Report on the site, etc., of the Royal Victoria Hospital, near Netley Abbey

REPORT ON THE SITE, &c.,

OF THE

ROYAL VICTORIA HOSPITAL,

NEAR NETLEY ABBEY.

Presented to the House of Commons by Command of Her Majesty,

1858.

LONDON:

HARRISON AND SONS.

1858.

War Office, Whitehall Gardens,
July 1, 1858.

Sir,

With reference to your communication of the 10th of April last, and in furtherance of the Instructions which accompanied it, I have the honour to acquaint you that the Committee* on Netley Hospital, have concluded their investigation, and I beg herewith to transmit our Report for submission to the Secretary of State for War.

This Report would have been rendered at an earlier period, had not the Committee considered it most important that, with their proceedings, the Secretary of State for War should receive the several valuable communications from the scientific and medical gentlemen who have been consulted in this matter, the last of whose reports reached us only on the 25th ultimo.

I have the honour to be,

Sir,

Your most obedient humble servant,

TERENCE O'BRIEN, *Colonel*,
Assistant Quartermaster-General,
President.

To the Under Secretary of State for War.

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* Colonel O'Brien—President.
Captain Laffan,
Dr. Sutherland,
Dr. Mapleton, 18th Hussars,
} Members.
On *June* 20,
Colonel Owen, C.B., replaced Captain Laffan (sick).

Instructions to the Committee on Netley Hospital upon being ordered by the Secretary of State for War to re-assemble and report upon further Papers in connection with that Hospital.

You will inquire into, and report generally, upon the objections to the site, &c., of the Royal Victoria Hospital at Netley, raised in the report dated 12th March last, of the Committee appointed in October 1857.

In the course of your investigation you will direct particular attention to the following, amongst other points which may appear to you to bear upon the question:—

The authority for, and the evidence on which, rested the choice of site.

The nature of the soil upon which the Hospital stands.

The climate in the vicinity of the Hospital, as affected by the following considerations:—

The admixture of fresh and sea water in the tidal estuary, upon the banks of which the Hospital is situated.

The sewage stated to flow from the town of Southampton into the estuary

The extent of mud banks, which are exposed to air and sun twice in twenty-four hours, as being likely, as alleged by the Committee, to influence the purity of the air over the entire district.

You will report upon the facility of access to the Hospital by water, as well as upon the alleged inconvenience occasioned by the necessity for landing the patients from vessels in boats, in consequence of the shallowness of the water.

You will also report upon the construction of the building, and the various objections raised to it in the Committee's Report, its ventilation, the arrangements by which 500 patients are to be placed under one roof, the means of continuous circulation round the building, so as to shorten as much as possible the distance to be traversed for executive purposes, and also its alleged incapability, or otherwise, of extension.

You will express an opinion upon the improvements recommended by the Committee's Report, and propose any further improvements which may suggest themselves.

You will compare the site, as regards the requirements for a Hospital to accommodate "convalescents and sick," pointed out in the Report, with that of the large existing Hospitals of the country, with Haslar Hospital at Gosport, with Greenwich and Chelsea Hospitals, also with St. Bartholomew's, Guy's, and the Naval Hospital at Chatham, and report whether these Hospitals are not subject to effluvia from tidal rivers, from sewage, or from the soil on which they are built.

In the event of the Hospital at Netley being converted into a barrack, you will point out what preferable site, if any could, in your opinion, be obtained for a Hospital.

You will take into consideration the time that would probably elapse before such a site could be obtained, whether great delay might not occur in reporting upon the most appropriate construction of such a Hospital in the completion of the plans, in the preparation of the specifications, &c., and in calling for tenders.

In arriving at conclusions upon the above points, you will bear in mind that the large sum of money which has already been expended upon Netley Hospital, and you will carefully examine the statement at page 13 of the Report, respecting the comparative cost of attendance.

(Signed) J. PEEL.

War Office, April 1858.

Report on the Site, &c., of the Royal Victoria Hospital, near Netley Abbey.

War Office, Whitehall Gardens,
June 1858.

Before entering on the immediate subject of the present Report, the Committee, in conformity with their instructions, proceed to detail briefly the origin of the establishment at Netley, and the steps taken by the Committee up to the present time.

With a view to the removal of the great inconvenience to the Service, arising from the defects of the General Hospital at Fort Pitt, as well as from the total inadequacy of the accommodation provided in the casemates at St. Mary's, Chatham, for the reception of the invalids of the Army, the Secretary of State for War deemed it desirable, in 1855, that a great Military Hospital should be substituted for these establishments; and Lord Panmure considered that it would be for the advantage of the public service if this Hospital could be placed within a moderate distance of either of the great ports of Portsmouth or of Plymouth. Appendix. p. 39.

The Director-General of the Army Medical Department, in a communication addressed to the Secretary of State for War, stated, that he was desirous that the Hospital referred to should be "on the coast, or on some large inlet of the sea, so that invalids from abroad could be landed immediately, and marched into their Barracks, and the sick, without injury, be placed in Hospital." The steps taken to further this object are fully detailed in Captain Laffan's letter to Lord Panmure, of the 11th July, 1857, page 41 of the Appendix to this Report. Ibid.

From this letter it will be seen that, on the 28th February, 1857, the Medical Officers of the Middlesex Hospital raised certain objections to the construction of the Hospital, which are in the main identical with those which we have now to consider. On consulting the Medical Officers of six great London Hospitals,* this Committee found that their evidence was generally in favour of the system of construction adopted, and the Committee accordingly reported unanimously that, notwithstanding the objections made by the Medical Officers of the Middlesex Hospital, the Building would be, with a few modifications, well adapted to its purpose. This report was dated the 25th of May, 1857, and was signed by Colonel O'Brien, Captain Laffan, Dr. Mapleton, and by Dr. Sutherland, who was added to the original Committee for the purpose of considering the objections raised to the plans.

We learn from the Report of the Barrack and Hospital Improvement Committee, that on the 28th December, 1857, they were requested by Lord Panmure to report upon the Royal Victoria Hospital, and their Report, dated 12th March, 1858, was transmitted to us on the 10th of April last, with a letter of instructions directing us to inquire and report upon certain objections raised against the site and the plans of the Hospital by that Committee. This Report was signed by Mr. Sidney Herbert, Dr. Sutherland, Dr. Burrell, and Captain Galton, R.E. Appendix, p. 19. See p. 2.

* Dr. Burrows, F.R.S., Physician to St. Bartholomew's Hospital.
Dr. Rees, F.R.S., Physician to Guy's Hospital.
Dr. Guy, Dean of the Medical Department, King's College, and Physician to King's College Hospital.
Dr. Page, Physician to St. George's Hospital.
Dr. Barker, Physician to St. Thomas's Hospital.
Dr. Parkes, Physician to University College Hospital.
Dr. Neill Arnott, F.R.S.
Dr. Dumbreck, C.B., Deputy Inspector-General of Hospitals.

The objections raised to the site and to the plans of the Hospital were of so grave and serious a nature, that the Committee thought it would be more satisfactory to the Secretary of State for War, if the points at issue were referred to certain gentlemen of acknowledged eminence in the several branches of science involved in this inquiry.

A list of such gentlemen was accordingly submitted by the Committee to the Secretary of State, which, after undergoing certain alterations to meet the views of Major-General Peel, as well as those of Mr. Sidney Herbert, who, it is understood, was consulted on the subject, stood as follows:—

Dr. Babington, F.R.S., President of the Epidemiological Society, late Physician to Guy's Hospital,
Dr. Milroy, late Commissioner to the Army in the East,
Professor Phillips, A.M., L.L.D., Reader in Geology of the University of Oxford,
Professor Thomson, M.D., F.R.S., Lecturer on Chemistry at St. Thomas's Hospital,
John Simon, Esq., F.R.S.. General Board of Health,
William Ranger, Esq., C.E., General Board of Health,
Dr. Mouat, C.B., V.C., Deputy Inspector-General of Hospitals.
Robert Cooper, Esq., Surgeon, 4th Dragoon Guards.

The Secretary of State for War likewise approved of inquiries being made of the following local Medical Authorities at Southampton—

Dr. Bullar, Physician to County Hospital,
Dr. Orsborn, Bitterne.
F. Cooper, Esq., Officer of Health.

The Committee also referred for information upon various points to Colonel James, Superintendent of Ordnance Survey; Major Ravenhill, Resident Royal Engineer at Netley; Captain Heath, R.N., H.M.S. "Arrogant," lying off the site; the Registrar-General, for the Mortality Returns of the district; Mr. Glaisher, Royal Observatory, Greenwich, for the Meteorological Report of several places in this country; and to Sir J. Liddell, Director-General Naval Medical Department, for several queries relative to Haslar Hospital, &c. The Committee requested the Geologist, Professor Phillips, and the Chemist, Professor Thomson, to proceed to the spot, the former to examine and report upon the geological formation of the ground; and the latter to analyse the sea water, the mud, the gases, if any, that escaped from the mud, and the amount of sewage in the water opposite the site of the Hospital, &c.

On receiving the Reports of the Professors of Geology and Chemistry, the Committee placed them before the other gentlemen engaged in the inquiry. They furnished them, also, with the returns of the Registrar-General; the Meteorological Tables of Southampton, by Colonel James; those of many other places in England, by Mr. Glaisher; together with all other documents bearing on the question of the site and plans of the Hospital, and these gentlemen were informed that a room was set apart in the War Office, Whitehall Gardens, where they could meet when they wished, and interchange their ideas before framing their several reports.

The plans of the building, and the proposed arrangements for ventilation, were laid before those gentlemen, and fully explained, from time to time, by Captain Laffan, Dr. Mapleton, and Mr. Mennie, the Surveyor to the War Department.

Appendix, pp. 55–185.

No conditions were imposed upon these gentlemen as to the manner in which they were to draw up their reports. The Committee desired to have from each his unbiassed opinions on the site and on the plans, and they did not wish to prevent those medical and scientific gentlemen from making a joint report, should they feel disposed so to do. The reports of the Geologist, Chemist, and Engineer are valuable for the *facts*, those of the Medical gentlemen for the *opinions* they contain, and had a *joint* report been exclusively called for, the Committee would not have had the full advantage of the individual views of those gentlemen who have made *one* particular subject their special study, and on whose report the medical opinions, as to the fitness or unfitness of the site, or of the plans, must, in a great measure, have been based.

We now proceed in the order of our Instructions to report upon :—

I.—*The Authority for, and the Evidence on which, rested the choice of Site.*

After several localities had been inspected and reported upon, Sir James Clark, who, as one of the best authorities on climate in England, had been consulted, suggested—"The eastern shore of Southampton Water, a little below Netley Abbey, as the ground there seemed to be gravelly, and sloped upwards from the water," and he was of opinion that a good spot could be selected, "sheltered from the north and east winds." In this opinion, as to the advantages of the position of Netley, Sir James was supported by the Report on the geological formation of the site by Professor Ramsay, Director of the Geological Survey of Great Britain. The "district close to Netley Abbey," was also recommended by Dr. A. Smith, the Director-General of the Medical Department, in a letter of the 5th June, 1856, to Lord Panmure. Appendix, p. 40.

Captain Laffan and Dr. Mapleton were then directed to inspect and report upon the site recommended by such high authority, and found that the characteristics of the locality fully justified these recommendations. They found a "space of ground presenting a gravelly bank or cliff, from ten to twenty-five feet in height, to the water, and rising from thence upwards at a gradual slope till it joined a higher ridge behind it, the soil being of deep dry sand and gravel, resting in some places on brick earth. The facilities of drainage very great, drinking water of excellent quality, means of landing easily supplied;" and, "on the concurrent testimony of all the people living near the spot, declared to be eminently healthy." Ibid. Ibid.

II.—*The Nature of the Soil upon which the Hospital stands.*

Mr. Sidney Herbert's Committee object to the subsoil, as being "clay" as opposed to being "dry and self-draining." Appendix, p. 29.

This objection appears to be confined to the site of the Hospital itself; for although in the summary of their report (p. 14) they state the "subsoil" to be "clay," without any reserve as to its extent, at the third page they state that the *building* stands upon "clay." Appendix, p. 29. Appendix, p. 21.

Professor Phillips says:—"The foundations of the Hospital are partly laid in the gravel, and a well, which is near the centre, is begun in that deposit. But in the *rear* of the building the gravel was thin and partial, and pale sandy clay was met with at or near the surface, and which has been found useful in brickmaking." Appendix, p. 56.

Major Ravenhill shows, as the result of well-sinking, that there is no bed of what geologists call clay at less than fifty-five feet from the surface, and that is but one foot in thickness. Appendix, p. 82.

About the soil of the *district* there can be no question whatever. Professor Phillips says "a layer of flint gravel spreads over a large tract of country round, and gives it for the most part a dry healthy character." Dr. Babington also says that "the locality selected for the Hospital is naturally well drained." Mr. Cooper, 4th Dragoon Guards, adds that "the geological formation of the country for miles round is such as to occasion the rapid disappearance of rain after it has fallen." Mr. Ranger, the Civil Engineer, says that "the strata is thoroughly washed and naturally drained to a great depth." Appendix, p. 56. Appendix, p. 124 Appendix, p. 155.

And the whole of the evidence upon this point is of the same character. Appendix, p. 67.

To return to the *clay*, or rather *brick earth*, which Mr. Sidney Herbert's Committee consider a grave objection to the site, it should be observed, that it is only under some of the *outbuildings* that the brick earth has been reached in laying the foundations of the Hospital; and Professor Phillips states, that "it is not at all like the strong clays in the vicinity of London; but is more arenaceous, and appears to be free from the bisulphuret of iron, which is so common in blue clays, and is subject to decomposition by atmospheric agencies. Considering how small is the total surface of clay here exposed to the atmosphere, how completely and easily it may be covered up by gravel laid over it, and how little retentive of moisture it is when compared with other clays, no injurious effects can possibly arise from it." Appendix, p. 56.

How different this brick earth is from the clay which is generally considered an objection to a site, may be gathered from Dr. Babington's experiments, recorded in his report, by which its porosity was established beyond question. Appendix, p. 123.

We therefore consider the objections to the subsoil quite groundless.

III.— *The Climate in the vicinity of the Hospital as affected* (1) *by the admixture of Fresh and Sea Water in the Tidal Estuary.*

Appendix, p. 21 — Mr. Sidney Herbert's Committee state that "it is well known the admixture of fresh water with sea water in tidal estuaries is a common source of malaria, especially in hot weather."

We admit that there is a mixture of salt and fresh water, though the salt water greatly preponderates, but we have not been able to ascertain on what grounds it is stated that such admixture is a "common source of malaria" in an open estuary in a temperate climate.

Appendix, p. 58. — As to the quantity of fresh water, Professor Thompson shows that the fresh water opposite Netley, at low tide, is in the proportion of 1 to 8, and at high tide 1 to 18.

As to the effects of this admixture, Mr. Simon, of the Board of Health,

Appendix, p. 73. — says:—"I am unacquainted with any grounds to justify such an assertion. It is, indeed, believed, and has for centuries been believed, that marshes to which sea water has access, are peculiarly fatal marshes. But I am not aware of any evidence tending to show that the commixture of fresh and salt water can in itself, apart from marsh land, generate malaria, or act in any manner injurious to health. Neither do I know any instance of malaria arising from a surface like that in question, twice daily covered by the tide."

Dr. Milroy, who fully explains the grounds of the hypothesis of the Committee, proved to be fallacious, says:—

Appendix, p. 129. — "I know of no evidence that makes it even presumable that the simple commixture of fresh and salt water in a *tidal* inlet of the sea like the estuary of Southampton, is injurious to health, and certainly none which shows that it is 'a common source of malaria,' as stated in the 'Confidential Report.'"

Appendix, p. 67. — Mr. Ranger states:—"In the discharge of my official duty I have examined sixteen towns on the sides of the large estuaries in England and Wales, in fourteen I was unable to trace the least injury to health from the mixture of the waters; in two instances, however, owing to *extensive marshes*, with *stagnant* salt and fresh water combined, fever and ague especially prevailed."

Appendix, p 58. — Professor Thompson also says:—"I am not aware of any facts that can be cited as evidence of any injurious reaction by the simple mixture of fresh and salt water."

Dr. Babington, and other referees give evidence to the same effect.

(2). "*By the sewage stated to flow from the town of Southampton into the Estuary.*"

Ibid — Professor Thompson states "that he has carefully tested the water at low states of the tide, and has not been able to detect even a trace of sewage in it."

Appendix, p. 66 — Mr. Ranger is of opinion that "no injurious effect can possibly arise from this source, however large the place may become."

(3). *By the extent of Mud Banks, which are exposed to air and sun twice in twenty-four hours, as being likely, as alleged by the Committee, to influence the purity of the air over the entire district.*

There is evidently a mistake in the statement of Mr. Sidney Herbert's Committee in the first page of their report, for if there were seven-eighths

Appendix, p. 19. — of a mile of mud exposed at low water on each side of an estuary only $1\frac{3}{4}$ miles wide, it is not possible that the channel would remain seven-eighths of a mile wide.

The fact is, that the width of the mud opposite the Hospital varies from

Ap
18. — 120 to 300 yards at low water, according as it may be neap or spring tides,

Appendix, p. 82. — and on the western side of the channel a further width of about 900 yards is left uncovered at low water. If, therefore, there be even so much as seven-eighths of a mile of mud exposed, it is only at low water spring tides, and the bulk of it is a full mile from the shore adjoining the Hospital.

We use the term *mud* in the same general sense in which it was probably used by the Committee, but as it is necessary to be precise when malarious influences are attributed to it, in an eminently healthy neighbourhood,

Appendix, p. 118. — we must observe with Dr. Babington that "this silt is by no means mere mud, although we call it so; it contains a large portion of sand, and even when kept moist in an open jar for a fortnight, gives out no offensive smell. To suppose that there is any similitude between this silt and the offensive mud of the Thames, would be altogether erroneous."

Mr. Sidney Herbert's Committee state, as the result of Mr. Witt's analysis, that "the mud contains sulphuretted hydrogen in combination, that similar changes are going on in the estuary to those to which the sea-coast malaria of tropical climates have been attributed, and that though the air disengaged from the mud, at the time the samples were collected, was apparently atmospheric air, it affords *no reasons* for supposing that noxious gases are *not generated* during the summer, as is known to be the case with the Thames." Appendix, p. 21.

We would wish to call attention in passing, to the very negative character of these allegations, and we would observe that while the sulphur remains "in combination," it is impossible that it can have any deleterious influence, and that Professor Thomson, who has made most careful and repeated experiments, during the course of the present unusually hot summer has failed to detect any sulphuretted hydrogen emanating from this mud.*

With regard to the peat, which is 9 feet below the surface, Professor Thomson states, as the result of absolute experiment, that "he does not apprehend that any noxious influence can be communicated to the atmosphere by the influence of the peat at such a depth, upon the salt water of the estuary." Appendix, p. 54.

