions for out-buildings, the architect must not be confined by strict rules, but must be guided partly by his taste, and partly by the shape and situation of the ground on which the buildings are to be constructed.

Sixth, Drainage and Sewerage.

In Guiana the drainage is effected by banks to keep off the sea, and by canals which have flood-gates, and by trenches, and by surface drains, which should be paved. The barrack square, parades, and every drained plot of ground should be raised in the middle, and sloped to the side trenches, and have a convex surface, and the cleanings of the trenches should be spread on the centre of the plots, and not left on the sides of the trenches,—an abuse very common in Guiana, and which causes the plots to be marshes. The canals, trenches, and surface drains should be kept clean, and the surface of the ground near the hospital and near the barracks, and to the distance of at least five or six hundred yards all round the hospital and barracks, should be kept clear of weeds, and of bush, and of every kind of unhealthy vegetation; for although cultivated vegetables and trees expire oxygen, and inspire carbonic acid when exposed to the sun and air, yet weeds and low bush rot, and inspire oxygen, and expire carbonic acid in the dark, and smell offensively, and harbour musquitoes, sand flies, and gallinippers. The new hospital, Demerara, has lately been supposed to be unhealthy. The inner walls are not parapet walls, but are jalousied to the ceiling,*—a fault of construction which I often represented to the late Captain Smyth; but the unhealthiness of the building I am inclined to attribute principally to the foulness of the hospital enclosure, and of the environs of the hospital, and not to the cutting down of the bush in the neighbourhood; for Camp House adjoins the new hospital, and is healthy, but the grounds round it are kept clean.

The drainage in Barbados, and in the other islands in this command, is by covered main drains, and by covered communicating drains, and by paved surface drains. The bottom of every

* These walls have since been cut down to the height of three and a half feet.

drain should be concave, or have an obtuse angle, and the height of the drain should be twice its width, and the drain should have a declivity that water may flow in it freely; and it is desirable that a rush of water should flow once a week or oftener through the main drain.

The barracks and hospitals in this command are not provided with water closets, nor with covered sewers joining main ducts, nor with any scientific contrivance for the removal and disposal of human excrement and house filth, and consequently servants very frequently empty hand-basins and chamber-pots over the galleries, or out of the windows. Generally the privies are too far from the hospitals and barracks, and some of them are in most improper situations. The privy of the Brick Barracks, Barbados, is 400 yards from the south end of the barrack, and is at the meeting of four roads, and is a nuisance and poisons the neighbourhood. It should be placed over Robert's drain between the two pavilions forming the barrack, according to the intention of the late Captain Roberts, R. E., who planned and made this drain. The privy of the Royal Artillery Barrack, Barbados, is near the road, and is seen from it, and is not over a covered sewer, although not 100 yards from Robert's drain; and the privy of the Stone Barracks is 179 yards from the barrack, and is not over a covered sewer. In the other stations in this command the sewerage is not better than in Barbados, except in British Guiana, where the trenches are used as sewers. The cleaning of the garrison privies in Barbados costs L.200 Sterling a-year, and is imperfectly performed. This expense might be saved or diminished. Privies that cannot be cleaned by a rush of water might have the seats over pavements or vaults approachable by carts, and might be cleaned every morning, and then lime might be put on the pavements, and the compost, in place of costing money for removal or disposal, might be sold to the planters, and bring revenue to government.

Seventh, Trees and Walks.

Trees are useful and ornamental round parades and in hospital enclosures. In 1820, Lieutenant Eyre, now Major Eyre, R. A., on my recommendation, planted trees to windward of the Royal Artillery Barrack, Barbados, and on the east side of the road lead-

ing from the barrack to the brigade-major's quarters; and the late Lieutenant-Colonel Piper, then commanding 4th regiment, following the good example, planted trees to leeward of the Brick Barrack; but Lieutenant Eyre left Barbados, and Lieutenant-Colonel Piper died, and the planting of trees to form a shaded walk round the parade at St Ann's has not been completed, but might be completed with little labour and for little expense. Sixty of the trees planted in 1820 are now alive, and many of them are magnificent.

Eighth, Supply of Water.