We therefore consider that to attribute malaria to the admixture of salt and fresh water to the sewage of Southampton or to the mud banks, in the absence of any proof that malaria exists, is most unreasonable.

IV.—*Whether the clay, the mingled salt and fresh water, the sewage, the mud, the peat, and other objections which have been raised against this site do actually produce malaria, and whether the malaria supposed to exist exerts any injurious influence on the health of the inhabitants or on the recovery of the sick.*

Mr. Simon very justly observes:—"It seems to me that the real question which I have to answer cannot be decided according to the strength or the weakness of a chemical theory. The injurious effects of malaria are definite; so are those of sulphuretted hydrogen; so are those of an atmosphere tainted with animal putridity. The object, as it appears to me, is to determine whether, under the tidal changes of Southampton Water, any of those effects are produced on the resident population." And he also adds, "I may say, without qualification, that I can discover no trace of such effects." Appendix, p. 68. Appendix, p. 74.

Mr. Sidney Herbert's Committee admit that the inhabitants of the district make no complaint of the climate, and that no special class of diseases prevails among them; but in answer to the statement, that "this is by no means irreconcileable with the objection made to Netley, as the site of a Hospital, on the ground of salubrity;" and, that "a climate which is not deleterious to healthy people, pursuing healthy avocations, is not necessarily the best climate for a Hospital," we would observe, that although this is, with few exceptions, one of the healthiest districts in England, a certain proportion of the inhabitants must always be invalids from the ordinary causes of sickness and of old age; and, if the climate is not suited to the recovery of a sick man, it is only reasonable to suppose that a large proportion of the sick would continue sick, or go to swell the bills of mortality of the district. Appendix, p. 21.

In respect of the healthiness of the district, the Registrar-General has furnished us with a return of the average mortality of the most healthy as well as of the most unhealthy places in England, and we find that the minimum annual mortality of any district in England is 15 per 1,000, the maximum being 36, whereas the mortality of Hound parish, in which the Hospital is situated, is 18 per 1,000. A statement is also appended of the causes of death in the same parish from 1853 to 1857 inclusive, which does not show a single fatal case of ague or remittent fever. Dr. Babington remarks, that "there is no fatal disease whatever during the whole of that period, which can fairly be attributed to any special defect of climate." Appendix, p. 85. Appendix, p. 117.

Dr. Milroy, "that the various theoretical objections alleged in the Confidential Report against the site, are invalid; and that there is no reason to question the opinion of the resident medical men as to the salubrity of the spot." Appendix, pp. 130, 132, 133.

* At the last moment a single instance has been communicated to us, by telegraph, from Professor Thomson:—"I can find no sulphuretted hydrogen on the surface of the mud in front of the Hospital, but I detected it on digging into mud on the south side of the jetty, where the vessels lie at a spot covered by weed, and where I am assured ship sewage is discharged. Nowhere else did I find it on stirring the mud." 4 P.M., 1st July, 1858.

Appendix, pp. 98, 105. The Committee consider that the climate of Netley will be found to be different from that of Southampton; Dr. Babington says:—

Appendix, p. 119. "Southampton is built upon a projecting peninsula, with water on the east, west, and south sides. This position *may* increase its rainfall, and, in all probability, *will* increase its humidity, as compared with Netley, which is situated on a higher level, and with water only on one side. Nor can it be inferred, because it is only three miles distant, that a great difference may not occur between Southampton and Netley, for, on examining the Registrar-General's tables, a considerable difference is often found between the observations taken at places near each other—for instance, at Whitbread's Brewery, Chiswell Street, city during the June quarter for 1851, there fell 1·34 inches of rain, of London, while at St. John's Wood there fell 3·41 inches, and for the December quarter of the same year the humidity at Chiswell Street was ·794, while at St. John's Wood it was ·908.*

Appendix, p. 122. "The opinion to which I have come, founded on all the above sources of information, is, that the climate of Netley is mild, moderately bracing, and as favourable for the generality of those cases which the Royal Victoria Hospital is intended to receive as any to be met with on the southern coast of England, being neither so relaxing as that of the coast towns in Devonshire and Cornwall, nor so sharp and cold as that of the Isle of Thanet. To persons from warmer regions, where they have lost their health by tropical diseases, such a happy medium seems well calculated to restore their powers."—(Dr. Babington's Report.)

Appendix, pp. 132–3. *See* also Dr. Milroy's evidence.

In Mr. Simon's Report, however, is quoted an opinion of Mr. Martin:—*

Appendix, p. 79. "There is another and opposite circumstance, which has occurred so often in my experience, that I consider it proper to mention it. I have so often been obliged to have persons suffering from bowel complaints especially, and others suffering from fevers, removed from Devonshire, that it has, during years, been the subject of remark. In the humid and comparatively warm atmosphere of the lower portions of Devonshire, convalescence I have found to be retarded, and I have, consequently, been constrained, in a great many instances, to remove the sufferers from the houses of their parents into higher localities, having a more bracing air. I may mention that generally humidity, whether joined to heat or to cold, is extremely injurious to tropical invalids of all classes."

Mr. Simon remarks upon this:—

"But such direct evidence as I have been able to gather on the convalescence of tropical invalids in the climate of Southampton Water does not seem to justify that apprehension. Mr. Wiblin, Medical Superintendent of Quarantine at the port of Southampton, writes to me:—

Appendix, p. 80. "'In my official capacity I have had very special and extensive experience as to the effect of a residence in this town and neighbourhood on persons who arrive here on board ship, especially the West India steamers, suffering from ague, remittent and intermittent disorders. I have seen and attended from 200 to 300 persons suffering from the above diseases during the last ten years, and I have invariably remarked how speedily they became convalescent after a short sojourn in the town or its immediate vicinity, such patients seldom requiring even the ordinary remedial treatment by quinine. During the last five years I have seen perhaps a hundred patients land at this port, having suffered from yellow fever, and I have, on many occasions, urged upon the Superintendent of the Royal Mail Company the necessity of providing a house at Woolston† or its neighbourhood for the reception of such cases. I am at this moment authorized by the Superintendent in question to take a house for the purposes above mentioned in the very neighbourhood to which your inquiries have reference; and I hope to be successful, as I consider Woolston and its vicinity a locality of undeniable salubrity.'

"On the whole," says Mr. Simon, "the views which I am disposed to take on the question of climate are these:—That no locality can be chosen which

* "The Influence of Tropical Climates on European Constitutions, including Practical Observations on the Nature and Treatment of the Diseases of Europeans on their Return from Tropical Climates." By James Ranald Martin. London: 1855.

† Between Netley and Southampton.

will be equally suited to all cases of disease; that the climate of Southampton Water is likely to agree well with the vast majority of cases, and is not likely to be disadvantageous in many instances; that whether the site of the Hospital were the one selected, or any other which could be named, there must always be a few patients for whom, if they alone had to be considered, some different site would be preferred; that this difficulty is inseparable from the system of single large hospitals; and that the only way of meeting it effectually is by having branch establishments in localities which differ widely in climate from the site of the principal buildings."

Dr. Mouat remarks, with regard to the climate:—

"This would be generally thought, as a matter of ascertained fact, to be exceedingly simple; but, it appears, to ascertain any modern fact or transaction with truth and exactness, is attended with considerable difficulty. We should not wonder that some obscurity prevails, where there is diversity of opinion; here it is but one of degree. The climate of Southampton, which is an approximation to that of Netley, is described, by its detractors, as '*soft and relaxing*,"—this is, we believe, the worst charge brought against it. It is likewise described as damp and moist by some; by others, as simply relaxing; and by its advocates or admirers, as *mild and genial* or *mild and temperate*. These are only relative terms, and apply strictly to the *town of Southampton*, which may be less bracing than places higher inland; but the site of the Hospital at Netley being higher than Southampton, on a rising ground, facing the water, with a clear open front, and, on all sides, an ever-moving or changing atmosphere, partly the result of the tides, fanned by a constant sea breeze, with a mean average temperature of 50 degrees, we are quite at a loss to understand how it can be considered as injuriously relaxing; indeed we feel disposed to question if such a climate as any part of the coast of England possesses can be deemed relaxing to the great bulk of patients likely to inhabit this Hospital for a brief period, namely, 'tropical invalids.' Possessing some experience of the complaints of this class, having held an appointment in India for some time, where the whole of the invalids of the Madras Presidency passed through our hands, and having returned from that country an invalid, and disembarked in this very locality, where we had previously resided, we may perhaps be permitted to offer an opinion on the nature of the climate, as adapted to this class of cases. Supported as these views are by all the resident medical men of the locality, we can come to no other conclusion than one favourable to it; indeed, judging by our own feelings and the experience of old Indians, both from the East and West, what is termed a 'bracing or keen atmosphere,' would prove injurious to both rheumatic and pulmonic affections, by far the largest classes of disease likely to come under observation;* and in winter, anything but agreeable to their feelings—for who can doubt or question the susceptibility of old Indians to extremes of temperature; it is proverbial." Appendix, p. 143

Dr. Milroy states:—

"Of course, no one climate is best for every constitution, or for every sort of infirmity or sickness. It must be for the bulk of the cases to be treated that we must have regard. Now, what have been hitherto the principal forms or classes of disease among the sick and invalids sent from stations in this country and abroad to the Hospitals at Chatham? From the returns furnished to the recent Sanitary Commission on the Army by Deputy Inspector-General Taylor, it appears that in the twenty-seven years, from 1835 to 1857, the total number admitted was 40,829. Deducting the cases of wounds and injuries, of dislocations, contractions, and of hernia, a total of 34,553 cases of disease are left. Of this number, no fewer than 9,141 are due to pulmonic affections, 6,045 to rheumatic ailments, and 6,855 to that state of infirmity and ill-health characteristically termed "worn out." In all, 22,041 out of the 34,552 cases, or nearly two-thirds, belong to the three classes now enumerated,—the remainder being chiefly caused by ulcers and varicose veins, by diseases of the eyes, and by scrofulous cachexy, and visceral affections. Appendix, p. 135.

"To the great majority of pulmonic cases the climate of Netley will be found

* *Vide* Director-General's Table of "Classes of Diseases to be provided for in Royal Victoria Hospital," as well as "Sanitary Commission Report," page 482.

admirably suited; there can be no doubt on this head. It will be equally appropriate for a vast proportion of the rheumatic ailments, and of the 'worn out' or 'broken-down health cases.' The warm salt water baths will be of inestimable service to the poor invalids. Dr. Churchill, of Fawley, mentioned to me the cases of several persons, himself among the number, who had derived the greatest benefit from the climate of that district, after years of unrelieved suffering from chronic rheumatism contracted elsewhere.

"To persons returning from hot climates with dysenteric and hepatic disease, a mild, soft climate like that of Netley will generally be highly beneficial for some time after their arrival in this country, and before they are transferred to a drier and more bracing climate. Any sudden change in the circulation of the skin and internal organs is thus best obviated, and the tendency to pulmonary or hepatic mischief counteracted. Hence it is that old residents of tropical climates generally find it a good plan to spend the first year or so, after their return, in the south of Europe, before they settle down in this country."

We are, therefore, decidedly of opinion that, far from being as stated in the "Confidential Report," "not a desirable spot for the majority of such cases as will be sent there for treatment," the climate is peculiarly favourable for the treatment and recovery of nearly the whole of such cases as have been received in the course of twenty-two years at the invalid establishment at Chatham which Netley is to replace.

Appendix pp. 94-6, 97-112, 187-88.

Summary of Opinions as to Site.

The Committee having reported in as concise a manner as the subject will admit, beg to add a short summary of the opinions of each of the gentlemen employed on the investigation, as to the *site* of the Hospital.

Appendix, p. 124. "From these data I am led to the conclusion, that the locality selected for the Hospital is naturally well drained, and that its site is wholly unobjectionable."—(Dr. Babington).

Appendix, p. 148. "That the locality is free from any malarious or other injurious endemic influence, and, in a sanitary point of view, is or can be rendered as fit for the purpose as any we are acquainted with."—(Dr. Mouat).

Appendix, p. 80. "I beg leave to add, that popular observation seems to have bred no misgivings as to the pleasantness and salubrity of the Hospital-site. All along the banks of the Southampton-Water are the pleasure residences of nobility and gentry; and the Cistercians took Netley for their convent in days when the Church was not much restricted in her choice of building land."—(Mr. Simon.)

Appendix, p. 56. "On the whole I see no ground for imputing unhealthiness to the site of this Hospital."—(Professor Phillips.)

Appendix, p. 67. "Finally, in my opinion, the site is well suited for an Hospital. The plateau, from the nature of its soil and proximity to the estuary, is always well ventilated, at the same time sheltered from cold easterly winds, and if the works I have ventured to suggest are carried out, all local causes of vitiation of the atmosphere will be removed."—(Mr. Ranger.)

Appendix, p. 137. "The medical profession of Southampton and the neighbourhood have recorded their deliberate opinion that 'in a sanitary point of view, the site of the Hospital has been wisely selected.' In this opinion I concur. The advantages appear to me great, the disadvantages imaginary rather than real. To speak of the site as being 'not probably sufficiently deleterious to injure persons in robust health, although not well calculated to promote recovery from disease,' must surely have proceeded from an imperfect acquaintance of facts."—(Dr. Milroy.)

Appendix, p. 160. "From all I can learn, Netley appears peculiarly well adapted for '*thoracic diseases*,' which prevail to so considerable an extent among the men for whom the accommodation is required. I have no experience to guide me to an opinion, as to whether or not the locality is adapted for patients arriving from the Tropics. At present, I see no reason why the climate should be unsuited to invalids suffering from the general run of trifling ailments. It cannot be expected to meet the requirements of every case. It would be unreasonable to anticipate such a result."—(Mr. Cooper, 4th Dragoon Guards.)

Appendix, p. 176 "I would add, as my deliberate and unbiassed opinion, that taking into consideration all the requisite conditions for the site of a Military Hospital, a

more eligible locality could scarcely be found in England than that selected at Netley; and that for facilities of access, capabilities of ventilation, favourable antecedent medical history, cheerfulness and beauty of situation, the locality in question cannot be surpassed; and that so far from yielding to the objections that have been raised to the site on purely vague and theoretical grounds, the military authorities will find that its salubrity can be established by evidence such as reason cannot reject, nor prejudice subvert."— (Dr. Orsborne.)

"In a sanitary point of view, the site appears to me to be well chosen for a Hospital for soldiers invalided from hot countries. It is open from the south, 33 feet above, and 400 feet distant from high-water mark, on land sloping to the sea, and thus admitting perfect drainage; and the foundations are on a stratum partly of gravel, partly of sandy clay or brick earth, mixed more or less with gravel, which stratum is porous, rapidly absorbing moisture, and resting on beds of sand. The land behind it gradually rises to the north-east for two miles, protecting it from the winds from that quarter, whilst in the south-east it is fully exposed to the sea breezes from the Solent. The situation is cheerful and very beautiful, and invalids can be landed at the spot. The climate is free from extremes, mild, and yet sufficiently bracing for those who cannot bear too great a demand on their weakened powers."—(Dr. Bullar.) Appendix, p. 172.

"The aspect of the Hospital is fine, and its proportions noble. The estuary, a source of health and mental enjoyment, such as cannot fail to conduce to the benefit of convalescents, and to the amelioration or recovery of those, more especially, who have suffered from attacks of a bronchial or pulmonary character. Ague and intermittents are unknown in this locality; instances of longevity are frequent, and as a rural population few places surpass it for vigorous and rude health. When laid out and planted, and its walks are gravelled, no place will present greater attractions, nor will the invalid soldier find in any part of the world greater chances of recovery, nor more certain means of health than are presented here. It is admirably placed for invalids from tropical climates. From the highest point of the Bitterne Hills, 180 feet above the level of high water, the air has an unimpeded sweep to Netley."— (Mr. Cooper, Southampton.) Appendix, p. 18.

V.—*Facility of Access to the Hospital by water, and the necessity of Landing the Sick in Boats.*

On this point the report of Captain Heath, as to Netley, is conclusive:— "That the landing from ordinary boats at the existing hard is quite free from difficulty of any sort;" and that "I have been more than a year at this anchorage, and there has been *no* day during that period on which communication by boat between the ship and the shore has been interrupted by gales of wind." Appendix, p. 116.

At Haslar the landing in boats of the sick from the ships in the harbour (at a distance of from half to one and a-half miles from the jetty) is not attended with any difficulty whatever.

There can be no doubt that a situation which would allow ships of deep draught of water to come alongside in all weathers, and discharge sick at the door of a Hospital, would be most convenient. But this Committee is not aware that any such position can be found on the coast of England, where it would be desirable to place a Hospital.

VI.—*Construction of Building.*

We now continue, in the order of our Instructions, to report upon the various objections raised against the *construction of the Building* by Mr. Sydney Herbert's Committee, and in this we feel, more than ever, the very difficult position in which we have been placed, by two circumstances. The first being that our colleague, Dr. Sutherland, joined this Committee, on the 25th of May, 1857,* in the "*unanimous*" opinion that "a few modifications was all that was required to render the Building well adapted to the purposes of a Military Hospital," and did also, on the 12th March, 1858, join Mr. Sidney Herbert's Committee, in the opinion that the same plans are so defective, that it would be better to convert it into a Barrack than complete it as a Hospital. Appendix, p. 20.

The second difficulty with which the Committee have had to contend with was, that Captain Laffan, under whose immediate directions the details of the Appendix, p. 32.

* *Vide* Dr. Sutherland's explanation, p. 17.

plans had been drawn out, became, unfortunately, too ill to attend to business of any kind, and was replaced by Lieutenant-Colonel Owen, C.B., who, at the last moment, had to enter upon an enquiry, with the previous course of which he was quite unacquainted.

The original Committee, which prepared the plans of the Royal Victoria Hospital, were well aware that a great difference of opinion existed amongst the most eminent medical men as to the proper mode of construction of Hospitals.

One great division of the medical body entertain strongly the opinions that wards for ten or twelve men are more comfortable and more easily warmed and ventilated in winter than larger ones; whilst another great body of the profession considers the arrangement of the larger wards, with windows placed opposite to one another, and the beds between the windows, as the only mode of construction that can be made capable of ensuring a proper amount of light and ventilation to the sick, and by this mode of construction the Middlesex Medical Officers say, that "Highly infectious diseases may be placed among the general patients without danger of their being communicated."

Appendix, pp. 51-52; 126; 139-185.

Appendix, p. 20.