Water is supplied to the hospital and barracks in this command from wells and from tanks of masonry or of iron. From some of the wells it is raised by windlasses and buckets when required; and from others by pumps worked by windmills, and is thrown into cisterns, from which it is taken by pumps, or by spouts when required. Water for drinking is passed through single or double drip-stones of Barbados stone. The windmills and pumps are not in immediate care of the engineers, but of soldiers, and are often out of repair. The iron tanks are small; each contains but 10,000 gallons, and being above ground are exposed to the sun, and they receive the water from the roofs of houses covered with shingles, which in dry weather are covered with dust, and therefore the bottoms of the tanks are soon covered with mud, and the water in the tanks is usually a hot brown infusion of mud, shingles, and iron. The water received from the roofs of houses should be filtered before it is used. The sketch No. 1,* furnished to me by Lieutenant-Colonel Moody, explains a method of filtering water by ascent. The sketch No. 2 explains a method of filtering the water by passing laterally, and by ascent through a drip-stone; and the sketch No. 3 explains a method of filtering the water by passing it laterally through a wall of Barbados stone. In each of these methods there is a receiving chamber, in which mud must collect, and an issuing chamber, in which mud cannot collect. The sketch No. 1 shows a plan for letting off the muddy water. The receiving chambers shown in the sketches No. 2 and 3 must be occasionally cleaned out. The tanks in the West Indies should be of masonry, and in dry stations should be arched chambers sunk in the ground like the Venetian tanks in the Ionian Islands; and in marshy

* These sketches are omitted, as not being important.

stations should be basins above ground, and covered with planks, or roofed with boards and shingles. The size of the tank should be in proportion to the number of persons and to the expected duration of the drought. In Guiana and in Antigua the drought sometimes continues three or four months; but in Barbados and in the other stations of this command seldom above two months. The allowance of water for each person in barracks should be two gallons daily, and for each person in hospital four gallons daily, and therefore a tank for 1000 persons in barracks should for two months contain 120,000 gallons, and for three months 180,000 gallons; and a tank for 100 persons in hospital should for two months contain 24,000 gallons, and for three months 36,000 gallons; and water should be provided for horses, dogs, and other animals belonging to the troops. A horse fed on dry forage in the West Indies requires 12 gallons of water daily. The tank for the barrack should be near the barrack, and the tank for the hospital should be in the hospital enclosure. In Barbados the hospitals and barracks are supplied with water from wells and from iron tanks. The water from the wells near the Stone Barrack and from the well in the hospital enclosure is brackish; the water from the other wells of the garrison is good. In Demerara Artesian wells were lately made for the troops by Major Staples; but when I was there in 1842 were out of repair, and did not supply any water; and reservoirs had not been provided for receiving the water from the wells. The water is chalybeate, and is a useful drink for convalescents from ague or from remittent fever; but for some domestic purposes requires to be freed from iron by exposure to the air, or by boiling, and can instantly be made fit for washing clothes by adding to it a small quantity of wood ashes. Each of these wells should have a receiving cistern and an issuing cistern. In the late naval hospital, Barbados, water was supplied for the douche, and for the dressing-rooms, water-closets, surgery, kitchen, bath-house, and wash-house, from a lead cistern placed between the upper stories of the second and third pavilions; and water for the other uses of the hospital, and for the baths and water-closets in the admiral's quarter and agent's quarter was supplied from a circular cistern of masonry sunk in the ground east of the pavilions. Both of these cisterns were supplied with water raised by a windmill from a well under the windmill; and

water for the patients to drink was cooled and purified by passing through drip-stones placed in the windward galleries.

Ninth, Encampment.

When yellow fever prevails among the troops in a barrack, or in a locality, the troops should be forthwith removed to a healthy locality, and in all the stations in this command, except in Guiana, should be encamped. The floors of the tents should be boarded, or the tents should be supplied with iron bedsteads and with bedding, and the officers should be encamped with the men. These measures, according to my experience in St Andero in 1813, and in the West Indies on many occasions from 1817 to this date, will certainly in 14 days stop the progress of yellow fever among troops if they are well commanded, and if the medical officers are active, and use rational prophylactic and curative means, and possess the full confidence of the officers and men. The bell tent used in this command is double, but is thin and worn, and can only lodge properly three persons; and therefore his Excellency Lieutenant-General Middlemore has applied that the kind of tent used by the troops in the East Indies may be supplied to the troops in the West Indies.

Tenth, Causes of Disease.

There are times in which the atmosphere is unhealthy in certain localities in the West Indies, but the sickness of the troops is principally caused by non-attention to the nine principles I have noticed. When sickness prevails at an out-station, the commanding officer and senior medical officer frequently become sick, and then the troops become alarmed, and the discipline of the barracks and of the hospitals becomes relaxed, and hence the propriety of selecting for an out-station a commanding officer and a senior medical officer seasoned to the climate, and active and of good abilities.