The original Committee, in preparing the plans of the Royal Victoria Hospital, had no desire that it should be adopted as a model for all Hospitals; or to decide the question whether one form or another of Hospital construction was the best. They arranged a plan which appeared to them to be most suitable for the patients who were to be provided for. In 1856, in addition to the establishment at Netley, it was found that a large Hospital would be required at Aldershot, and Dr. Mapleton, one of the members of the Committee on the Royal Victoria Hospital, was, by orders of the Minister for War, associated with Captains Collinson and Murray, Royal Engineers, and Mr. Stent, of the Royal Engineer Department at Aldershot, in drawing up plans for a proposed Hospital at that station. These plans were made on the block or separate pavilion system, according to the express desire of Dr. Andrew Smith, Director-General of the Army Medical Department, who was fully aware how little unanimity prevailed in the profession on the subject of hospital construction. These plans, although prepared in 1856, embody the ideas of the objectors to the Royal Victoria Hospital in the "Confidential Report," as well as those of the Royal Commissioners of 1858.*

The main objection of Mr. Sidney Herbert's Committee is, that the Hospital is not on the pavilion principle. That there are advantages in this system of construction is undoubted, but it is equally certain that it has not yet been tried to any extent in this country, and that many grave objections are raised to it by eminent authorities.

Appendix, pp. 55 *et seq.*; pp. 124, 183.

The corridor principle has great advantages, in giving abundant space for exercise for convalescents in all states of the weather, and change of air and scene, even to a bed-ridden patient; in which points the pavilion principle is deficient, except on the ground-floor.

Much stress has been laid upon the north-east aspect of the windows of the wards; but there are also windows on the south-west side opening into an airy corridor, which will have a pure atmosphere at all times, day and night. This corridor will probably be more occupied than the wards during the day, and will give the invalids a bright and cheerful prospect in weather which confines them to the building.

Appendix, p. 139.

It will be found, by the evidence which we have collected, that with certain modifications, consistent with the present plan, the ventilation of the Royal Victoria Hospital may be made quite satisfactory, and that the lighting of the wards is ample.

The whole of the evidence collected upon this point is well worthy of attention, but we would specially cite the following:—

"Though it may be easier to supply fresh air by lateral windows in a single block building, provided they can be kept open, it is more difficult to keep up the requisite degree of warmth, a great expanse of single wall and windows, exposed on both sides to the open air, being readily cooled; and secondly, there is no practical difficulty in establishing an effective ventilation from end to end in wards which, as at Netley, are but a few feet larger than the breadth of wards on the single block plan. That the current of air should pass over five beds can hardly be considered as practically objectionable, provided the supply be abun-

Appendix, p. 125.

* *Vide* p. lxxvii,—"Report of Commissioners on Sanitary Condition of the Army."

dant. The windows of the corridor at Netley are so wide, and so numerous, that the wards may be regarded as communicating with the air, so far as the purity and abundance of its supply is concerned; but the corridor will, in my opinion, be found highly useful, in preventing the direct rays and heat of the afternoon sun from penetrating to the wards, and that the foul air of one ward will affect another, through the medium of the corridor is a groundless apprehension; for as the air of the wards will always be more rarefied than that of the corridor, its current will always set in a direction towards the ward, and never from it. Much stress has been laid on the necessity of having abundant light in the wards of a Hospital, and it cannot be denied that as much as is sufficient to impart a sense of cheerfulness, to enable the nurses and orderlies to do their duty efficiently, and those patients who are well enough to use books and writing materials, is desirable, and even requisite, Light, to at least this extent, will be supplied in the Netley wards; but that the direct rays of the sun should reach all the beds seems to me quite needless. With the general plan of the Hospital I am likewise well satisfied."—(Dr. Babington).

"Throughout, I have kept in view the rendering of the wards suitable for occupation by a full complement of patients during the day as well as the night, and should these suggestions be acted upon, I believe very great benefit will result to the patients, saving in outlay will be effected, and the building well suited for a Hospital."—(Mr. Ranger). Appendix, p. 68.

"The general feeling of the medical profession in this country is decidedly in favour of moderate sized wards—wards that will hold from eight or ten to fourteen or sixteen beds, allowing a space of about 1,500 cubic feet to each. Twenty patient wards are considered large, and very few physicians or surgeons will be found to approve of wards larger still, in a general hospital. Appendix, p. 139.

"In Haslar and Melville Hospitals, almost all the wards are for fourteen patients, and Sir John Liddell says, that he considers this 'a very suitable and convenient size,' and that he would not recommend any change. Dr. Nesbitt, the present Principal Medical Officer of Haslar, remarked to me that, if any change was desirable, he would prefer wards with fewer, and certainly not with more, patients in them. Large wards are extremely fatiguing to the Medical Officer, if he carefully examines each patient without a pause or break. The disturbance, too, of a number of sick from one noisy or troublesome patient is also to be considered.

"In the new Hospital at Blackburn, which is being constructed in separate blocks, somewhat after the plan of the Lariboisière Hospital at Paris, the wards are, I observe, not to contain more than eight patients.

"It is confidently stated in the 'Confidential Report' that wards for twenty-five to thirty sick are more healthy than smaller wards, from the greater facility with which they can be ventilated. There is no proof that I know of for this. Dr. Arnott declares distinctly that, 'as regards warming and ventilation only, the size of the wards is of little importance,' and certainly most men who have had experience in ventilating large chambers and halls, will be found not to concur in the above opinion.

"It has been asserted that Hospitals on the Lariboisière plan of construction are better for the recovery of the sick than Hospitals on the Haslar or Netley plans, or on any other plan that has been tried. I have applied for, but failed to obtain, any information as to the results of the treatment—its success and duration—of surgical and medical cases in the Lariboisière and other Hospitals built on that plan, as compared with similar results from other Hospitals. The three medical gentlemen who went over to the Continent last year, at the instance of the Sanitary Commission of the Army, to inspect the Hospitals in Paris and Brussels, do not appear to have been more fortunate in procuring accurate data for comparison; and the circumstance that the new Military Hospital now erecting at Vincennes is not on the same plan as the Lariboisière, would seem to indicate that the Lariboisière plan is not considered by the French medical authorities to be unobjectionable.

"There is much force in the remarks of Dr. Burrows, and the other London Hospital physicians, on the possible disadvantages of the separate block system in a climate like that of England. It is probably better suited for a more mild and genial climate than ours; and certainly there might be greater difficulty in maintaining an equable warmth in such buildings, during the winter months, than in our ordinary Hospitals.

"Due attention being uniformly paid to the various points indicated above, I feel every confidence that the Royal Victoria Hospital will be a first rate Hospital in respect of healthiness, and be found altogether well suited for the purposes for which it was designed."—(Dr. Milroy.)

Appendix, p. 103. "With regard to the size of the wards (which are constructed to contain 9, 12, and 14 patients, respectively, with an average cubic space of 1400 feet), the general, we may say almost unanimous, opinions of both naval and military officers, as well as most civilians, is in favour of small wards. Such strong concurrent testimony ought not to be set aside, in the absence of evidence, that such arrangement is not equally efficacious in promoting recovery; and there can be no question that small wards are more quiet and comfortable than large ones; nevertheless, we are not indisposed to consider 20 too many in a well proportioned roomy apartment, provided they are not acute cases.

"Having recently visited all the large London Hospitals, and being well acquainted with the Civil and Military establishments of France and Belgium, as well as our own at home and abroad, we are surprised to find set forth as new, principles that have been acknowledged as established for years. We are still further surprised to find, condemned as injudicious, the enclosed corridor or verandah, the very *sine qua non* of military hospitals, and all public buildings in our colonies, where they afford shelter and protection from the rays of a tropical sun, and in this country, from the variable nature of our moist climate, they offer the sick and convalesent a protected promenade, accessible in all states of the weather. The advantages of a corridor are its own; the disadvantage, in a sanitary point, entirely one of mal-construction. We are at a loss to discover how a corridor of the nature and extent of the one proposed at Netley, can 'tend to disseminate the foul air of the wards,' bearing in mind that the corridor has, or ought to have, to a great extent, an external atmosphere, and that the wards, each are separately and specially ventilated, and not directly communicating with one another. The natural tendency of the air currents, more particularly at night, and when the windows are closed, will be into rather than out of it; that foul air, being generally warmer and specifically lighter than the outer air, will have a tendency to ascend, and escape by the chimneys, &c., and the cooler and fresher current from the corridor will rush in to replace it; the corridor, from its nature and extent, being in reality a large reservoir of fresh air for the supply of the wards, which may be either admitted at the natural temperature or slightly warmed in winter, as circumstances may require.

"The subject of light, air, and ventilation, although strictly the province of the engineer, who is bound to provide an ample supply of all those indispensable requisites in a Hospital, cannot be passed over in silence. Mr. Ranger, the talented Civil Engineer, who will deal with this part of the subject, assures us that all these objects can be effectually provided for without materially interfering with the plans, or altering the building, which has been designed with strict reference to the class of cases which will generally form the great bulk of the inmates, yet we should not feel satisfied unless we were convinced that the structure, in all its details, hygienic and administrative, was such as to be adapted to a Hospital fit for any purpose and any class of cases. With this view, certain improvements have been suggested in the plans, which appear well calculated to effect that object, and render this establishment perfect of its kind."—(Dr. Mouat.)

Appendix, p. 161. "The building, after it has undergone certain improvements, in all likelihood will become a suitable residence for the majority of cases requiring, temporary accommodation in an invalid depôt. Mr. Ranger will submit his ideas on the subject in a separate report. It is, therefore, quite unnecessary for me to enter upon the alterations suggested by him."—(Mr. Cooper, 4th Dragoon Guards.)

Appendix, p. 80. "In planning the Netley Hospital, it has been requisite to give special consideration to patients who do not keep their beds. Regard being had to this fact, and to the assumed military necessity of having few beds in any one ward, I cannot say that I think the general arrangements inappropriate to the object in view."—(Mr. Simon.)

VII.—*Alterations recommended.*

The alterations which have been recommended by Mr. Ranger and

Dr. Babington, are an increase of size, and a change of position, of the grates in the wards; the suppression of the ventiduct for the extraction of foul air, and the carrying up of all the flues, whether for smoke or ventilation, in the space between the wards originally set apart for orderlies.

They also recommend an alteration in some of the out-buildings to improve the ventilation in the yard; that the sewage should be defecated; that the dust-bins should be portable; that the division-walls should be made fire proof, and carried up through the roofs; and that a stratum of concrete should be laid on the surface of the ground under the floors.

With respect to the alterations, we recommend that Mr. Ranger be placed in communication with the Inspector-General of Fortifications.

VIII.—*Cost of administration and attendance of the Royal Victoria Hospital.*

Mr. Sidney Herbert's Committee state that, "in a Hospital consisting of wards of nine sick, one orderly will be required for day service in each ward, and one for night service, or two orderlies for every such ward;" and they deduce from this that "the expense of attendance is double for small wards than it would be for large wards." Appendix, p. 28. Appendix, p. 28

If it were indispensable that in every ward at Netley one orderly by day and another orderly by night must be provided for *each* ward, the objection made on the score of increased expense might be valid.

But it must be borne in mind, it is not contemplated that the inmates of this Hospital will, in any very large proportion, be confined to bed. On the contrary, the greater number in each ward will be convalescents, who, under the rules of the Service, are bound to give their assistance to the Hospital orderlies, and the Committee are of opinion that the number of attendants (viz. one under ten, two above ten, three above twenty, and so on), which, according to the practice and usage of the Army will be provided, will be amply sufficient. Appendix, pp. 94-6

In the Naval Service, the proportion of Hospital attendants is one to seven, and no difficulty in the administration is experienced at Haslar, where the wards are small (for fourteen patients), and the attendants of contiguous wards are divided into watches for night duty to a Division, and are not exclusively confined to the care of patients in the wards to which the attendants actually belong. In most Civil Hospitals it is believed that a still larger proportion of attendants to sick is deemed requisite. Appendix, p. 114.

IX.—*What preferable site could be obtained for a Hospital.*

Should it be decided to convert the building into a barrack, we know of no locality where so many advantages for a Hospital, designed for like purposes, would be combined, as in the immediate neighbourhood of the same site.

X.—*Comparison with other Hospitals.*

We have compared the requirements for a Hospital for "convalescents and sick" with those of the existing Hospitals referred to in the Instructions, and we believe that, whether for the recovery of the sick, the comfort and well being of the convalescents, or the general salubrity and beauty of the site, the Hospital will bear comparison with any.

Conclusion.

We have purposely refrained from quoting to any great extent the opinions of the local authorities whom we have consulted, in order to show that the case can be established upon the testimony of persons who had not committed themselves to any previous opinions. We, however, believe the whole of the opinions to be equally worthy of attention. The unanimity of these opinions is very remarkable, containing, as they do, unqualified expressions of approval as to the soil, climate, and the general healthiness of the district, and of the plans as being suited to the purpose for which the building was designed.

We are, therefore, fully justified in coming to the conclusion—

1. That the site is unobjectionable.

2. That the building is well adapted to the purposes for which it was designed.*

* See Dr. Smith's Tables, Appendix, p. 94.

3. That it is not the sort of building best adapted for a Medical School on the scale contemplated by Mr. Sidney Herbert's Committee, nor was it designed for such a purpose.

4. Considering the large expenditure already incurred at Netley, and the importance of making early provision for the sick of the Army, we do not certainly recommend that an otherwise good Hospital should be converted into a Barrack.

5. If a Medical School is to be established, it appears to us that the best place for it would be at some large military station.

Whatever course the Secretary of State may think proper to adopt, we beg most respectfully to tender our thanks for the opportunity he has given us of replying to the "Confidential Report." The names of the gentlemen attached to that Report form a sufficient guarantee that it was intended to further the interests of the public service; but, however unintentionally, the statements it contains and its general tone, certainly tend to throw grave doubts upon the judgment and even the intelligence, of every Officer or professional person who has been concerned in the selection of the site, or in the preparation of the plans of the Royal Victoria Hospital; and though they are, as every one else is, liable to error, the Report we have now the honour to submit shows that there were at all events very sufficient grounds for the course which they have from time to time recommended.

(Signed) TERENCE O'BRIEN, *Colonel,*
Assistant Quartermaster-General,
President.

H. C. OWEN, *Brevet Lieut.-Colonel, R.E.,*
Deputy Inspector-General of Fortifications.

HENRY MAPLETON, M.D., *Surgeon,*
18*th Hussars.*

Dr. Sutherland has handed to the Committee the following reasons for not concurring in this Report:—

Being a member of the Barrack and Hospital Commission, and also of the Committee on the Royal Victoria Hospital, it appears desirable that I should state my conclusions on this inquiry separately, which I now proceed to do.

I regret very much that I cannot agree in the general tenour and conclusions of this Report, because I am unable to adopt certain of the opinions of the medical gentlemen whose assistance was requested by the Committee.

I accept most of the facts brought forward as to the locality, but I cannot arrive at the conclusions which have been drawn from these facts.

The facts as to the district and climate appear to me to prove that they are favourable for pulmonary diseases; that a more bracing climate would be necessary for diseases of the digestive organs, especially such as have been connected with tropical fevers, and which will form a large proportion of the cases from India; and that for other chronic diseases the climate may be considered a fair average one.

As far as regards the building, it is necessary to state that after the Royal Commission on the Sanitary Condition of the Army had completed its work, the Barrack and Hospital Improvement Commission was requested by the Minister at War to report on the Royal Victoria Hospital.

We considered the plans from the basis of the conclusions arrived at by the Royal Commission, as to hospital construction, administration, and nursing; and we found, for reasons stated in our Report, and which are not impugned, that the Hospital was not adapted for a Model General Hospital for sick. At the same time it must be stated that the building was originally intended for another purpose, and that it was not expected to fulfil the conditions required by us.

In conclusion, I am of opinion—

1. That the Royal Victoria Hospital, including the sanitary improvements introduced into its plans by this Committee last year, is suitable for its original intention as an Invalid Hospital, so far at least as concerns pulmonary and certain classes of chronic disease, of whom only a small proportion, as appears by the returns laid before this Committee, will be in bed.

2. That it is not adapted for a General Hospital for sick, in which administrators and attendants can be trained economically and efficiently for service, wherever they may be required; and that it is not adapted for clinical instruction.

3. That for these purposes, for which, as stated, the Royal Victoria Hospital was not originally designed, a General Hospital, constructed on another plan and in another locality, will have to be provided.

I object to the statements made in this Report as to my connection with the plans of the Royal Victoria Hospital. I was not on the Committee which drew up the plans, and am in no sense responsible for them. I was only requested by the Minister at War to join this Committee to assist in removing certain objections raised against the building after the whole Hospital was about five feet above ground. These objections we removed as I believe satisfactorily, and we reported accordingly; but we never considered the Hospital in any other light than for invalids and for sick, and wounded soldiers sent home, in the exceptional case of a foreign war; and to this extent only I concurred in the unanimous opinion of the Committee.

JOHN SUTHERLAND.

Appendix.

No. 1.

Confidential Report on the Victoria Hospital, Netley.

My Lord,

With a view to carry into execution the instructions received from your Lordship, on the 28th December, 1857, we have personally inspected the works at Netley, have examined all the plans for the Victoria Hospital, both as originally designed, and as subsequently altered, in accordance with the Report of a Commission appointed for the purpose, and we have read all the Documents, Reports, and Correspondence which have passed on the subject. We have now the honour to report the result.

Position of Hospital.

The works of Netley Hospital are situated on the eastern bank of Southampton Water, facing the south-west, on a shelf about fifty feet above the level of high water, and protected on the north-east by higher land, which forms the crest of the basin of the estuary.

At high water the estuary is a mile and three-quarters broad, opposite the site of the Hospital, but the water is shallow near the sides, and mud banks, seven-eighths of a mile in width, on each side, are exposed at low water, leaving the channel at that time seven-eighths of a mile broad, with an average depth of eighteen feet.

The area of water in the estuary at high water is somewhere about sixteen square miles; and at low water about ten square miles of mud banks are exposed.

In addition to the tidal water, the estuary receives the surface drainage from an area of nearly 700 square miles of country. Three miles above the site of the Hospital the sewage of the town of Southampton flows into the estuary. The population of the town was 34,000 in 1851, and it is rapidly increasing.

Description

The proposed Hospital consists of a centre and two wings, extending about 1,400 feet in a straight line. The central building, four stories in height, is to contain the administrative offices, and part of it is intended to afford accommodation for sick officers and for nurses. The wings, each of which is 554½ feet long, consist of three flats, and form the body of the Hospital. Each wing contains a single range of sick wards, extending the whole length of each story. On the ground floor only several rooms are devoted to other purposes. The wards are of different sizes, those communicating directly with the corridor are intended to contain nine beds each. At each extremity of the wing there are wards capable of holding 12 to 16 sick. These end wards have windows on two sides, communicating directly with the open air; but the wards along the corridor have windows to the open air on the north-east side only, while the windows on the south-west and milder side of the Hospital are covered throughout the entire length by the corridor affording the means of access to the wards. Each wing has a separate kitchen, dining-room, offices, and steam-engine, situated in the court behind the Hospital; and the chapel is placed behind the central building. The entire south-west side of the building has an uninterrupted exposure to the Southampton Water, and the north-east side is inclosed by two square courts of offices and stores, part of which is one story, part two stories in height. In the centre of each of these courts are situated the kitchens and dining-rooms, which are the same height as the Hospital buildings.

The letter of Captain Laffan, to your Lordship, dated July 10, 1857, which is to be found in the papers presented to Parliament in the same month, gives a clear and detailed account of the reasons which dictated the selection of the site and the principles on which the block-plan of the building was designed.

Memorial from Middlesex Hospital

In February 1857, some time after the plans had been made public, a memorial was addressed to the War Department, by the Physicians and Surgeons of the Middlesex Hospital, setting forth several objections to the form of construction proposed to be adopted at the Victoria Hospital. They stated that, "a building sufficiently well adapted for the dwellings of persons in good health, may, and generally will, be very inadequate to the requirements of the sick. Hospitals, in which patients may lie for weeks or months, demand a different construction, and a more perfect ventilation, than any other class of buildings." And they laid down as an axiom, that "the great principle on which all good Hospitals are constructed is, that the wards open into the external air, on at least two sides, and have windows which are placed opposite to one another. By this means, a free and perfect current of air is obtained; and highly infectious diseases may be placed amongst the general patients without danger of their being communicated."

On this ground they objected to the corridor which faces the south-west, and is the principal feature of the Netley plan, as tending to disseminate the atmosphere of each ward through the others, and as intercepting the sun and air from the wards. Adding that, "the few windows which open upon really fresh air, face the north-east, and expose the wards to that wind which is notoriously the least beneficial to the sick. Moreover, the current of air, even on this face, is in part impeded by a block of buildings and a covered way, which extend across the whole yard on the north-east side of the wards."

In justification of their interference on the matter the Memoralists added, that they did not "speak without ample experience in their own Hospital. Built in the form of the letter H, the Middlesex Hospital is freely ventilated by currents across and along it, whilst its wards have been made to extend the whole length and breadth of each compartment of its wings. Until the Hospital was reconstructed, about 10 years ago, it was subject to outbreaks of all the diseases to which reference has been made; but since the present system of thorough ventilation has been adopted they have all but entirely disappeared, and the nurses and resident officers enjoy a degree of health hitherto unknown, and beyond that in most Hospitals."

Other criticisms were made, but these are the principal objections advanced on sanitary grounds.

Proceedings thereon.

Shortly after this memorial was transmitted to your Lordship, and when the foundations had not only been laid, but were above ground, a Commission, consisting of Colonel O'Brien, Assistant Quartermaster-General; Dr. Sutherland; Dr. Mapleton, 15th Hussars; and Captain Laffan, Deputy Inspector-General of Fortifications, was appointed to consider the objections, and to make such changes as might obviate them so far as the state of the works would admit.

Considerable alterations in the plans were, at their instance, adopted. Unlighted corners, or parts of wards, were cut off. The windows admitting borrowed light from the corridor, and also the windows to the external air, were much enlarged, and the corridor itself was converted into a glazed loggia, the glass doors of which would be thrown open in summer to admit the air and sun.

The appropriation of about 20 small wards, intended to accommodate two patients each, but which had no window opening to the external air, was changed, and it was proposed that they should be allotted for the use of the nurses.

The offices behind and nearest the Hospital were lowered to one story, so as not to impede the free circulation of air at the back of the building, and the water-closets were more effectually cut off from the wards, by the interposition of a well-ventilated lobby.

By these means considerable improvements were made in the plan, though they did not affect the principle of the objection advanced by the Middlesex Memorialists against the form of construction of the building. We have deemed it to be our duty to reconsider this point, and we will, in a later part of our Report, state the conclusions at which, after careful consideration, we have arrived respecting it.

Objections to site.

Objections have been advanced against the locality in which the Victoria Hospital is situated.

It has been alleged, by persons conversant with the district, that the climate of the whole locality is soft and relaxing, and that the site of the Hospital itself, opposite to a large mud bank, is one ineligible for the purpose.

The building itself stands upon clay, of which the contractor is making excellent bricks for the construction of the Hospital. This clay sub-soil has also been made another ground of objection to the site.

On the other hand, it is stated by medical men in the neighbourhood that the inhabitants of the district make no complaint of the climate, and moreover that no special class of diseases prevails amongst them. The Coast-Guard man and his family, who live in a hulk, moored on the mud itself, appear perfectly healthy. This, however, is by no means irreconcileable with the objection made to Netley as the site of a Hospital, on the ground of salubrity. A climate which is not deleterious to healthy people, pursuing healthy avocations, is not necessarily the climate best fitted for a Hospital; what we seek is not a climate in which a healthy man, living an out-door life, will not be made ill, but one in which sick men, confined in doors, shall get well. The air should be the very best and purest that can be found, consistently with facility of access for the patients, and facility of supply for the administration, the first, however, being the paramount consideration. The importance of pure air in all medical treatment is every day more acknowledged by medical men, and, in the opinion of some of them, pure air, pure water, and wholesome food are, in a vast number of cases, more efficacious than any drugs.

We have already adverted to the mixture of salt and fresh water in the estuary, to the influx of the sewage of Southampton, and to the large extent of mud banks left exposed at low water, as being likely to influence injuriously the purity of the air over the entire district. With the view of arriving at some estimate of this, on scientific grounds, we requested Mr. Witt, Assistant-chemist to the Government School of Mines, to examine chemically the water and mud of the estuary, and also the gases disengaged from the bed of the estuary opposite the site of the Hospital. We have appended Mr. Witt's report, from which we gather the following facts and conclusions.

1. The estuary from Cracknor Hard Ferry, above Southampton, down to the site of Netley Hospital, consists of mixed salt and fresh water. Fresh water exists in largest proportion highest up, and it is in larger proportion opposite Netley, at low, than at high water. In any case, however, the quantity of fresh water is considerable, especially at low water, and it is well known the admixture of fresh water with sea water in tidal estuaries is a common source of malaria, especially in hot weather.

2. The upper surface of the mud exposed at low water opposite Netley contains nearly 12 per cent. of vegetable organic matter; but the submerged mud contains nearly 22 per cent. of vegetable organic matter, which is nearly as high a proportion as that yielded by the mud of the Thames at Westminster-Bridge. The amount of animal matter in the Netley mud is in appreciable quantity, although by no means so great as it is in Thames mud.

3. With regard to the sewage of Southampton, although the mud of the estuary opposite the Hospital contains about a quarter per cent. of nitrogen and a trace of phosphoric acid, or about a sixteenth part of what is contained in the insoluble matter of ordinary sewage, Mr. Witt is of opinion, that the present amount of Southampton sewage, in proportion to the volume of the estuary, is too small to occasion mischief.

4. An examination of the mud showed that the decomposition of organic matter is going on in the bed of the estuary, that the sulphuric acid of the sulphates in sea water is being decomposed and united with iron, that the mud contains sulphuretted hydrogen in combination; in fact, that similar changes are going on in the estuary to those to which the sea coast malaria of tropical climates has been attributed, though of course, of greatly inferior intensity, on account of the much lower temperature of our climate. That the air disengaged from the mud, at the time the samples were collected, at a temperature of 48° to 50° Fahrenheit, was apparently atmospheric air, which, however, affords no reason for supposing that noxious gases are not generated during summer, as is known to be the case with the Thames. That the effluvia proceeding from the depressions in the mud ("leeks"), are well known in the neighbourhood, and that it is highly probable that in hot weather offensive and deleterious effluvia may be disengaged by the action of the organic matter in the mud upon the sea water.

After considering the statements on both sides, as to this important subject, and also the scientific evidence laid before us by Mr. Witt, we have

arrived at the conclusion that the shores of Southampton Water are not a desirable spot on which to erect a Hospital for the majority of such cases as will be sent there for treatment, and that the site, though by no means inapplicable for many public purposes, is not of a character which would justify its special selection for the purpose of a Hospital.

It was at one time proposed to create a dockyard at the mouth of the Hamble, not far from the site of Netley; and it is probable, that had the project been further entertained, there would have been no objections, on the ground of health, which could have been urged against the neighhourhood being selected for such a purpose, sufficiently weighty to overbalance the advantages which it possesses in its sheltered situation, its depth of water, its proximity to Portsmouth and to Southampton, and its secure position within the defences of Spithead. What in this case would be a minor consideration would give way to the major, and military and commercial reasons would prevail, and justly prevail, in the selection of the site.

In the case of a Hospital, however, the conditions are reversed, a mere facility of access alone, or cheapness of administration, should not be allowed to weigh against any appreciable deficiency in that which is the first and most indispensable requisite, namely, a pure and healthy atmosphere on a dry soil.

Facility of access by water, if such facility exist, must not be overlooked; but the water on the shoal and mud banks opposite the Hospital is so shallow that no vessel of the tonnage usually employed in the transport of our sick, could anchor within 1,000 yards of the shore, a distance probably greater than would be reached by any pier to be there constructed.

If this be so, the patients must either be landed in boats, which is an inconvenient process, or be landed at Southampton or Portsmouth. A branch railway, in the latter case, would be necessary, in order to secure easy access to the Hospital for patients coming, not only from abroad, but from garrisons and stations at home.

Present state of Works.

We proceed now to consider the plan and construction of the building itself, as fitted for the purposes of a Hospital, and we may here observe, as bearing both on our own subsequent recommendations, and on the course which Her Majesty's Government may be disposed to take in the matter, that the foundations of the whole building are laid, and that the granite plinth of the Hospital itself is now completed, and stands about five feet above ground. The offices in the rear of the Hospital, a large portion of which consists of but one story, are advancing towards completion. A return has been sent to us showing that up to the date of that document 30,000*l.* had been expended on the site, and 89,000*l.* on the works and building, the two sums amounting together to 119,000*l.*

Having thus given the history of the objections taken to Netley, and the proceedings founded thereon, and described the site and the present state of the works, we proceed to discuss the advantages or disadvantages of the plans as they now stand, and what we consider to be their defects.

General principles of Hospital construction.

Before proceeding to state our conclusions on the questions submitted to us, it appears necessary to lay down those general principles governing the selection of sites and the construction of Hospitals, which recent experience has indicated as the best, and then by contrasting those requirements with the Netley plans, we hope to enable the Government to arrive at a right decision on this important question.

Requirements for Hospitals.

The following requirements are essential in all Hospitals:—

1. Pure Air.
2. Pure Water.
3. Abundance of Light.
4. Facility of Administration and Discipline.
5. Convenience and Facility of Access.
6. Economy in Construction and Safety from Fire.

Any sacrifice for any purpose whatever of the first three requirements must be inevitably attended with danger to the sick. Neglect of the last three requirements will result in unnecessary expenditure.

A properly constructed Hospital ought to combine all of them, but the sanitary requirements must precede the economical and administrative, for the end of the whole procedure is the recovery of the sick; and in all Army Hospitals, rapid recovery, and a low rate of mortality, are true economy.

Requirements as to Sites of Hospitals.

The condition of the air, light, and water of a Hospital depend, first of all, on the situation and exposure of the ground selected for its site. The soil and subsoil should be dry and self-draining. There should be no marshes or muddy ground near it. Any Hospital constructed on a site chosen in violation of these primary conditions would be unfavourable for the recovery of cases having the remains of tropical fevers upon them. For the majority of cases arriving from tropical climates, the local climate of the district where the Hospital is situated ought to be dry, bracing, and mild, and the air as pure and free from organic impregnations as it is possible to obtain it. A more relaxing climate is suitable for certain classes of chest complaints; for the greater proportion of other cases it would be injurious. A moderate elevation above the surrounding country, and protection from cold northerly and easterly winds are also most desirable, provided the configuration of the district allows at the same time a free circulation of air in all directions. The water supply of all Hospitals should be pure, soft, and abundant, and laid on hot and cold all over the building.

It is proposed to supply Netley Hospital with water from a reservoir at a short distance, and also from a well. The water from both sources is remarkably soft and pure, much more so than any water supplied to the metropolis. It will be seen by Mr. Witt's analysis of these waters that they act on lead to a degree which might make it prudent to convey the supply through iron pipes.

Requirements as to Structure of Hospitals.

The first essential of Hospital construction, in order to secure free circulation of air within and without the building, is *simplicity of structure.*

All corners or angles formed by the meeting or junction of masses of building, and all small close courts are inadmissible, as leading to stagnation or delay in the circulation of air.

In like manner there ought to be no unventilated or unlighted parts of wards, or other apartments, within any Hospital.

The buildings externally ought to be exposed freely to the moving atmosphere, and to the influence of sun light; and the interior of every sick ward ought to communicate directly with the open air by windows placed on two opposite sides. It is a manifest error in construction to have wards with windows only on one side, or to cover the windows on one side by a corridor. In either case, light and air are unnecessarily obstructed, and ventilation by natural means is rendered more difficult.

The term "hospital atmosphere," which has been coined to express the fœtid sickly smell which pervades many wards, ought to have no existence in the vocabulary of a properly constructed Hospital. This "atmosphere" is highly detrimental to the sick, and dangerous to the attendants. It is the special cause of Hospital epidemics, and is the result of bad ventilation, overcrowding, defective drainage, and want of cleanliness. Defective ventilation is its most frequent cause, and as sufficient means of natural ventilation can only be obtained by suitable structure, it is necessary to exercise the greatest care in this matter.

The following structural arrangements have been proved by experience to be necessary for insuring a healthy state of the air in sick wards:—

1. In order to avoid the congregation of a large number of sick under one roof, the Hospital should be sub-divided into separate blocks or pavilions. It has been observed that the greater the dispersion, the greater, *cæteris paribus* will be the security from epidemic disease, especially during epidemic seasons. This sanitary rule applies especially to Hospitals, inasmuch as the sick are peculiarly susceptible of the action of a polluted atmosphere.

2. Experience has shown that not more than about 100 sick ought to be placed under one roof, and that there ought not to be more than three sick wards superimposed; two are better still, as diminishing the risk of atmospheric pollution of the upper ward; but in no case should there be more than three superimposed wards.

3. In every ward the windows should be placed opposite each other, and the beds between the windows, with their heads to the wall. There should not be more than two beds between every two windows.

The sun-light should, as far as practicable, fall on every bed, and the beds should be sufficiently near the windows to profit by the ventilation.

4. The amount of cubic space for each patient should not be less than 1,500 cubic feet, which appears to be the amount most suitable for the

twofold object of economy of space and health. A smaller amount would render natural ventilation, in cold weather, difficult, as the air must be admitted at the temperature of the external atmosphere, whatever that may be, and it would require a certain amount of warm air in the ward to mingle with the fresh air to prevent the temperature being lowered too much, as would be the case with a smaller amount of cubic space.

Hospitals of Lariboisière and Vincennes.

The structural arrangements best adapted for securing these primary conditions of health in two different ways are well exemplified in the two most recent Parisian Hospitals—the Hôpital Lariboisière and the Military Hospital at Vincennes, of which plans will be found in the Appendix.

Six pavilions, each containing 102 sick are, in the Hospital Lariboisière placed parallel to each other, 68 feet apart, and at right angles to a corridor of one story, which forms the sides of a quadrangle, and connects the pavilions with each other and with the offices.

At Vincennes, the Hospital is formed of two wings, each consisting of two end to end pavilions under one roof, but separated by large intervening staircases, and joined by a corridor of one story to a centre block, devoted to the administration, the whole forming a letter E. By this arrangement, between 300 and 400 sick will be lodged under one roof.

The defect in the construction of Vincennes is that it militates against the principle we have laid down—that the sick should be distributed under a number of separate roofs. It would, no doubt, be possible to obviate this objection by separating the pavilions completely from each other; still keeping the end to end arrangement; but then it is doubtful whether such an arrangement would not be more expensive, both in construction and in administration, than the other method mentioned, namely, arranging the pavilions side by side.

At the Hôpital Lariboisière the communications are kept up between the *ends* of the pavilions by means of a corridor running round the basement of the Hospital, which does not interfere with the light or ventilation of the wards; while at Vincennes the corridor is carried along the lower flat of the *side* of one pavilion to reach the staircase between the two, and the result is that the lower flat of that pavilion would not be suitable for sick, and is used for offices. A large ward in each wing of two pavilions has thus to be sacrificed to the corridor.

The Lariboisière plan, therefore, is the only one by which the communications all over the Hospital can be kept up without any sacrifice of ward space, and the only one which is capable of extension to a large size without infringing the principles we have laid down.

The Vincennes plan would answer for a small Hospital in an exposed situation, where it was necessary to protect the airing ground from cold winds; but the latter advantage in a large Hospital, for, say 1,000 sick, would be far more than counterbalanced by the necessity of congregating large numbers under a single roof. It might be possible, as has been stated, so to modify the plan as to separate the pavilions entirely from each other, and the connecting corridor might be so arranged as not to require the sacrifice of the lower wards of the pavilions along which it might be necessary to carry it; but if we compare the existing structure of these two Hospitals, the plan of Lariboisière appears to us to present, for a large Hospital, the largest number of sanitary advantages and administrative facilities.

The next point to consider is, what arrangement of the pavilions will form the most easily administrable Hospital, in other words, which in the daily administration will require the attendants and officers to pass over the smallest extent of ground.

This in Lariboisière is accomplished by arranging the pavilions on two sides of a parallelogram, the two other sides being completed by a low screen of buildings, round which the corridor is carried.

At Vincennes the buildings being arranged in the form of the letter E, the central corps de batiment, containing the chapel and offices of the administration, is connected only by the corridors with the two wings, which contain the wards. In going from the extreme point of one wing to the extreme point of the other, the whole length of the building would have to be traversed, and the more the building is enlarged, the more this inconvenience will be felt.

But whether at Vincennes, or at the Lariboisière Hospitals there is but one administration, one kitchen, and one laboratory, for the whole Hospital.

As regards exposure, the largest amount of sunshine can be obtained by placing the axis of the ward north and south, the windows being to the east and west, and receiving the sun on one side or the other nearly the whole day, while northerly winds would fall on the outside walls, and on the windows at a low angle, and be turned off from the building. The parallel pavilions should be placed at a distance apart equal to twice the height of the building. The pavilions at Lariboisière are at a less distance apart, and the sun is thereby partially intercepted.