Letter to the Military Secretary, Barbados.

*Barbados,
29th March 1844.*

SIR,—In conformity to the instructions of His Excellency Lieutenant-General Middlemore, C. B., communicated to me in your letter, dated 12th August last, I have very frequently com-

municated with Lieutenant-Colonel Moody, commanding Royal Engineer, relative to the hospitals and barracks in Grenada and in Barbados, and at his request I wrote, and on the 22d September last gave to him a statement of principles to be observed in providing hospitals and barracks for troops in the West Indies; and I herewith have the honour to send to you, for favourable consideration of his Excellency, a corrected and enlarged copy of this statement, which I hope his Excellency will approve and recommend to be adopted by the Royal Engineer Department, and by the Board of Ordnance, when they are preparing estimates for building barracks and hospitals for the troops in this command.

I have the honour to be,
SIR,

Your most obedient humble Servant,
H. BONE, M. D.
Inspector-General.

N. B. A corrected and enlarged copy of this statement was sent to Lieutenant-Colonel Moody on the 10th April 1844.

H. B.

*Letter to Sir James M'Grigor, Bart., Director-General.
Barbados, 23d April 1844.*

SIR,—I have the honour to forward to you a statement of principles that, in my opinion, should be observed in providing hospitals and barracks for the troops in this command. This statement has been carefully prepared, and if it receives your approval I hope you will obtain that it may be made a vade mecum to be consulted by the Royal Engineer Department, Barbados, and by the Inspector-General of Fortifications when they are preparing estimates for the building of hospitals and of barracks for the troops in this command.

I have the honour to be,
SIR,

Your most obedient humble Servant,
H. BONE, M. D.
Inspector-General.

*Extract from Dr Bone's Quarterly Report, dated Demerara,
30th September 1831.*

*New Amsterdam Barracks, Berbice,
2d April 1831.*

Proceedings of a Board of mixed officers, held by order of His Excellency Major-General Sir Benjamin D'Urban, K.C.B., &c., &c., &c., to minutely examine and fully report upon the necessity of certain improvements for the hospital and barracks, New Amsterdam, Berbice, proposed by Dr Bone in a report to His Excellency Major-General Sir Benjamin D'Urban, on the 18th of October last, and recommended by Dr Baxter, Inspector-General of Hospitals, in his letter to Major Bridgeman on the 7th March last, to be immediately completed.

President,

Major H. SENIOR, 65th Regiment.

Members,

Captain J. NOKES, 65th Regt. Lieutenant WYNNE, R. E.
Lieutenant TIREMAN, R. A. Dr BONE, D.I.G. of Hospitals.

The Board having read the Report of Dr Bone, dated 18th of October last, and the letter of Major Bridgeman, dated 8th March last, enclosing the letter from Dr Baxter, Inspector-General of Hospitals, dated 7th March last, and having very minutely examined the hospital and the men's barracks, find that both buildings are liable to the objections stated in Dr Bone's report, and therefore recommend,

For the Hospital.

1st. That the N. E. side and both ends of the upper and lower gallery be boarded up and made close galleries, with glass windows; and that the S. W. side of both galleries have moveable jalousies, and that a jalousied window to the floor be made all round between each column in the boarded part of both galleries.

2d. That the inner side and gable walls be pulled down and made parapet walls, 5 feet* in height, and having a jalousied window, 18 inches wide, between each bed.

* Barbados, 3d September 1843.—Three and a-half feet is better.—H. B.

3d. That the N. E. gable room of the garret of the hospital be divided, and one of the divisions be fitted up and appropriated for purveyor's and apothecary's stores, in charge of the P. M. O., and the other be fitted up and appropriated for clean hospital and barrack stores in use by the regimental hospital in this barracks.

4th. That the S. E. gable room of the garret of the hospital, where the hospital sergeant is at present quartered, be appropriated as a sleeping room for the hospital orderlies, and that a quarter be built for the hospital sergeant, and adjoining it a pack store and a provision store.

5th. That, to increase the accommodation of the hospital for patients, eleven of whom sleep in barracks, the windward room of the first floor of the hospital, now used as a surgery, be made a ward for patients, according to the original intention, and that a surgery adjoining the hospital be built.