As a general principle of construction, all Hospitals should, like those of Lariboisière and Vincennes, be raised on substructures, to allow of free circulation of the air beneath the building, and to cut off malaria and damp.

Advantages of separate Pavilions.

The advantages of a Hospital constructed in separate pavilions, and so placed, are obvious:—

1. The sanitary requirements as to numbers of sick under one roof, sufficient means of natural ventilation, and abundance of light, are fulfilled.

2. The arched corridor, with its open terrace above, affords every facility for exercise for convalescents in all states of the weather.

3. Administration and discipline are facilitated.

4. The risk of fire is greatly diminished.

Internal arrangement of Pavilions.

The internal arrangement of each pavilion should be as follows:—

1. Three superimposed wards should constitute the bulk of the structure.

2. The water-closets and urinals should be placed at one end of the pavilion. They should be entirely cut off by double doors and ventilated lobbies from the wards, and they should be placed at the end opposite the entrance.

3. The end of the pavilion next the corridor should contain the wide, open, ventilated and warmed staircases for communicating with the different stories.

4. It should also contain one or more dining-rooms for convalescents, and a lift.

5. On each landing there should be a small ward for two sick, with a separate water-closet.

6. On each landing a small scullery, with means for preparing poultices and warming drinks and articles of diet.

7. A nurse's room to each story.

8. A medical officer's room and an assistant ward master's room to each pavilion.

Size of Wards.

As regards the size of wards, this must be determined by limiting the number of beds in each ward to that which is most conducive to the comfort and recovery of the sick, and to facility and economy of administration.

The epithets, large and small, are comparative. In France, a ward of eighty beds is a large one, and a ward of twenty-five or thirty a moderate sized ward; and the latter, which is in England not unusually called a large ward, is probably best adapted for the purpose of a Military Hospital.

It is stated by many medical men that the sick recover better in small wards than in large, without apparently remembering that it is the purity of the air and not the size of the ward that determines the recovery of the sick. If the air in a small ward is purer than in a large ward the sick will recover better in a small ward. But then it must be shown, that a small ward is necessarily better ventilated than a large one, which is not the case, for we believe that it requires more care to ventilate a small ward than a large one, owing to the greater liability to draughts, and the greater proportion of corners (*i.e.*, places where delays in the circulation of air occur) which exist in small wards in proportion to the cubic space, than is the case in large wards.

In all Hospitals there are cases in which, partly from the nature of the disease, partly from the temperament of the patient, treatment in seclusion is necessary, and, for these, wards containing two, or even single beds, must, in any case, be provided; but wards of nine beds each are neither large enough for attendance and administration nor small enough for privacy.

Soldiers, it must also be recollected, are in the habit of being barracked together in squads, while the invalids who form the bulk of the patients in our General Hospitals are chronic cases, not requiring seclusion or separate treatment. Seclusion is, therefore, neither required by the habits of the soldier nor by the prevailing nature of the diseases.

Treatment will be just as efficacious in large as in small wards, if the ventilation in both be equally well regulated, as it ought to be, while, in defec-

tively constructed Hospitals, large and small wards will be found, side by side equally unhealthy.

If it be possible, as it certainly is, to ventilate large wards efficiently, then, taking this for granted, we have to enquire what is the size of ward best adapted for discipline, and most economical for administration in a Military Hospital.

One thing is certain, that in small wards discipline is more difficult and administration less economical than in moderately large wards. We cannot better sum up our opinion in favour of moderately large wards than by quoting the remarkable evidence of Miss Nightingale, given on this subject to the Commission on the Sanitary Condition of the Army. She is asked:

Miss Nightingale's evidence.

"*Question* 10,025.—Will you state what you consider the number of sick which a ward should contain, for health, discipline, and administration, with your reasons for preferring one number to another?"

"*Answer.*—The best size of wards for ensuring the two conditions of health and facility of discipline, is from twenty to twenty-five sick.

"Wards smaller than these are more difficult to ventilate by natural means alone. A certain amount of space is requisite for diffusion, in order to secure perfect natural ventilation.

"The mode of construction in Hospitals is, it is presumed, to be determined by that which is best for the recovery of the sick. If any other consideration is taken, such or such a percentage of mortality is to be sacrificed to that other consideration.

"But it so happens that the safest for the sick is the most economical mode of construction.

"Take the example of Portsmouth Hospital, or of Netley, where the windows are at each end of the ward. There should not properly be more than four beds in each of those wards. For it is undesirable ever to allow more than two beds between each two windows; otherwise, when the windows are opened, the effluvia blow over all the intervening row of beds before escaping.

"Wards of a smaller size than those indicated above, viz., of twenty to twenty-five, are decidedly objectionable, because unfavourable to discipline, inasmuch as a small number of men, when placed together in the same ward, more readily associate together for any breach of discipline than a larger number.

"It has been proved by experience that the presence of female nurses in large wards renders discipline extremely easy, and that a sufficient number of female nurses cannot be allotted in smaller wards.

"In the event of a death taking place in the ward, the survivors, when they are few in number, are far more likely to be affected by it than a larger number.

"It is very desirable, for the purposes of discipline, that men of the same regiment should not be placed together in the same small wards of General Hospitals.

"Two other considerations are involved in that of the size of wards, economy and clinical instruction.

"It may be asked, why should not all the sick be placed in one ward, provided there be cubic space enough? The answer is, with from twenty to twenty-five sick a height of 15 to 16 feet is enough, but it would not be enough for more, and height always involves expense.

"The greatest economy, and the greatest safety to patients, is in the above number.

"Also, without the most perfect ventilation, there is always more danger of effluvia being driven by a draught till it accumulates in one part of a very large ward, as was the case in the long corridors of Scutari.

"Wards of a moderate size, like those indicated, are better for the purposes of ventilation than wards half the size, and are less subject to a hospital atmosphere than wards of double the size. But a ward of this latter size may be rendered perfectly healthy by having a height in proportion to its width.

"Where clinical instruction is intended, to admit even a class of six students into a ward of twelve sick is increasing the population in the cubic space by one-half. There is more than twice the room proportionally for students in a ward of double the size. On the other hand, if the number of students be very large, a ward of from twenty to twenty-five patients, it must be

at once admitted, is too small. The ward must be increased, and with it its height and its cubic space; for, be it remembered, the whole of the proportions of the ward, not only its length, must increase with its number of beds; for, if the ward be very long, in proportion to its height and breadth, it becomes not a ward but a corridor, and all corridors are objectionable for sick, because it is impossible to ventilate them safely; because, in admitting air, the effluvia may be driven from one end, and be accumulated at the opposite end faster than it can be taken out. The right proportion is a fixed one; but in a ward for forty patients, twenty bad cases will be disturbed while twenty slight cases are being examined. If twenty sick only be put in each ward, the slight cases may be put together.

"The cubic space for each patient has been fixed by European sanitary science at not less than 1,500 feet.

"A good proportion for a ward of twenty patients would be, 80 feet long 25 feet wide, and 16 feet high. This would give 1,600 cubic feet to each bed. It would give 13 feet between foot and foot, which is not too much where there is a clinical school. It would give an average of eight feet to each bed.

"Half the sick are supposed to be on each side the ward."

"*Question.*—What is the best proportion of windows to beds, and what ought to be the relative position of windows and beds, with your reasons for preferring one arrangement to another?"

"*Answer.*—One window should be allotted for every two beds; thewindow, to be not less than four feet eight inches wide, within two or three feet of the floor, so that the patient can see out, and up to the ceiling.

"The pair of beds between the windows to be not less than three feet apart. With a very bad fever case, I would leave the other bed empty, for the sake of isolating the patient. Miasma may be said, roughly speaking, to diminish as the square of the distance. With good ventilation, it is not found to extend much beyond three feet from the patient; although miasma from the excretions may extend a considerably greater distance.

"The windows are to be placed opposite each other, and to be either double or filled with plate glass; the former is preferable, as it affords the opportunity of indirect ventilation in all weather. Wire-gauze across the open part of the window would afford an extent of surface for ventilation not otherwise to be obtained, and preclude all possibility of draught upon the patient.

"The window opening as at Middlesex and Guy's Hospitals, in three or more parts, with an iron casting outside, to prevent a delirious patient from throwing himself out, is the best form of window.

"No part of the ward ought to be dark. It is of the utmost importance, in many cases. The light can always be modified for individual patients. But even for such patients to have light in the ward is not the less important.

"There are three reasons for this multiplicity of windows—

"1. Light.

"2. Ventilation.

"3. To enable patients to read in bed.

Necessity of Light.

"The necessity of light is established by all scientific inquiry and experience. The proportion of windows to cubic space is of the first importance to health. It has been lost sight of in English architecture, owing to the unfortunate window-tax, which has left its legacy in giving us a far smaller proportion of light than in French houses. In huts, the proportion of window space to cubic space is far greater than in buildings. One main cause of the unhealthiness of large numbers of men congregated in one large building, even with sufficient cubic space, is the disproportionately small window space. In the huts in the Crimea, during the last twenty-two weeks of our occupation, the mortality of the whole army was only two-thirds of what it is in England.

"For the same purpose of ensuring a sufficiency of light, the walls should always be white, excepting perhaps for ophthalmia wards."

Ventilation and Warming.

With respect to the ventilating and warming of Hospitals, we are of opinion that in this climate, and with abundance of fuel, ventilation should be obtained by natural means, namely, windows, doors, and fireplaces, assisted, if need be, by ventilating shafts carried up from the ceiling of the wards, and this can only be done with success by attending to the structural requirements we have pointed out.

Warming in Hospitals can be best accomplished by open fire-places, of sufficient size, two for a ward of twenty-four to thirty sick. These should be placed on opposite sides of the ward, but not opposite each other.

The corridors and staircases ought to be ventilated and warmed separately.

The ventilation of a sick ward depends very much on the distance between the windows across the ward.

If wards be too broad the natural ventilation is apt to become imperfect, even with open windows.

For facility of natural ventilation, wards, of whatever length, should never exceed thirty feet in breadth between two opposite windows.

Wards at Lariboisière.

Of the largest wards in Lariboisière the dimensions are :—

Length	.. ..	111 feet 6 inches
Breadth	.. ..	30 feet
Height	.. ..	17 feet 6 inches

which for thirty-two sick gives a larger amount of cubic space than we have prescribed above.

Natural Ventilation.

Ventilation by natural means is easy enough in summer, but not so easy in cold weather, when there is a great difference in the temperature within and without. A practical illustration of the difficulty of the case came under our notice at the Military Hospital at Winchester, where during cold weather the ordinary ventilation produced bronchitis among the sick, and when the ventilation was diminished on that account phagedena appeared. But in this instance the ventilation of all the wards in the building communicates by corridors and staircases.

With properly constructed wards, sufficient cubic space for the sick, and suitable means of ventilating and warming, neither the one disease nor the other ought to have appeared. We mention this case as an illustration of the necessity of well-considered structural arrangements in Hospitals being indispensable to the successful use of natural ventilation.

Artificial Ventilation.

It is necessary here to allude to those artificial systems of ventilation which are coming into extensive use abroad, both in Civil and Military Hospitals.

During winter, when they are in use, the wards are closed from the access of the external air, and are supplied, by artificial means, with air heated to 60°F., in such proportion as appears requisite to preserve the air of the wards sufficiently pure.

One chief object of these systems is to save fuel in countries where fuel is costly, but, apart from this, it is very doubtful whether the maintenance of an unvarying temperature round the sick is conducive to their benefit. In certain cases it no doubt is so, but the great majority of cases in a Military Hospital would, as it appears to us, be rather injured than benefited by a constant unvarying temperature. There is no heat so healthy or cheerful as radiant heat from an open fireplace, and the general experience of Hospitals in Great Britain and Ireland has shown that wards can be sufficiently warmed during the coldest weather by this means. It is always possible to diminish the great loss of heat from thin glass windows by doubling the glass, or by using thick plate glass in ward windows; and by building Hospitals with hollow walls.

Comparative cost of Attendance.

We next proceed to consider the comparative cost of attendance in Hospitals built of large and small wards.

In a Hospital consisting of wards of nine sick, one orderly would be required for day service in each ward, and one for night service, or two orderlies for every such ward. Otherwise one bad case would keep the one orderly on duty during the twenty-four hours. One nurse could superintend three such wards. It hence follows, that for twenty-seven sick in three wards, containing nine sick each, six orderlies and a nurse would be necessary, or about twenty-two orderlies and four nurses for every 100 sick.

If a Hospital were constructed of wards for thirty sick each, three orderlies and one nurse could do the whole duty day and night; that is, for every 100 sick, in wards of thirty each, ten orderlies, and a little more than three nurses would be required, or about one-half the staff necessary for the smaller wards.

If separate wards were set apart for convalescent patients, such wards, whatever their dimensions, could be administered at a smaller cost for attendance than if they were occupied partly or wholly by sick. A proper classification of cases would, therefore, save expense.

The expense of nursing and attendance would be about double for small wards than it would be for the larger wards.

If we take the cost of wages, rations, lodging, &c., at 50*l.* per annum for orderlies or nurses, then according to the present value of money (thirty-three years' purchase) the cost in perpetuity of nursing 1,000 sick, in wards of nine, would be, in round numbers, about £427,000

While in wards of thirty sick it would be 220,000

At 4 per cent. the cost of nursing in wards of nine sick, would be £324,000

For wards of thirty sick 166,000

With a proper allowance of cubic space, and abundant means of natural ventilation, wards for thirty sick might very well be used. Wards for twenty-four would perhaps be better, but they would cost, in administration, with money at 3½ per cent., 250,000*l.*, and at 4 per cent., 200,000*l.* for 1,000 sick.

One kitchen is quite enough for a Hospital of 1,000 sick. To have two is simply to double the cost, without any corresponding advantage. **Duplicate Offices in Netley Plan.**

We have confined ourselves in the preceding pages to the more important sanitary principles on which Hospitals ought to be built, without descending to details of structure. These principles we believe to represent the present state of knowledge on the subject. They are not theoretical, but may be all seen in application in the more recently constructed Hospitals of different countries.

It is only reasonable to expect that they should be embodied in a great Military Hospital, which is to serve at once as a school of instruction for the entire Medical Service of the British Army, as a model on which Hospitals should be constructed and governed, and as a place of recovery for sick and convalescents from all countries and climates. **Principles should be embodied in a Military Hospital.**

That there are a number of striking discrepancies between the more important principles stated above, and those embodied in the plans of Netley Hospital, will be obvious from the following contrasts:— **Contrast with Netley Plan.**

Requirements for a Hospital to accommodate Convalescents and Sick.	*Netley Plans.*
1. A dry, bracing, and mild climate. No marshes, mud banks, or other sources of malaria. Dry, self-draining subsoil.	1. Site on the banks of a tidal estuary, receiving the fresh water drainage from an area of nearly 700 square miles in Hampshire and Wiltshire. Soft mud banks, ten square miles in extent, containing a large quantity of decomposing organic matter, exposed in the estuary to air and sun twice in 24 hours. Mud directly opposite the site, soft, and underlaid by peat, giving off gas and offensive smell during warm weather, especially when disturbed. The sewage of Southampton, with a population of 34,000 inhabitants in 1851, and now rapidly increasing, turned into the estuary on the same side, and about three miles above the site of the Hospital. Air in vicinity of Hospital not dry nor bracing, but soft and relaxing. Sub-soil—clay.
2. Simplicity of construction. All parts of the ward walls should be exposed externally to direct air and sunlight. Wards should communicate on opposite sides directly with the external air by windows opposite each other. Axis of ward should run north and south, and the ward windows should look east and west.	2. Building about 1,400 feet long, in a single line. Ward windows open into the external air, on north-east side only. Sun only falls directly on the ward windows on the north-east side early in the morning in the middle of summer. No direct sunlight or air touches the external walls of the wards from any other direction, except in the wards at the end of the long range of each wing.

Requirements for a Hospital to accommodate Convalescents and Sick.	*Netley Plans.*
	The whole of the south-west side of the Hospital, on which sunlight and air ought to fall directly, is covered by a corridor, which, without constant attention to the ventilation, could easily permit the atmosphere of different wards on the same flat to intermingle. The ward windows thus communicate directly with the external air only on the side least adapted for either light or ventilation.
3. The means of natural ventilation should be ample.	3. Means of natural ventilation, though greatly improved in the amended plans, would be mainly on one side through the corridor in winter. Moreover, artificial ventilation appears to have been recommended by the former committee to supply this defect.
4. No more than about 100 sick should be placed under one roof. Each building for 100 sick should be detached from every other.	4. Each of the two wings of Netley is intended to hold about 500 sick under one roof, thereby increasing the risk of impure air from the greater difficulty of ventilation, and also the risk from fire, as the only means of escape from the wards is by the corridor, which might be destroyed unless built of fire-proof materials.
5. All the parts of a Hospital should be so planned and arranged that the distance to be traversed for administrative purposes should be as short as possible. Kitchens, laboratory, stores, and offices, should be at a convenient distance from the sick wards, and there should be the means of continuous *circulation* all round the building. One kitchen and one set of offices would, on the principles laid down, be sufficient for a Hospital of 1,000 sick.	5. Netley Hospital is about 1,400 feet long from one end to the other, and has no means of *circulation*. It would be impossible to administer it as one Hospital. The following offices have had to be provided in duplicate, or even in greater numbers, in some of which one set would have been sufficient:— Kitchen, pantry, larder, scullery, steward's living room, steward's bed room, room for arranging dinners, set of store rooms, set of provision rooms, set of bedding rooms, set of medical officers' rooms, medical registry, drug room, dispensary, set of orderlies' rooms, set of ablution rooms, wash-houses, set of latrines, dust, dead-house, post-mortem room, set of dirty clothes' rooms, dissecting room, set of stores, coal store, set of cook's rooms, pack store, set of contagion wards, set of itch wards, library, Principal Medical Officer's and clerk's room, wardmaster's living room, wardmaster's bed room. There are no fewer than six medical registry offices and eight utensil stores, where one of each would do.
6. A Hospital should be capable of easy extension by addition of parts.	6. Netley Hospital is incapable of extension without injury either to its sanitary state or to its means of communication.
7. Wards for 25 to 30 sick with windows placed opposite each other,	7. Most of the wards at Netley are for eight or nine sick, an arrangement

Requirements for a Hospital to accommodate Convalescents and Sick.	*Netley Plans.*
and between the beds, are more healthy than smaller wards, from the greater facility of ventilation, while they are much less expensive for administration than small wards of eight or nine sick.	which, without increasing the comfort or security of the sick, will augment the cost of nursing and attendance from the large number of officials required for a Hospital of small wards.
8. In all Hospitals, the beds should be arranged with their heads between the windows for light and air.	8. In the Netley plan the beds are arranged with the heads to the blank walls, and all the effluvia from the sick must rake all the other beds before escaping.
9. There should be at least one window to every two beds, with the beds between the windows.	9. This arrangement is impossible in Netley Hospital. The beds are arranged along the dead walls.
10. The breadth of wards for 30 sick between the opposite windows should not exceed 30 feet, although it might be less.	10. The distance between the opposite windows at Netley for a ward of only nine sick is thirty-six feet.
11. There ought not to be more than three large wards in a pavilion.	11. Each of the two wings of Netley contains forty-three wards for sick.