6th. That the ground under the hospital be raised and flagged.

7th. That a conducting pipe from the tank to the bath be made.

For the Men's Barracks.

1st. That the upper and lower galleries be boarded up as high as the present railing, the remaining part to be close jalousied all round, with a jalousied window to the floor between each column.

2d. That the four partition walls in the barrack be pulled down, and a railing six feet high substituted.

3d. That the inner side walls of both floors be pulled down to the sills of the windows, and that the lower board be removed* to allow the air to circulate along the floor.

4th. That the floor under the barrack be raised and flagged. All these improvements for the hospital and barracks the board most earnestly recommend to be commenced immediately, and completed before the commencement of the sickly season.

5th. The board having minutely examined a small room in which the Royal Artillery and Sappers and Miners are quartered, find that it was originally intended as a quarter for black

* Barbados, 3d September 1843.—Or hinged to turn up, which is better.—H. B.

pioneers, and is a totally unfit quarter for European troops; and therefore recommend that a quarter be built for the Royal Artillery and Royal Sappers and Miners, and that the room in which they are now quartered be furnished with glass windows, or moveable jalousied windows, and then appropriated, as Major Senior wishes, for a school-room and sergeants' mess-room.

6th. The board having minutely examined the parade ground, find that it is a marsh, and recommend that it be raised in the middle, and made to slope to the side trenches.

(Signed) HENRY SENIOR, Major, 65th Regt., President.
JAS. NOKES, Captain, 65th Regiment.
GEORGE WYNNE, Lieutenant, R. E.
N. S. TIREMAN, R. A.
H. BONE, M. D., D. I. G. of Hospitals.

Letter to the Inspector-General of Hospitals, West Indies.
Head Quarters, Barbados,
4th November 1841.

SIR,—With reference to your letters of 3d July, 22d September, and 2d November 1841, I am directed to acquaint you that the hospital accommodation at St Vincent, although rated by the ordnance as being for fifty patients, has been found on admeasurement, as stated by Staff-Surgeon Hall, to be sufficient for thirty only, allotting to each bed five feet of wall, as directed by the hospital regulations, dated War Office, 31st August 1838, and that the Lieutenant-General commanding the Forces will take an early opportunity of bringing the same to the notice of the home authorities.

I have the honour to be,

SIR,

Your obedient humble Servant,

C. R. EGERTON,
Captain, Military Secretary.

Proceedings of a Board of Officers, directed to assemble by order of Lieutenant-General Maister, dated Barbados, 1st March 1842, to investigate and report upon matters that will be communicated to the President by letter from the Military Secretary.

*St Ann's, Barbados,
3d and 4th March 1842.*

President.

Colonel MACDONALD, C. B., 92d Regiment.

Members.

Lieutenant-Colonel BLOIS, 52d Regiment.

Lieutenant-Colonel CLARKE, K. H., 46th Regiment.

Captain CALDWELL, 92d Regiment.

Dr BONE, Inspector-General of Hospitals.

Staff-Surgeon Dr BIRRELL, P. M. O.

Surgeon PALMER, 92d Regiment.

The Board, in reference to the instructions directing it to consider what space should be allotted to each man in the barracks and hospitals in the West Indies command, having due regard to the preservation of the health of the troops, also to inspect and make an especial report upon the accommodation of the Stone Barracks at St Ann's, the Board ordered that the bedsteads in that barracks should be placed at six inches from the wall, leaving one foot apart between each bedstead, and keeping the doorways free from obstruction; and that the building in this state be ready for the inspection of the Board at 10 o'clock A. M. to-morrow, till which hour the Board adjourns.

St Ann's, 4th March 1842.

The Board having met pursuant to adjournment, proceeded to examine the Stone Barracks, and having placed the bedsteads one foot apart, as directed in its minutes of yesterday, it finds that the south-east side of the ground-floor will only contain 66 bedsteads, from the circumstance of there being two doors less on this side than on the opposite, making a total on the ground-floor of 134 bedsteads. On the upper story it finds that, by the same process, each side will contain 71 bedsteads, making the upper story to contain 142 bedsteads. Thus this barrack will

contain a grand total of 276 bedsteads; and the Board is of opinion no greater number should be placed therein. The Board also considers that bedsteads being placed at the end of the room is very objectionable, as also bedsteads being placed along the centre of the rooms, it being the opinion of the board that this space should be appropriated for the accommodation of the men at their meals and other occupations; more particularly during rainy and tempestuous weather. Moreover, it would too much vitiate the air and impede its free circulation.

The board then proceeded to examine the new or Iron Barracks lately erected. This building is reported as being calculated to contain 200 men. However, on the lower flat, it appears that there are only 94 fittings, including eight over as many doors; consequently, deducting that number from 94, leaves 86 upon each flat; making the greatest number this barrack is capable to contain, 172. The board is of opinion that the best arrangement for this barrack would be to place only two bedsteads between the windows; and then the fittings immediately above them would not obstruct the free circulation of air, which it necessarily does by the present mode. By adopting this plan, it would afford the means of the fittings being lowered within the reach of the soldier, which at present is not the case. The beds thus arranged would accommodate in all 136 men. The board has also remarked that there are no places in this barrack for the security of arms, consequently they are liable to injury. The board further takes this opportunity of remarking, that there is little or no accommodation afforded to the staff-sergeants of regiments in this barrack, and it considers that places should be allotted in each barrack for colour or pay-sergeants, who are placed in very responsible positions, to enable them to carry on the discipline of their companies, and to write and make out their reports without observation.

The board, in entering into the consideration of the quantity of space which should be allotted to each man in the barracks in this command, considers, firstly, that it should be regulated by the distance from bed to bed along the wall; secondly, by the area of floor; and, thirdly, by cubic space. With respect to the first, the board considers that the bedsteads should never be ~~more~~ ^{less} than one foot apart from each other along the wall,—leaving the doorways, the ends, and centre of rooms perfectly free from bed-

steads. With regard to the second, that, when bedsteads are placed as directed above, the room should not be less than 24 feet in breadth within the walls; and, with regard to the third, no barrack-room should be less than 12 feet high. The board has come to this opinion, with the understanding that there should be a gallery or verandah of not less than ten feet wide all round, and jalousied, particularly on the weather side. The board concludes this branch, by giving its opinion, that in all barracks not constructed as above, the area of floor per man should never be less than 50 feet, and the cubic space never less than 600 feet. The board begs leave to call attention to a few of the many wants of accommodation for officers' servants, married soldiers and their families, mess and officers' kitchens, and the distance that the privies are from the quarters of the officers and men. The board now comes to the consideration of the space to be allotted to patients in the hospitals in this command; and, being guided by the same principles upon which it founded its opinion as regards barrack accommodation, it recommends that in no case should there ever be less than *two* feet between the bedsteads, giving five feet of wall for each patient; and that, for all severe cases of disease, *double* that distance should be allowed, and that every patient should have at least 80 square feet of floor, and never less than 1000 cubic feet of space.

Signed by the President and Members of the Board.

Copy of a Letter to the Inspector-General of Fortifications.

*Office of Ordnance,
10th March 1845. M. G. 61.*

SIR,—The Master-General and Board of Ordnance having been in correspondence with the Colonial Secretary of State, and his Grace the Commander-in-Chief, on the suggestion contained in your report, dated 9th October last, (upon a letter from the Commanding Royal Engineer in the West Indies,) that the cubical space within a barrack room and hospital ward should in future constructions be fixed at from

450 to 480 feet per man in barracks, in temperate climates,	
480 to 540 do. do. in the tropics,	
600 to 700 do. in hospital wards, in temperate climates,	
700 to 900 do. do. in the tropics,	

I have it in command to acquaint you therewith, and to enclose copies of the decisions come to on this question by the Colonial

Secretary of State, and the Commander-in-Chief, in order that you may be fully acquainted hereon, and that you may circulate the same, in such manner as you may deem advisable, for the future guidance of the corps of Royal Engineers.

You will perceive from the Military Secretary's letter that it is desirable the maximum space proposed by you should be generally allowed, and that the highest succeeding integer should be taken as a guide.

INTEGRAL MAXIMUM.

500 feet per man in barracks, in temperate climates.	
700 do. hospitals, do.	
600 do. barracks, in tropical climates.	
900 do. hospitals, do.	

With reference to the concluding paragraph of Mr Stephen's letter, I am to state that the space now laid down is to be considered the general rule; but that where circumstances may seem to require a deviation from that rule, as suggested by the Secretary of State, a special report of those circumstances is to be made by the Commanding Royal Engineer on the spot.