Conclusion.

We have contrasted together the more prominent differences between the plans of Netley and those of Hospitals representing the present state of knowledge and experience.

The Committee appointed last March by your Lordship to consider to what extent the sanitary defects of the plans insisted on by the medical officers of the Middlesex Hospital could be remedied, consistently with the preservation of the foundations of the building, then raised several feet above the ground, made a number of important alterations with this object, which received your Lordship's sanction.

Keeping in view the principles which ought, in our opinion, to be embodied in all buildings constructed for Hospital purposes, we have attempted to proceed further in the same direction, and at the same time to remove certain structural defects as regards the administration of the buildings which have been brought under our notice

It occurred to us that wards containing from twenty-four to thirty sick, constructed as separate pavilions, on the principles we have already enunciated, might be thrown back at proper intervals from the corridor which would serve as a communication to all; but pavilions so built would abut on the offices which are already erected, and so create unventilated courts of a very objectionable character, while the greater part of the existing foundations would be wasted.

We attempted likewise, with a view to reduce the cost of administration which the form of Netley Hospital will entail, by removing partition walls, so as to throw three wards of nine into one ward of twenty-four, lit by windows on either side, the beds being ranged between the windows. In this case, however, owing to the great width of the wards (36 feet), which is in itself unfavourable to ventilation, a great waste of space would be incurred, without a proportionate advantage attending it, while the number of patients to be accommodated in the Hospital would be materially reduced. In any case the duplicate arrangements of the kitchens and offices would remain unchanged, for they do not admit of combination into one. Still the building would be improved, in some respects, by this alteration.

The fallacy which lies at the root of all its structural defects, is the subdivision into small wards for nine sick, a requirement altogether unnecessary for health, or discipline, and to which it has been necessary in the plan to sacrifice the light, air, and administrative facilities of the Hospital.

In fact, the plan of Netley is not so much that of a Hospital, as of a gigantic barrack, or rather of two barracks, each capable of accommodating a battalion of 1000 men. The plan of the wards or barrack-rooms is preferable, in our opinion, to that which is often seen in barracks, as at the Tower and at the

Wellington Barracks, where the rooms are placed back to back, and lit but on one side, and are ventilated into one another. The corridor, if unglazed, would afford excellent communication between the rooms, as well as shelter for the formation of guards, &c. The site is not, probably, sufficiently deleterious to injure persons in robust health, although not well adapted to promote recovery from disease.

The distance of Netley from any garrison, or any locality, where it is important to maintain an armed force, may militate against the change of destination here suggested; but if an additional station is required for the depôt battalions, which the increased amount of the Queen's forces now employed in India, may necessitate, the above-mentioned drawbacks to the site cease to have weight, as the depôts cannot be made available for garrison or police duty.

We therefore recommend that the building at Netley be finished as a barrack, with such alterations and reductions in height and fittings as may be necessary, and that a Hospital constructed on the principles we have defined be built elsewhere.

We have shown that a large sum has actually been spent upon the buildings, a portion of which would be sacrificed if it be attempted materially to alter the building; and we have shown that such alteration will, after all, be very ineffective for its purpose.

We have shown that, altogether apart from the question of its advantages or disadvantages as a Hospital, the cost of administration and attendance on the present plan will be so large, that even were Netley abandoned, together with the 119,000*l.* already sunk, another Hospital might be built on another site, on a plan which would reduce the cost of administration by a sum equal to the money so sacrificed.

But if the suggestions we have made be adopted, the money already sunk will not be lost, economy of construction will equally be secured, and a Hospital might be erected, which would be the best that the present state of knowledge on this subject would enable the Government to construct, in which the greatest chances of recovery would be afforded to the sick, combined with the greatest facilities for discipline, administration, attendance, and economy. Such a Hospital would further afford the means of establishing a Medical School, an institution which was not contemplated when the plans of the Netley Hospital were originally drawn, the wards of which are, from their small dimensions, inapplicable for clinical instruction to a large number of pupils. The nation would then feel satisfied that the money ungrudgingly given had been laid out in the manner best calculated to attain the object in view, and an institution erected, which would be a model for all other Hospitals, whether as regards construction or administration, which would afford the means of establishing a Medical School, such as the army urgently requires, and which would be worthy of the intentions of its founder and of the British nation.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

March 12, 1858.

Appendix to Confidential Report.

REPORT OF CHEMICAL INVESTIGATIONS relating to the Site of the New Hospital at Netley, near Southampton, and of Analyses of the Drinking Waters.

Sir, *Museum of Practical Geology, March* 10, 1858.

IN accordance with instructions forwarded to me by Mr. Frederick W. Lancaster, Secretary to the Barrack and Hospital Improvement Commission, on the 2nd of last month, I have visited the Barracks at Netley, near Southampton, and collected samples of the sea water from the various points mentioned in your letter of the 29th of January, viz.:—

A. Opposite Netley Barracks, at low tide.
B. Opposite Netley Barracks, at high tide.
C. At the mouth of the Itchen River.
D. At a point above Southamptom between Cracknor Hard Ferry and March wood; and also—
E. From the open sea at Calshot Castle,

and I now beg to submit to you the results of the analyses of the same.

Samples were likewise collected of the mud on the shore opposite the new Barracks at Netley (F and G), and in the following report will be found the results of their analysis, together with the observations which I have to offer respecting the probability of the formation of miasmata by the action of the sea water upon this mud.

Lastly analyses have also been made of the two samples of drinking water forwarded to me from Netley on the 10th of February (H and I), the result of which you will find highly favourable to the suitability of these waters for drinking purposes.

A.

Analysis of Water of the Southampton Water off Netley Barracks, at Low Tide, 10 A.M., February 5, 1858.
Temperature of Air, 50° F.; of Water, 50° F.
Specific Gravity, 1021·75.

Direct result of Experiments.—

Total Solid Residue. .	1841·08	grains in the gallon.
Sodium	605·75	„
Potassium	26·54	„
Lime	17·159	„
Magnesia	73·92	„
Chlorine	1000·04	„
Sulphuric Acid	125·118	„

Arrangement of Results:—

Chloride of Sodium	1540·71	grains.
Chloride of Potassium	50·70	„
Chloride of Magnesium	55·09	„
Sulphate of Magnesia	150·91	„
Sulphate of Lime	41·66	„
Carbonate of Lime, Bromide of Magnesium, &c.	2·00	„
Total	1841·07	grains.

B.

Analysis of Water of the Southampton Water, off Netley Barracks, at High Tide, 3 P.M., February 5, 1858:—
Temperature of Air, 48° F; of Water, 43° F.
Specific Gravity, 1023·825.

Direct Results of Experiments:—

Total Solid Residue	2213·12	grains in the gallon.
Chlorine	1173·10	„
Sulphuric Acid	132·18	„

C.

Analysis of Sample taken at the Mouth of the Itchen River, at a Distance of about 200 yards outside the Docks, at Low Tide, at 1·50 P.M., February 5, 1858.
Temperature of Air, 50° F.; of Water, 44° F.
Specific Gravity, 1016·825

Direct Experimental Results:—

Total Solid Residue	1462·90	grains in the gallon.
Chlorine	827 71	„
Sulphuric Acid	97·065	„
Lime	19·714	„

D.

Analysis of Sample, taken at a point, *above Southampton*, midway between Cracknor Hard Ferry and Marchwood, in the mid-stream, at Low Tide, 1 P.M., February 5, 1858:—

Temperature of the Air, 50° F.; Water, 44°, F.
Specific Gravity, 1017·085

Direct Experimental Results:—

Total Solid Residue ..	1315·05	grains in the gallon.
Chlorine	817·95	"
Sulphuric Acid	97·09	"
Lime	16·759	"

E.

Analysis of Sample of Sea Water, taken off Calshot Castle, at High Tide, 2·45 P.M., February 4, 1858:—

Temperature of Air and Water the same, viz., 48° F.
Specific Gravity, 1027·3

Direct Experimental Results:—

Total Solid Constituents ..	2588·7	grains in the gallon.
Chlorine	1358·5	"

Table of Comparison of Analyses of the Water of the Southampton Water at various points from Calshot Castle to Cracknor Hard Ferry.

	At Calshot Castle.	At Netley, Low Tide.	At Netley, High Tide.	At the Mouth of the Itchen River.	At Cracknor Hard Ferry.
	Grains in the Gallon.	Grains in the Gallon.	Grains in the Gallon.	Grains in the Gallon.	Grains in the Gallon.
Total Solid Residue	2588·7	1841·08	2213·12	1462·90	1315·05
Chlorine	1358·5	1000·04	1173·10	827·71	817·95
Sulphuric Acid ..	..	125·118	132·18	97·065	97·09
Lime	..	17·159	..	19·714	16·759
Specific gravity ..	1027·3	1021·75	1023·825	1016·825	1017 085

On inspecting the preceding table, the following points are remarkable:—

1st. The steady diminution in the specific gravity, and amount of total solid constituents, as we proceed from Calshot up the river.

2nd. The increase of salts at Netley at high tide, above what is present in the water at low tide, from the larger admixture of sea water.

3rd. The increase and diminution in the quantity of sulphates, in proportion to the amount of sea water; whilst—

4th. The quantity of lime increases as we ascend the river; and curiously is larger at the mouth of the Itchen than at Cracknor. This, doubtless, arises from the Itchen bringing down more lime in solution.

It may be interesting to compare my analyses at Netley, and at Calshot, with Dr. Schweitzer's analysis of the water of the English Channel, made at Brighton in July 1839.

	English Channel (Schweitzer) July 1839.	Southampton Water (at Netley) February 1858.	English Channel (at Calshot).
(In Grains in the Gallon)			Chlorine.
Chloride of Sodium	1894·13	1540·71	
„ Potassium	53·55	50·70	1358·5
„ Magnesium	256·62	55·09	
Bromide of Magnesium	2·03	Trace.	
Sulphate of Magnesia	160·65	150·91	
„ Lime	98·42	41·66	
Carbonate of Lime	2·31	2·00	
Total Solid Constituents ..	2467·71	1841·07	2588·7

This comparison serves to point out the extent of dilution of the sea-water at Netley by the river water.

Analysis of Mud.

Sample F of the Mud from which the Sea Water had receded.
Dried at 212° Fahrenheit.

	I.	II.	Mean.
Organic Matter	11·9 ..	11·8 ..	11·85
Mineral Matter—			
a Insoluble in Acids (Sand and Clay)	73·5 ..	73·2 ..	73·35
b Soluble in Acids (Carbonate of Lime, and Soluble Silicate of Alumina)	.. ..	.. ..	14·80
			100·00

Total Nitrogen .. .. .. 0·23 per cent.
Phosphoric Acid (in Ash) .. Trace.

Sample G of Mud still Submerged.

	I.	II.	Mean.
Organic Matter	21·9 ..	21·6 ..	21·7
Inorganic Matter—			
a Insoluble in Acids (Sand and Clay)	60·5 ..	61·1 ..	60·80
b Soluble in Acids (Carbonate of Lime, and Soluble Silicate of Alumina)	.. ..	.. ..	17·45
			100·00

Total Nitrogen .. .. .. 0.357 per cent.
Phosphoric Acid (in the Ash) .. Trace.

The latter sample of mud contains nearly as large a proportion of organic matter as the mud of the Thames at Westminster Bridge;* nevertheless, this does not arise from the presence of animal excrementitious matter, but merely from the roots of weeds, which are very abundant. That there is but a very small quantity of animal matter present, is proved by the fact that the quantity of nitrogen amounted only to from 0·23 to 0·357 per cent., and the ash of this mud contained a mere trace of phosphoric acid; whilst the insoluble matter of sewage (Savoy Street sewer, London),† contained 55·89 per cent. of organic matter, 4 per cent. of nitrogen, and 1·27 of phosphoric acid.

Sanitary Question.

With regard to the general question of the disengagement of offensive or deleterious gases by the action of the sea water upon the mud opposite Netley, I regret to say that, although great care was bestowed upon the collection of samples of the air over the exposed mud, and also of the gases evolved by stirring the mud, which was still covered with a shallow stratum of water, their examination has led me to no decisive result. The air did not differ in composition from ordinary atmospheric air, and did not contain a quantity of sulphuretted hydrogen, or any other offensive compound recognisable by chemical tests; whilst the gas escaping from the submerged mud consisted chiefly of atmospheric air, together with a small quantity of marsh gas.

Nevertheless, this by no means satisfies me of the healthfulness of the situation; for it is a well established fact that putrefactive decompositions of organic matter, and likewise other chemical changes caused by organic matter, require a certain temperature to induce them. It is highly probable that below 60° F. such changes take place very slowly if at all. Even the water of the Thames at London Bridge is devoid of smell on a cold winter's day, but every summer gives us renewed evidence of the offensive effluvia disengaged by the *decomposition* of the sewage mud in the river in hot weather.

In order, therefore, to ascertain this point satisfactorily, it would be necessary to examine the air during the hot summer months when the mud is exposed to the action of the sun whilst saturated with sea water; for, on the occasion of my visit, not only was the temperature very low (varying from 48° to 50° F.), but also a strong wind was blowing from the south-west which would rapidly carry away any effluvia which might have been disengaged.

It is a well known property of organic matter to decompose the sulphuric acid of the sulphates of magnesia and lime present in sea water, reducing them to the state of sulphides, which by the action of the carbonic acid of the air, give rise to the formation of sulphuretted hydrogen.‡

The malaria of the western coast of Africa is attributed, by Dr. Daniell, to hydrogen compounds, resulting from the decomposition of the sulphates, in this way, by the organic matter, with which the rivers from the interior of the country are charged.

The experience of our own coasts, also, teaches us that in times of epidemic diseases the greatest amount of sickness prevails where the refuse of a populated district meet with the waters of the sea. A reference to the cholera map of England published by the Registrar-General will support this view.

And in further confirmation of this it may be mentioned that I have in my possession some very interesting specimens of wood, found on the coast near Harwich, which have been converted into a mass of iron pyrites by the reducing action of the organic matter upon the sulphate of iron locally present in the sea-water, which sulphate of iron had itself been produced by the oxidation of iron pyrites existing on the coast, by the joint action of air and water.

These facts being established, and remembering that the sea water at Netley contains from 125 to 132 grains of sulphuric acid in the gallon; and that there is present in the mud from 11 to 21 per cent. of organic matter, it appears to me highly probable that in hot weather offensive and perhaps deleterious effluvia may be disengaged by the action of this mud upon the sea water.

* See Report of Chemical Investigations, relating to the Metropolitan Main Drainage Question, by A. W. Hofmann, and H. M. Witt, page 5.

† Opus Cit., page 12.

‡ See Bischof's "Elements of Chemical and Physical Geology," I, p. 419.

This opinion is moreover supported by the circumstance that the submerged mud was found, in places, to be quite black, from the presence of sulphide of iron, and on treatment with a strong acid gave off a perceptible amount of sulphuretted hydrogen.

This mud, which consists chiefly of a blue clay, as the analyses show, has an average depth of from six to seven feet. On the occasion of my visit there was, at low tide, about 100 yards of the mud exposed; but I am informed that at the low spring tides there are 400 to 500 yards of the mud dry, though only for two hours at a time, twice in the twenty-four hours.

There are at certain points on these mud banks depressions called "leeks," into which the sea water runs when the tide is receding, and in which the weeds accumulate. The effluvia escaping from these leeks is well known in the neighbourhood, and there can be no doubt that they present the most favourable conditions for causing the decompositions of the kind above referred to.

As regards the influence of the sewage of Southampton, it appears that the volume of the Southampton Water is really so large that its purity cannot be seriously affected by its admixture with so comparatively small a quantity of sewage.

Drinking Waters.

With respect to the drinking waters from Netley, the *water from the Reservoir*, Sample H, was found to contain:—

Sulphate of Lime	3·0	grains in the gallon.
Carbonate of Lime..	0·8	„
Iron (in suspension)	trace	
Common Salt (Chloride of Sodium) ..	1·4	„
Chloride of Potassium, Magnesian Salts, Carbonate of Soda, &c.	0·3	„
Organic Matter	0·9	„
Total solid residue	6·4	„

Its hardness by Dr. Clarke's soap test was—

Before boiling	3·8
After „	3·0
Loss by boiling ..	·8

This is, therefore, a remarkably pure water, being very soft, containing but a very small quantity of saline impurities; and, although there is an appreciable quantity of organic matter, yet it is less than is present in the Thames water, at Kingston, as is seen by comparison with the following—

Analysis of Thames Water, at Kingston.*

Sulphate of Lime	4·506	grains in the gallon.
Carbonate of Lime	9·616	„
Carbonate of Magnesia ..	0·970	„
Chloride of Sodium	1·661	„
Chloride of Potassium ..	trace	„
Carbonate of Soda	1·950	„
Organic Matter	1·631	„
Suspended Clay	3.603	„
Carbonate of Ammonia ..	0·003	„
Total Solid Residue ..	23·95	„

Hardness by Dr. Clarke's soap test—

Before boiling	11°
After „	6°
	5°

* Vide "Variations in the Chemical Composition of the Thames Water."—H. M. Witt, *Phil. Mag.* xii, p. 116.

So pure, in fact, is this water, that its action on lead was to be feared, and on examination it was found that it exerted sufficient action upon lead to necessitate caution in its distribution through lead pipes.*

Sample I, Water from Well.

This sample contained—

Sulphate of Lime	3·5	grains in the gallon.
Carbonate of Lime..	4·0	„
Common Salt	3·2	„
Chloride of Potassium, Magnesian Salts, Carbonate of Soda, &c., Suspended Matter, containing a trace of Iron ..	5·0	„
Organic Matter	0·9	„
Total Solid Residue	16·0	

Its hardness by Clarke's soap test is—

Before boiling	7·5°
After „	3.5°
Loss by boiling ..	4·0°

This well water, therefore, though somewhat harder than that from the reservoir, contains only about the same amount of organic matter. It is a water which is perfectly unexceptionable for use as a beverage, and has this advantage over that from the reservoir, of exerting no perceptible solvent action upon lead.

In conclusion, I cannot avoid expressing my regret that the most unfavourable season was chosen for the inquiry relative to the escape of effluvia from the mud; and that, therefore, my opinion on this point is founded rather upon analogical reasoning, than the results of actual experiment.

The purity of the drinking waters is highly favourable—if their quantity be sufficient for the supply of the Hospital.

I have, &c.

(Signed) HENRY W. WITT, F.C.S.,

Assistant Chemist to the Government School of Mines.

* A plate of clean lead was placed into the water, in such a manner that the lead was simultaneously in contact both with the water and the air, and, after remainining twenty-four hours, the water was tested for lead. After this treatment the reservoir water was found to contain a decided amount of lead in solution, whilst that from the well, submitted to the same process, was entirely free.

No. 2.

Captain R. M. Laffan, Deputy Inspector-General of Fortifications, to the Right Hon. Lord Panmure.

My Lord, *War Office, Whitehall Gardens, July* 11, 1857.

Having been directed by your Lordship to prepare the returns respecting the Royal Victoria Hospital at Netley, called for by the Address of the House of Commons of the 9th ultimo, and the plans called for by the Address of the House of Commons of the 19th ultimo, I have the honour to lay before your Lordship returns and plans which I think afford all the information called for by those addresses.

But as those returns and plans, drawn up expressly to meet the terms of the addresses, do not afford all the information which I think it would be desirable to furnish to the House of Commons on the subject, I would suggest to your Lordship whether it might not be expedient to cause them to be accompanied by a brief history of the several steps taken by your Lordship's orders—first, with a view to the selection of a proper site for the Hospital; and next, for the purpose of obtaining a good design for the buildings.

The first step was taken in March 1855, when your Lordship requested Sir John Burgoyne, G.C.B., Inspector-General of Fortifications, to appoint an Officer of Engineers to assist you in the selection of a site for a great Military Hospital.

Sir John Burgoyne appointed me for that duty; and on my waiting upon your Lordship, you told me that the Government proposed to erect a Military Hospital capable of receiving 1,000 patients, and that in your opinion such an establishment should be so situated as to be easy of access from the sea, in order that invalids returning from foreign service, and sick and wounded soldiers sent home from the seat of any foreign war, might be transferred from the ships to the Hospital with the least possible amount of land carriage.

You added, that the south coast appeared to you to possess advantages for this purpose over any other, and that it would be for the advantage of the public service if the Hospital could be placed within a moderate distance of either of the great naval stations at Portsmouth or at Plymouth.

You directed me, therefore, to examine, in the first instance, the neighbourhood of Portsmouth Harbour, and to report to you whether any site could be found in that vicinity possessing those advantages in respect of general salubrity, the nature of the soil, the supply of water, the facilities for drainage, and the readiness of access from the sea, or from the inlets of the harbour, which were required for the purpose the Government had in view.

You directed me to call upon the Director-General of the Army Medical Department, Dr. Andrew Smith, to inform him of your Lordship's views, and to request him to appoint a medical officer in whose judgment, on such a question, he felt confidence, to accompany me to Portsmouth, and to report in conjunction with me upon any site me might select.

On repeating to Dr. Andrew Smith all that your Lordship had told me, he informed me that he would appoint Dr. Mapleton, Staff Surgeon, who had been Lord Raglan's personal medical attendant in the East, to report with me upon the subject your Lordship had referred to us.

On 12th March, 1855, Dr. Mapleton and I proceeded to Portsmouth, and after having examined the ground about that place, and about Gosport, we reported to your Lordship that the best site in that neighbourhood appeared to us to be an open space facing the sea, between Fort Monckton and Haslar, on the Gosport side of the harbour.

A few days afterwards, however, your Lordship having been informed that Porchester Castle and the ground about it presented a better site for the intended buildings, Dr. Andrew Smith sent Dr. Mapleton to meet Major-General Sir Frederick Smith, R.E., to report with him on that locality. The report of those officers was unfavourable.

Subsequently, in May 1855, in consequence of some communication between your Lordship and Sir James Clark, Bart., M.D., you sent for me, and informed me that Sir James had urged some grave objections to the site at Haslar, and

had pointed out to you that a much better site might be found on the eastern shore of the Southampton Water.

You directed me to call upon Sir James, and to examine and report to you upon the locality which he would point out to me. You told me to communicate first with the Director-General of the Army Medical Department, and request him to appoint a medical officer in whom he had confidence, to examine the proposed site with me, and to report with me as to its eligibility. On leaving your Lordship, I went at once to Dr. Andrew Smith's office, and he appointed Dr. Mapleton for that duty.

I then called upon Sir James Clark, who informed me that there were, in his opinion, numerous objections to be urged against the site at Haslar; amongst others, that the circumstance of there being two very large Hospitals so near each other would be disadvantageous, and that the climate was not favourable to the restoration of health in cases of convalescents or invalids returning from warm climates.

Sir James told me that he had frequently been struck with the numerous advantages, as a site for a great Military Hospital, presented by the sloping ground on the eastern shore of Southampton Water, a little below Netley Abbey; that the ground there seemed to be gravelly, and to slope upwards from the water, while there was a high ridge behind it, which sheltered it from the cold northern and eastern winds.

Sir James handed me a letter he had received from Professor Ramsay, Director of the Geological Survey of Great Britain, in which Professor Ramsay informed him that he had just returned from Southampton; that the ground on the eastern bank of the river was deep dry sand and gravel; that it sloped well up; and that he had no doubt a good spot could be selected, sheltered from the east winds. The letter added, that the greater part of the country, on both sides of the river, was gravelly.

Finally, Sir James handed me a strip cut from the Ordnance Survey of Hampshire, upon which he had marked the place he wished Dr. Mapleton and myself more particularly to examine; and he added, that he thought we should there find a site possessing advantages superior to those presented by the site at Haslar.

On 18th May, Dr. Mapleton and I examined the whole of the ground about Netley, and at the place marked by Sir James on the map, about a mile below Netley Abbey, we found a space of ground about 100 acres, presenting a gravelly bank or cliff, from 10 to 20 feet in height, to the water, and rising from thence upwards at a gentle slope, till it joined a higher ridge behind it. The soil consisted, as described by Professor Ramsay, of deep dry sand and gravel, resting in some places on beds of brick earth. The facilities of drainage were very great. The water in a small well in one of the fields was of excellent quality, and there were several streams in the vicinity from which water for baths and other such purposes could be led to the buildings; the means of landing could be provided by carrying out a jetty into Southampton Water; and the concurrent testimony of all the people living near the spot declared the neighbourhood to be eminently healthy.

There was one circumstance connected with the proposed site which attracted our particular attention; the existence of a wide extent of sand, intermixed with mud, which was left uncovered at low water, and the exhalations from which we at first thought might be a source of unpleasantness, if not actually prejudicial to health. At the time of year we examined the place, we could not perceive any offensive smell, but we asked all the people we could find in the neighbourhood, whether, during the hot summer months, such offensive smells were not perceived. We were told that some miles higher up the river, where a good deal of vegetable matter was deposited with the mud, offensive effluvia might at times be perceived, but, that at the place where we stood, no such inconvenience had ever been felt.

There was then, as there still is, on the beach, a small vessel, the "Partridge," brig, permanently fixed and embedded in the mud and sand, just opposite to the centre of the proposed site, forming a dwelling for a party of the Preventive Service, with their wives and children. This vessel, at low water, is entirely surrounded by the wide expanse of mud and sand, and we thought, therefore, that the men and women and children living on board would be good

witnesses to examine as to the healthiness of the place, and as to any inconvenience which might arise from the vicinity of the mud.

We found them all unanimous in declaring that their dwelling was healthy; that at all times, at low water, a slight smell might be perceived from the mud, but that it was not at all offensive, or injurious to health. Their statements were borne out by their appearance; all looked healthy, particularly the children.

On returning to town, Dr. Mapleton and I reported to your Lordship that the place pointed out by Sir James Clark appeared to us to possess many advantages over the site at Haslar, and that we considered it peculiarly eligible. We gave a detailed description of the place, mentioning the existence of the mud; but stating at the same time that from all we had been able to observe, and from what we had learnt from the people on the spot, we were of opinion that its vicinity would not be prejudicial.

I then called upon Sir James Clark, and informed him of the result of our inspection, and Dr. Mapleton waited upon the head of his branch of the service, Dr. Andrew Smith, and informed him of the favourable opinion he had formed of the newly proposed site, offering at the same time to supply him with a copy of our joint report. Dr. Mapleton informed me that Dr Smith had declined to have a copy of the report; and that he had told him it was he himself (Dr. Smith) who had first pointed out to Sir James Clark the advantages of Netley as a site for a great Military Hospital.

It appears that the Director-General of the Army Medical Department had also pointed out the same locality to your Lordship; for in a letter addressed to your Lordship, on 5th January, 1856, pointing out the deficiencies in every respect of the general hospital at Chatham, he says, "In my opinion, the general hospital for the purpose for which that at Fort Pitt is employed, should be on the coast, or in some large inlet of the sea, so that the invalids from abroad could be landed immediately, and marched into their barracks, while the sick could without injury be placed in Hospital. In conversation, last year, I more than once pointed out what I considered the proper locality, viz., a district close to Netley Abbey, below Southampton."

Dr. Mapleton also informed me, that before leaving the Director-General, he had pointed out to him the existence of the wide extent of sand and mud left uncovered at low water, stating that he was not inclined to attach any weight to it; but that on a question of such great importance, it would be satisfactory to him, if Dr. Smith would himself visit the place, in order to form an opinion.

The Director-General did not examine the place at the time; but on the 14th March, 1856, he reported to your Lordship that he had carefully examined the locality, and conversed on the subject with various medical practitioners, and other persons resident in the neighbourhood, and that he had no reason to believe that there was anything in the nature of the locality itself, or in that of its vicinity, calculated to generate disease, or to operate unfavourably to the restoration of health.

On receiving the joint report of Dr. Mapleton and myself, in May 1855, your Lordship did not immediately make up your mind to purchase the site at Netley. In June 1855, you caused two other proposed sites to be examined, Herstmonceaux, in Sussex, and Appuldercombe, in the Isle of Wight. Dr. Mapleton was sent by the Director-General of the Army Medical Department to report upon both places, in conjunction with Captain Ross, of the Royal Engineers. Both reports were unfavourable.

On the 21st August, 1855, negotiations were, by your Lordship's instructions, entered into for the purchase of the ground at Netley, and on 3rd January, 1856, you authorized an expenditure of 15,000*l.*, for the purchase of 109 acres 1 rood and 32 perches of land.

This concludes the history of the several steps taken by your Lordship's orders, for the purpose of obtaining a site for the new Hospital.

On 27th January, 1856, your Lordship appointed a Committee, consisting of Colonel O'Brien, Assistant Quartermaster-General, Horse Guards, of Dr. Mapleton, M.D., and of myself, to prepare an outline plan of the new Hospital, and to report to you on the nature of the accommodation it was desirable to provide. You instructed the Committee to place themselves in communication with the Director-General of the Army Medical Department, and to receive

any suggestions that officer might make; and at the request of the Director-General, you sent an engineer officer to Rotterdam, to procure for the Committee the details of the internal arrangements of a great civil Hospital in that city, which Dr. Smith had been informed was one of the best planned on the Continent.

While that officer was absent on his mission, Dr. Mapleton examined all the great civil hospitals of London, and consulted with many of the medical men attached to them, as to the internal arrangements it would be desirable to adopt in the new building; and during the whole time the plans were being prepared by the committee Dr. Mapleton was in daily communication with the Director-General of the Army Medical Department, and the Committee adopted every suggestion that was made by that Officer.

In a conversation I had with your Lordship on the subject, you told me that in your opinion it would be desirable that a Hospital on such a large scale as Netley should be divided into a number of detached blocks, separated from one another by intervals, as wide as the nature of the site, and the convenience of the inmates would admit, but connected by a covered gallery for general communication.

At the first meeting of the Committee, the question discussed was, whether to recommend that the new Hospital should thus be divided into a number of separate blocks, or that the wards should be grouped together in larger masses of buildings.

The division of a large hospital into a number of separate blocks is attended with an increase of expense. Within moderate limits, that increase is more than compensated by the advantages accruing to the patients; but if the division be carried too far, the additional cost becomes enormous, and the numbers of the nurses, orderlies, and other attendants, must be greatly increased, in order to provide efficiently for the service of an establishment so widely scattered.

It would have been practicable, for instance, to have divided the buildings of the Hospital at Netley into as many as ten blocks. To that extent the division need not have entailed an increase in the cost disproportioned to the advantages to be gained, or have necessitated the employment of a much large rnumber of attendants.

The views of the Committee were at first favourable to such an arrangement; but when they came to study the details they found it impossible to carry those views into effect.

The great object which is sought in the division of a hospital into separate blocks, is to have wards communicating directly with the outer air by windows on opposite sides, so as to get the greatest amount of light and sunshine, and to have in the opposite rows of windows the means of ensuring the most perfect natural ventilation.

In order to attain that end, it is necessary that each floor of each detached block should form one large ward, having the staircase, and, if desired, a small room for two patients, at the end next the covered gallery of communication, having then a row of windows on each side of the great ward, and having at the other end a nurse's room, the bath room, water-closet, and other necessary appendages. This is the system of construction usually followed in France.

The addition of a second ward on the same floor would greatly impair the value of the separate block system; for if the two wards were placed side by side, they would both be deprived of the advantage of having opposite rows of windows, and if they were placed end to end, it would be necessary to pass through one ward in order to reach another, an arrangement always considered most objectionable.

It appeared, therefore, to the Committee, that if the French system of detached blocks were to be adopted, it would be necessary also to propose to have wards of large size, capable, as in France, of receiving from thirty to forty patients; for as the buildings could not be carried with advantage higher than three stories, each detached block would only supply three large wards, with three smaller rooms, each holding two patients.

If, therefore, the building at Netley were to be divided into ten blocks, it would be necessary that each large ward should be capable of containing thirty-two patients; and as few Military Hospitals in this country had hitherto been

constructed with rooms on so large a scale, the Committee referred for instructions to the Army Medical Department, as to whether they might propose to place so many patients in one ward.

The Committee was informed that the Director-General of the Army Medical Department was decidedly opposed to the adoption of such large wards in a Military Hospital. The Committee found that the opinions of the Director-General on this question were shared in by all the Military Surgeons they consulted, and that the Officers of the Army also considered that it would be difficult, if not impossible, to maintain proper discipline in a ward containing so many sick soldiers.

The general opinion of the medical men, aud of the military officers who had had experience in the management or superintendence of military hospitals, was, that the average number in a ward should not exceed ten.

With that number, the system of detached blocks, as adopted in France, was obviously impracticable at Netley; for at least 30 of these blocks would be required for the 1,000 patients for whom provision was to be made, and the covered gallery connecting the blocks would be more than a mile in length.

The Committee, therefore, though somewhat reluctantly, gave up their original idea of separating the buildings into detached blocks, and proposed the system of construction shown upon the plans, and in the report which they had the honour to submit to your Lordship.

Before submitting those plans to your Lordship, the Committee laid them before a Medical Committee, appointed by the Director-General of the Army Medical Department, and presided over by that Officer himself.

The Medical Committee consisted of—

Dr. Andrew Smith, M.D., Director-General of the Army Medical Department.
Dr. Cumming, M.D., Inspector-General of Hospitals.
Dr. Dumbreck, M.D., C.B., Deputy Inspector-General of Hospitals.
Dr. Forrest, M.D., C.B., Deputy Inspector-General of Hospitals.

And after all the external and internal arrangements had been fully explained and discussed, the Medical Committee unanimously approved of the plans.

The plans were next submitted to your Lordship, and after you had examined and approved of them, you submitted them to Her Majesty, who was graciously pleased to approve of them also.

On 2nd March last, Mr. Gregson, M.P., forwarded to your Lordship a memorial, signed by the medical men connected with the Middlesex Hospital, urging some objections against the plans of the new Hospital, and suggesting that your Lordship should put a stop to any further progress in the building till those plans should have been referred to a few medical men connected with some of the best constructed civil Hospitals of London, who might confer with the Committee by whom the plans had been prepared, and submit to your Lordship the result of their joint deliberations.

Your Lordship complied with the suggestion of the memorialists; you ordered the Committee by whom the plans had been prepared to re-assemble, adding to their number Dr. Sutherland, who had acquired most valuable experience in the management of Military Hospitals in the East; and you instructed the Committee to reconsider the plans of the new Hospital, to confer with the principal medical men of the Middlesex Hospital, and of the other great civil Hospitals of London, and to report to your Lordship the opinion of the medical men, as well as their own.

The Committee re-assembled in compliance with your Lordship's instructions. Dr. Sutherland joined them; and, after having carefully reconsidered the plans, and conferred with the medical men deputed to represent the opinions of the medical staff of the Middlesex Hospital, and with medical men connected with six other great civil Hospitals in London, they addressed to your Lordship a Report, stating the opinions of the Committee, and those of the medical men with whom they had conferred, and recommending some modifications in the original plans.

In order to show more clearly the nature of those modifications, a fresh set of plans were prepared, and after having been examined and approved by the Director-General of the Army Medical Department, they were submitted to your

Lordship on the 7th instant. You approved of them, and submitted them to Her Majesty, who, on the 9th instant, was graciously pleased to approve of them also.

I have now completed the history of all the circumstances connected with the selection of the site, the preparation of the original plans, and the modifications subsequently made in them. In conclusion, I wish to add a few observations.

The memorial of the medical men connected with the Middlesex Hospital informed your Lordship that the great principle upon which all good hospitals are constructed, is, that the wards should open into the external air, on at least two sides, and have windows, which are placed opposite to one another. It stated that this principle was carried out in all the plans now adopted for Military Hospitals on the Continent, and especially in France; and it enclosed as an example a ground plan of a great Military Hospital at Bordeaux, where the buildings are divided into detached blocks, and the whole of each floor of each block forms a single ward of large size, intended to hold 40 patients.

The memorial pointed out that this style of construction was diametrically opposed to that shown on the plans of the Hospital at Netley, and it expressed a strong opinion that the wards of the new Hospital were too small, as experience had shown, that in wards which are very high in proportion to their breadth, there occurs a stagnation of air, which it is almost impossible to overcome.

In all these statements and opinions I am inclined to agree with the memorialists. I prefer the French system of construction, that of detached blocks and large wards, to the system shown on the plans of the new Hospital; but I have already explained that the detached block system can only be followed when wards of large size are allowed; and that the Director-General of the Army Medical Department, and the great majority of the medical men attached to the Army, and most military officers, think large wards objectionable in a Military Hospital.