I am at the same time to request you will call upon the Commanding Royal Engineer in the West Indies, to consider and report fully on the practicability of giving effect to the present decision, as the space in barracks and hospitals in *that* command, by reducing the accommodation to the distribution of the troops specified in a return received from Lieutenant-General Maister in 1843, (a copy of which is enclosed,) conferring thereon with the present Commander of the Forces; and further that similar reports be obtained from the other stations abroad.—I have, &c.
(Signed) R. BYHAM.

Copy of Inspector-General's Minute referred to.

The Inspector-General encloses a report, No. 276, dated 2d September, from the Commanding Engineer in the West Indies, upon the question to which the above minute refers; and likewise No. 57, to which the Commanding Engineer's present letter adverts, Nos. 52 and 54, which are also mentioned by him, were sent to the Board with the Inspector-General's minute of 10th August 1843.

The cubical space per man within a barrack-room must of course in some degree vary with the climate and locality in which

the barrack is situated, and Lieutenant-Colonel Moody's letters amply confirm this; but to carry out the Board's view of arriving at some definite capacity for ordinary construction, it will not be possible to enter minutely into localities; and as regards climate, it is to be observed that when barracks are, as they should be in warm climates especially, built with verandahs or external galleries, capable of being closed by jalousies, as suggested in the Inspector-General's letter of the 5th August 1842, the aerial capacity of the room is so dilated or merged into that of the surrounding gallery and roof, as to meet in a great degree, if not entirely, the extra cubical space which the barrack-room would otherwise require.

The Inspector-General therefore suggests that the modification of construction for West India Barracks, submitted in the letter of 5th August 1842, above alluded to, be approved for hot climates, and that wire gauze be introduced in hospitals or windward windows exposed to cold mountainous air or malaria of any kind; and if this should be approved, he thinks that the cubical space within a barrack-room or hospital ward in future constructions may be without detriment fixed at from

Feet.	Feet.		
450 to 480	per man in barracks,	in temperate climates.	
480 to 540	do.	do.	in the tropics.
600 to 700	do.	in hospital wards in temperate climates.	
700 to 900	do.	do.	in the tropics.

The Inspector-General has given the correspondence which has occurred, and the subject generally, much consideration, with a view of arriving at some practical and reasonable result, and as such he offers the above suggestions, which, if the Master-General and Board approve, might be submitted to the Commander-in-Chief for His Grace's concurrence or observation.

For the I. G. F.
9th October 1844.

Copy of a Letter to R. Byham, Esq. &c. &c.

*Horse Guards,
December 6, 1844.*

SIR,—I have the honour to acknowledge the receipt of your letter of the 28th October, with the enclosures herewith returned. In reply to my two letters of the 15th April 1842, relative to the number of cubic feet to be allowed to men in barracks and

hospitals throughout the West India Command, and having duly laid the same before the Commander-in-Chief, I have now to offer the following observations upon the whole of this important subject, for the consideration of the Master-General and Board of Ordnance. It appears that, in consequence of a representation from the Lieutenant-General commanding at Barbados, transmitted to you in my letter to you of the 29th December 1841, relative to the capacity of the hospital at St Vincent, allowing 1054* cubic feet for each patient, the Board of Ordnance stated in reply, that the proportionate space to be allotted to troops in the West Indies, both in barracks and hospitals, is a question that should be determined by the Commander-in-Chief, who will probably consult medical opinions as well as commanding-officers of corps, and that when this shall have been done, and communicated to the Board, the Commanding Royal Engineer will be instructed in all future constructions that may be ordered, to plan and estimate accordingly. In pursuance to this suggestion of the Board of Ordnance, a board of officers was assembled at Barbados, for the consideration of this important subject, the result of which was transmitted for the information of the Master-General and Board in my letter of the 15th April 1842.

This Board was composed of one Colonel, president; two Lieutenant-Colonels, one Captain, one Inspector-General of Hospitals, one Staff-Surgeon, P. M. O., one Regimental Surgeon, —and one more competent to form a sound opinion could not have been assembled; and they recommended that the cubic space allotted for each man in a barrack should never be less than 600 feet, and of space to be allotted to patients in hospitals, in no case should there ever be less than two feet between the bedsteads, giving five feet of wall to each patient, and for all severe cases of disease double that distance; and that every patient should have at least 80 square feet of floor, and never

* The hospital in St Vincent's is 78 feet in length, 21 in breadth, 12 in height, and therefore contains 19656 cubic feet, which, divided by 50, the number of patients it was to accommodate by the ordnance regulations, gives only 393 cubic feet for each patient. The plan for placing 50 patients in that hospital was to place two bedsteads touching each other, and to allow only 6 inches between each pair of bedsteads.—(Dr Bone's Annual Report, dated Barbados, 31st March 1842.)

less than 1000 cubic feet of space. It appears from your letter of the 21st October last, now under consideration, that during the time that has elapsed since the date (15th April 1842) of my last letter, as above alluded to, and to which yours is a reply, that the Master-General and Board of Ordnance have been engaged in correspondence and discussion with various authorities on this matter, and having given much consideration to everything that has occurred in the course of these communications, and with a view of arriving at some practical and reasonable result, they recommend the following arrangements, as under all the circumstances the best and most practical, varying, as all barrack and hospital accommodation must, in some degree do, with the climate and locality in which the buildings are situated.

Barracks.—450 feet to 480 feet per man in barracks in temperate climates. 480 feet to 540 feet per man in the tropics.

Hospitals.—600 to 700 feet per man in hospital wards in temperate climates. 700 or 900 feet per man in the tropics.

As this result appears to be an approximation to the space recommended by the Board above alluded to, it will be desirable that the maximum of these figures be generally adhered to, and taking the highest succeeding integer for the guide, thus,

INTEGRAL MAXIMUM.

500 feet per man in barracks, in temperate climates.			
700	do.	hospitals,	do.
600	do.	barracks, in tropical climates.	
900	do.	hospitals,	do.

In respect to very bad febrile cases, it is considered to be always in the power of the ruling local authority to make such extended arrangements for the comfort of the patients as the circumstances of each case, under the recommendation of the principal medical officer, may appear to require.—I have, &c.

(Signed) FITZROY SOMERSET.

Copy of a Letter to R. Byham, Esq., &c. &c.

*Downing Street,
17th February 1845.*

SIR,—Having laid before Lord Stanley your letter of the 18th December last, with the enclosures herewith returned, I am directed to request that you will state to the Master-General and Board of Ordnance, that his Lordship is of opinion that the recommendations of the Commander-in-Chief, as stated in the letter addressed to you by His Grace's Military Secretary, under date of the 6th December, in regard to the amount of cubical space to be allowed to the soldier within his barrack room and hospital ward should generally be adopted; although, considering the great variety which must exist in the different localities in which barracks will be required to be placed, his Lordship does not mean to prescribe the space mentioned by his Grace as that to be invariably, and under all circumstances, the rule to be followed in their construction.

I have, &c.

(Signed) JAS. STEPHEN.

Note on Prisons, p. 59.

A board of officers, Lieutenant-Colonel Moody, R. E., president; Dr Bone, Inspector-General, and Lieutenant-Colonel Archer, D. Q. M. G., members, was held by G. O. in St Ann's, Barbados, on the 17th, and on several following days in June 1845, to examine and report on the state of the military prisons in Barbados, and recommended many improvements relative to military prisons, and to the dieting of military prisoners.

I N D E X.

I.

MEANING OF THE NAME YELLOW FEVER.

Explanation of the terms fever and yellow, p. 1.

II.

DEFINITION OF THE DISEASE.

Characteristic symptoms, p. 2.—Difficulty of defining the disease, p. 2.

III.

HISTORY OF THE SYMPTOMS.

Symptoms described, p. 3—Eight varieties of fluids vomited p. 3—Black vomit, p. 3—Quantity of fluids vomited, p. 4—Assistant-surgeon Donelly, p. 4—Primary and secondary vomiting, p. 4—All who have this disease do not vomit, p. 4—Examples, p. 4—Endemic yellow fever of marshy countries, p. 4—Appearance of the eyes, tongue, face, urine, p. 4, 5—Yellowness, p. 5—All who have this disease are not yellow—p. 5—Examples, p. 5—Nomenclature of colours, p. 6—Proportion of those who become yellow, p. 6.

IV.

DIAGNOSIS.

Diagnosis uncertain, p. 7—Yellow fever in Guiana in 1831, p. 7—Symptoms of a severe disease, p. 7—Nomenclature of West India febrile diseases, p. 7.

V.

EFFECTS OR EVENTS ON THE CONSTITUTION.

Effects of severe bleeding and of calomel and quinine, p. 9—Definition of the term cachexia tumida, p. 9—Mal d'estomac, convalescence, p. 10.

VI.

REMOTE CAUSES OF THE DISEASE.

1. Predisposing causes, p. 11—Persons least predisposed, p. 11.

2. Occasional causes, p. 11—Heat and moisture, p. 11—Dr Gregory, p. 12—Weather favourable to the disease, p. 12—Places where the causes principally prevail, p. 12—Crowding in barracks and hospitals, p. 12—Suffocator windows, p. 12—Space required by a soldier in his barrack-room, p. 12—Yellow fever in Trinidad in 1818, p. 12—Proofs that crowding causes yellow fever, p. 13—Exposure of the body to a draught of air the most frequent exciting cause of the disease, p. 14—Examples from Dr Bone's Tobago Reports, p. 15—North and east winds, p. 15—Sergeant Murphy, p. 16.
3. Contagion.—Statements of the contagionists, p. 16—Celsus and Hippocrates, p. 17—Yellow fever in the Ionian Islands, p. 17—Plague of Athens, p. 17—Dilution alone does not stop the spread of yellow fever, but removal from foul air stops the progress of the disease: Examples, p. 18—Steamers in West Indies, p. 19—Account of yellow fever in St Andero in 1813, p. 19—Attendants of yellow fever patients, p. 21—Naval Hospital, Barbados, p. 21—Quarantine regulations, p. 21—Yellow fever in Tobago in 1819, p. 22—Causes of the sickness and mortality, p. 22—Examples of yellow fever recurring in the same person, p. 23—Dr Gregory's lectures, p. 23—South Carolina fever, p. 24—Terror and long faces of the contagionists, p. 24—Quarantine regulations in Trieste, p. 24—Receipt for generating yellow fever, p. 25—Dr Chevrin, p. 25.

VII.

MORBID APPEARANCES.

External appearances, p. 26—Internal appearances, p. 26—Head, thorax, abdomen, p. 26.

VIII.

PROGNOSTIC SYMPTOMS.

Unfavourable symptoms, p. 28—Crisis, p. 28—Favourable symptoms, p. 29.

IX.

PROXIMATE CAUSES.

The disease general, p. 30—Proximate causes to be looked for in the sentient principle, fluids, solids, and primæ viæ, p. 30—Changes produced in the blood, p. 31—Division of the diseases of internal organs in tropical climates, p. 31.

X.

RATIO SYMPTOMATUM.

Explanation of the symptoms, p. 33—Tendency to coma, p. 33—Extracts from Dr Bone's Guiana Report, p. 34—Sir Henry Halford, p. 34.

XI.

METHOD OF CURE.

Indications of cure, p. 35—Duties of the nurse, p. 35—Saline medicines, p. 36—Dr Billing, p. 36—Antiseptic aperients, p. 36—Fluid medicines, p. 36—Dr Bone's Seidlitz practice began in 1817 in the West Indies, p. 36—Table showing the period when Seidlitz powders began to be used in the Hospitals in St Ann's Garrison, Barbados, p. 37—Quantity of saline medicines and of diluents necessary first twenty-four hours, p. 37—Diaphoretics, purgative injections, p. 40—A free flow of pure fluids in the canals of the living body keeps it in good health, p. 42—Dilutents and ptisans, p. 41—Dr A. T. Thomson, p. 42—Urinary secretion, p. 43—Vis vitæ to be supported, p. 43—Danger from stimulation, p. 43—Treatment of uneasy symptoms, p. 43—Safety and efficacy of the plan of curing the disease by evacuant remedies supported by many enlightened physicians,—Dr Gregory, Sir J. Pringle, M. Deportes, Dr Billing, p. 44—Advantages of curing the disease by mild saline medicines, p. 45—Other medical powers, emetics, p. 46—Bleeding, p. 46—Stagnation of blood in the capillaries, and illustration by a diagram, p. 46—Croton oil, p. 47—Blisters, p. 47—Dr Gregory, p. 47—Cold affusion, p. 47—Mercury, p. 48—Salivation predisposes to yellow fever, p. 48—Calomel a medicine uncertain in its action, p. 49—Faintness caused by large doses of calomel, p. 49—Effects of the mercurial practice, p. 47—Quinine, p. 47—Practice in Guiana, and effects of large doses of quinine, p. 50—Water cure, p. 50—Stimulants, p. 50.

XII.

PROPHYLACTICS.

Necessity for the use of aperients to prevent stagnation in the primæ viæ, p. 51—Plan to arrest the progress of an epidemic, p. 51—Means for preserving the health of the troops in the West Indies, p. 52.