The Hospital at Netley is intended for the reception of military men, who are to be attended by military doctors; and it seems to me, therefore, that it would have been unreasonable to have passed over the opinions of the military branch of the medical profession, in order to follow those of an engineer officer, and of the medical men connected with a Civil Hospital.

The memorialists objected to the corridor or closed gallery, which extends along the front of the building, that it would shut out the sun, intercept the currents of air, which might otherwise be directed through the wards, and form instead a permanent receptacle for the contaminated effluvia which escaped from them.

As first planned, the corridor in question was open; that is to say, it was simply a colonnade, the columns connected together on each floor by a series of arches. It was intended that the colonnades should be left open in fine weather, and that in winter the openings should be wholly or partially closed by means of glazed sashes. In deference to the opinion of a medical officer, who thought that a corridor so open would be liable to great and sudden vicissitudes of temperature, and that the admission of so much sunlight would cause an excess of glare, an ordinary wall, with windows corresponding to the doors and windows of the wards, was substituted for the columns and arches; but on reconsidering the subject, seeing the strong objections which were urged against the closed corridor, the Committee recommended to your Lordship to revert to the original design.

The memorialists appear to think that the corridor should, if it were adopted at all, have been placed on the north-east, instead of the south-west side of the building.

The corridor has been adopted as the most convenient means of communication between the different parts of so vast a building, and as forming at all times an agreeable promenade for those patients who may be sufficiently recovered to render a little exercise desirable, but whom it would be imprudent to permit to venture into the open air. It has been placed on the south-west side, because it will then command a fine view over a beautiful country, whereas had it been placed on the north-east side it would have overlooked nothing but kitchen- and out-offices.

By its position on the south-west also, the corridor helps most materially to preserve the wards from that great evil, dampness; for the south-west is the rainy quarter; and the storms of rain which are brought up by the south-west winds beat with great violence against all the buildings erected along Southampton Water, and render it very difficult to keep the rooms on that side dry.

The memorialists object entirely to the adoption of any system of artificial ventilation, as they are satisfied, by experience already obtained, of the uncertain efficacy of all such systems. On this subject I am unable to agree with them; for though their experience may appear to justify such a conclusion, it does not follow that, because the systems they have seen in action have been failures, all other systems should be condemned.

In the French Hospitals, which they quote as models, artificial ventilation is always adopted in aid of the natural means afforded in the doors and windows, and the medical men connected with the French Hospitals attribute much of the success of their treatment to the increased supply of pure air introduced by artificial means.

At Netley the means of ensuring the most perfect natural ventilation are afforded to an extent rarely, if ever, seen in any existing Hospital. Each room, meant for only nine patients, contains 13,000 cubic feet of air, and has three lofty windows opening to the outer air; two more very large windows and a door opening to the open corridor; and an open fireplace, one of the best agents of ventilation.

But in the cold winter season it is most probable that all these windows and doors will be kept closed, and that even if some of them were partially opened by the attendants, they would be closed again by the patients; for the dislike of soldiers to the admission of cold air into any room occupied by them is a fact too well known to all who have had any experience in the military service.

I think it desirable, therefore, that the means of ensuring what is called artificial ventilation should be provided; and I would propose to provide them in the simplest way, by introducing under the floors air channels or pipes, by which the pure air from the outside of the building could be conveyed to hollow columns rising from the floor to a height of some six feet, and terminated at the top by a grating. A free communication would thus be established between the atmosphere of the room and the fresh air outside, and the fresh air would enter the room somewhere near the centre, and at a height from the floor sufficient to guard the inmates from a cold draught; and, for the purpose of removing the foul or vitiated air, I propose to have, in addition to the chimney, five air flues rising through the side walls of each ward, and carried up into the roof.

From the papers annexed to the return, your Lordship will perceive, that while the medical gentlemen connected with the Middlesex Hospital still condemn the revised plans, and think the whole design radically faulty, the medical gentlemen deputed to confer with the Committee on the subject, by the authorities of the University College Hospital, St. Thomas's Hospital, King's College Hospital, St. Bartholomew's Hospital, and St. George's Hospital, approve of the revised plans, and think the whole design extremely good.

It is singular, indeed, to observe that the main feature in the design—the general corridor—should be selected by the medical gentlemen of the Middlesex Hospital for special reprobation, while the medical gentlemen of the other five great hospitals highly approve of it.

I have, &c.

(Signed) R. M. LAFFAN,

Deputy Inspector-General of Fortifications.

Memorial to Lord Panmure, respecting the Royal Victoria Hospital at Netley.

THE undersigned desire to bring the following observations respecting this building under the notice of Lord Panmure.

They have no personal interest whatever in the matter, but having paid much attention to the construction and ventilation of Hospitals, they are

desirous of preventing, if possible, the disapointment and disastrous results which will, as they believe, inevitably follow the carrying out of the present plans in their integrity.

Passing by several minor, though by no means unimportant faults in the proposed internal arrangements of the Royal Victoria Hospital, they would simply test its general plan by principles which have been abundantly established by experience in Civil Hospitals.

1. A building sufficiently well adapted for the dwelling of persons in good health may, and generally will, be very inadequate to the requirements of the sick. Hospitals, in which patients may lie for weeks or months, demand a different construction, and a more perfect ventilation, than any other class of buildings.

2. In a new Hospital, where there is a choice of construction, the ventilation should be entirely natural, and everything like artificial ventilation, which is always imperfect and precarious in its operation, should be avoided.

3. The great principle on which all good Hospitals are constructed is, that the wards open into the external air, on at least two sides, and have windows which are placed opposite to one another. By this means, a free and perfect current of air is obtained; and highly infectious diseases may be placed amongst the general patients without danger of their being communicated.

To apply these maxims to the Royal Victoria Hospital,

The principal feature in the plan is a vast corridor or closed gallery, which extends the whole length of the building, and is interposed between the wards, and the south-west front. The wards, with a few trifling exceptions, are placed behind it, and open by doors and windows into the corridor, into one another, or into a yard on the north-eastern aspect of the Hospital. Nothing could be more obstructive of ventilation and comfort. The corridor, 12 feet in breadth, shuts out the sun, intercepts the current of fresh air which might be directed through the wards, and forms instead a permanent receptacle for the contaminated effluvia which escape from them.

The lateral ventilation of the wards is still more objectionable, since they communicate only with one another, or with sculleries and latrines. The few windows which open upon really fresh air face the north-east, and expose the wards to that wind which is notoriously the least beneficial to the sick. Moreover, the current of air, even on this face, is in part impeded by a block of buildings and a covered way, which extend across the whole yard on the north-east side of the wards.

By this seclusion of the wards from the fresh air there will be generated throughout the building what is called a "hospital atmosphere," and experience has shown that in such an atmosphere it is impossible for the attendants on the sick to maintain their health, and for the sick themselves to escape from fever, hospital gangrene, and other similar diseases.

The undersigned are aware that it is proposed to make up for these disastrous defects in the plan of the Hospital by a system of artificial ventilation, but they are so satisfied by experience already obtained of the uncertain efficacy of that system, and of the positive danger of drawing cold air into the floors of the wards, which is a part of it, that they are most decided in their convictions of the necessity of its being abandoned.

Lord Panmure should be informed that hospitals which have been recently constructed in this country on somewhat similar principles to the Royal Victoria Hospital have proved failures, and are continually subject to visitations of erysipelas and hospital gangrene.

The plan now adopted of the Military Hospitals of the Continent, and especially in France, is diametrically opposed to that under consideration. In the Military Hospital at Bordeaux, for example, a ground plan of which accompanies this paper, every ward occupies the whole superficial area of the building in which it is situated, and opens on all four sides into gardens, or other spaces of air.

The authors of this paper do not speak without ample experience in their own Hospital. Built in the form of the letter H, the Middlesex Hospital is freely ventilated by currents across and along it, whilst its wards have been made to extend the whole length and breadth of each compartment of its wings.

Until the Hospital was reconstructed, about ten years ago, it was subject to outbreaks of all the diseases to which reference has been made; but since the present system of thorough ventilation has been adopted, they have all but entirely disappeared, and the nurses and resident officers enjoy a degree of health hitherto unknown, and beyond that in most hospitals.

There are other points of great importance to the comfort of the sick, to which objection might be made.

The wards are too small, for experience has well shown that in a ward which is very high in proportion to the breadth, there occurs a stagnation of air, which it is almost impossible to overcome.

The position of the orderlies' rooms is bad, as they form, in fact, parts of the wards. The injury to the health of the attendants on the sick from constantly breathing the vitiated air of wards is too obvious to need more than mention.

The position of the water-closets, the proposal to admit steam into them, and other matters, might be referred to, but as the object is not to point out every error, but merely to show the desirability of reconsidering the present plans, enough has now been said.

The undersigned are aware that the plans in quesstion have resulted from the labours of a Committee especially appointed to investigate the subject of Hospitals.

But it is no disrespect to the medical gentlemen composing it to affirm, that the entire absence of good military Hospitals in this country renders the opinion of military Medical Officers less valuable than it would otherwise be. And the existence of the serious mistakes pointed out in the proposed Victoria Hospital furnishes convincing proof that further consideration is required, before the country is finally involved in so large and unprofitable an expenditure.

There is, indeed, reason to fear that the plans have been so far matured, and the foundations so far proceeded with, that no amount of alteration will convert it into what a great Military Hospital should be. Still, certain alterations might be yet made, which would materially improve the present plans.

Alterations might be made in the corridor, the open gratings in the floors might be removed, there might be a change in the size of the wards, and in the situation of the apartments of the orderlies and resident Medical Officers, tripartite windows might be adopted, and perforated zinc gratings inserted in the walls, &c.

Considering these circumstances, the undersigned can only suggest that Lord Panmure should put a peremptory stop upon any further progress being made in the buildings until the plans have been referred to a few medical men connected with some of the best constructed civil Hospitals, who might confer with the previously appointed Committee, and submit to his Lordship the result of their joint deliberations.

(Signed) FRANCIS HAWKINS, M.D., Physician to the Middlesex Hospital.
ALEX. SHAW, Surgeon to the Middlesex Hospital.
A. P. STEWART, M.D., Physician ditto
SETH THOMPSON, M.D., ditto ditto
HENRY THOMPSON, Assist.-Phys. ditto
S. J. GOODFELLOW, ditto ditto
CAMPBELL DE MORGAN, Surgeon ditto
CHARLES H. MOORE, ditto ditto
MITCHELL HENRY, Assist.-Surgeon ditto
R. TEMPLE FRERE, Physician for Diseases of Women and Children to the Middlesex Hospital.
GEORGE CORFE, M.D., Middlesex Hospital.

My Lord, *War Office, Whitehall, May 25, 1857.*

The Committee appointed by your Lordship to consider the objections which have been urged against the plans of the Royal Victoria Hospital, at Netley, have

concluded their inquiries, and I have the honour to transmit herewith, for your Lordship's consideration, a Report setting forth the opinions to which we have unanimously agreed.

I have, &c.

(Signed) TERENCE O'BRIEN, *Colonel.*
Assistant Quartermaster-General.

Report to the Right Honourable the Secretary of State for War.

My Lord, *War Office, May 25, 1857.*

The Committee appointed by your Lordship to consider and report upon the objections made to the general design, and to some of the internal arrangements of the Royal Victoria Hospital, in a memorial addressed to your Lordship by the Medical Officers of the Middlesex Hospital, London, having concluded their inquiries, have the honour to lay before your Lordship the following Report :—

"The memorialists object to the general plan of the new building, that it is opposed to the principles which have been established by experience in civil hospitals;

That the windows of the wards do not open into the external space on at least two sides;

"That the corridor, which affords the means of communication between the different parts of the building, is highly objectionable, as it forms a permanent receptacle for the contaminated effluvia, which will escape from the wards into it, and which will thus pass from one ward to another;

"That the wards, with few trifling exceptions, are placed behind this corridor, open by doors and windows into it, into one another, or into a yard on the north-east aspect of the Hospital.

"That the lateral ventilation of the wards is still more objectionable, since they communicate only with one another, or with sculleries and latrines.

"That the few windows which really open upon fresh air face the north-east, and expose the wards to that wind which is notoriously the least beneficial to the sick; moreover, that the current of air, even on that face, is in part impeded by a block of buildings and a covered way, which extend across the whole yard on the north-east side of the Hospital.

"The memorialists state, that they are aware that it is proposed to make up for these disastrous defects in the plan of the Hospital by a system of artificial ventilation, but that they are so satisfied, by experience already obtained of the uncertain efficacy of that system, and of the positive danger of drawing cold air into the floors of the wards, which is a part of it, that they are most decided in their convictions of the necessity of its being abandoned."

In order to aid them in arriving at a correct conclusion on the questions submitted to them—questions involving considerations of medical science and practice, of architectural construction, of ventilation, of the discipline and of the requirements of a Military Hospital—

The Committee have sought and obtained the opinions and advice of the Medical Officers of the Middlesex Hospital, and of a Medical Officer from each of the following great London Hospitals, viz:—Guy's, St. Thomas's, St. George's, London University, King's College, and St. Bartholomew's; of the Professional Officers of the Architectural Branch of the War Department; of Dr. Arnott, who has given so much attention to all matters relating to warming and ventilating buildings; and of Dr. Dumbreck, C.B., Deputy Inspector-General of Military Hospitals; and have referred to the Report of the Official Committee on Barrack Accommodation for the Army, for the opinions of Military and other Officers as to what internal arrangements are likely to be most conducive to the comfort and well being of the sick in a Military Hospital

The Committee also request two of their number, Drs. Sutherland and Mapleton to visit the the works at Netley, and to consider, on the spot, the objections contained in the memorial.

The original plans of the Hospital were prepared by a Committee appointed by your Lordship for that purpose last year, whose report, dated War Depart-

ment, 15th May, 1856, sets forth the reasons which guided them in recommending the various arrangements. These plans show a range of wards placed side by side, on each story, with a corridor for the convenience of communication and exercise for convalescents. Each of the larger wards has two windows opening into the outer air on the north-east side, and two windows and a door opening into the corridor on the south-western side. The corridor itself communicates with the external air by windows of the usual construction and apertures in other parts of it, with open fireplaces to assist in its ventilation.

Between each of the larger wards there is a smaller ward to accommodate two patients, supplied with light from the corridor, and a projection on the north-east side contains the water-closets, &c.

The Committee find that, previous to the communication from the Medical Officers of the Middlesex Hospital, the original plans had received from the Director-General of the Army Medical Department, and the officers of the War Department, a careful reconsideration and revision, as to the structural arrangement of the corridor, the projections containing the water-closets, &c.

On examining the original plans, it appears to the Committee that the means of affording light and air, both to the wards and corridor, might be increased with advantage; and the Committee recommend that along the whole front of the buildings the windows in the corridors be replaced by wide-arched openings, capable of being kept entirely open in fine weather, but provided with sashes that can be closed when necessary.

The Committee further recommend that the number of windows opening from each ward, on the north-east side into the external air, be three instead of two, thereby increasing the window space by about one-third. With respect to the remarks of the memorialists, as to the side ventilation of the wards, the Committee beg to observe that, as shown on the plans of the Royal Victoria Hospital, no one ward communicates directly with another.

The position of the water-closets, in relation to the wards, had, as already stated, previously received the attention of the Officers of the War Department, and it had been arranged that the projections containing them should be carried out three feet further than shown in the original plans, in order to admit of the construction of a small lobby intervening between them and the wards.

Another structural objection raised against the plan is, that the kitchens and dining-rooms are so arranged as to impede the current of air at the back of the building.

These buildings are situated 80 feet from the Hospital, and extend on one story only 150 feet across the yard, and not along the whole extent of it. The two upper flats, 60 feet in length, are intended for separate dining and day rooms, to enable those patients, who can, to to dine away from their wards.

The sanitary advantages of such an arrangement are most obvious, and as a reduction of the height of the building would necessitate the use of the wards or corridors for dining accommodation, the advantage of having separate dining and day rooms will more than counterbalance any possible disadvantage from their position.

Between the kitchens and the Hospital is a one-storied building, containing the engine room and a large store room, both of which the Committee find can with advantage be placed below the level of the ground, and this they recommend.

The only other buildings behind the Hospital likely to interfere with the free circulation of air, are those of two stories which run round the yard, and the Committee recommend that these be reduced on the sides to one story.

In the event of its being decided that female nurses shall be employed in the Royal Victoria Hospital, the Committee find that accommodation can be provided for them, and that a sufficient number of day rooms, extra diet kitchens, and store rooms, can be obtained in the small rooms formerly proposed to be used as wards for two patients, and that bed rooms can be provided in the central building, by raising that building one story, and making a communication between it and the wings on each floor.

With respect to the observations of the memorialists as to the superiority of natural over artificial ventilation, the Committee beg leave to point out to

your Lordship, that with the alterations proposed, viz., opening the corridor and increasing the number and size of the windows in the wards, the means of providing natural ventilation in the new Hospital will be amply sufficient, but inasmuch as natural ventilation (as understood by doors, windows, and fire-places) cannot always be depended upon, the Committee are of opinion that the best system of artificial ventilation should also be provided, capable of insuring a supply of fresh air, and of effecting the removal of foul air at all times and seasons.

The Committee having now reported to your Lordship on the several objections urged by the memorialists, are unanimously of opinion that the few modifications which they recommend in the arrangements of the Royal Victoria Hospital, and which may be seen in the plans accompanying this report, are all that is required to render that building well adapted to the purposes of a Military Hospital; and although they are aware that the Medical Officers of the Middlesex Hospital still retain their unfavourable opinion, notwithstanding the improvements that have been made in the plans, the Committee feel strengthened in arriving at the opposite conclusion, by the concurrent approval of all the Medical Officers of the other great London Hospitals, whose written opinions on the subject your Lordship will find appended to this report. To these gentlemen, and to those who represented the opinions of the medical authorities of Middlesex Hospital, as well as to Dr. Arnott, the Committee are under great obligation for the readiness and courtesy with which they afforded their assistance and advice.

(Signed) TERENCE O'BRIEN, *Colonel,*
Assistant Quartermaster-General.
JOHN SUTHERLAND, M.D.
HENRY MAPLETON, *Surgeon,*
15th Hussars.
R. M. LAFFAN,
Deputy Inspector-General of Fortifications.

EVIDENCE.

Dr. Parkes, Physician to University College Hospital.

Q. Do you consider large or small wards to be preferable?

A. Large. (From 30 to 50 patients).

Q. As large wards admit of being arranged, as in France, in separate blocks, whereas small wards evidently cannot be so disposed, what is your opinion of the system shown in the plan of the Victoria Hospital, of causing small wards to open from a general corridor?

A. Small wards being adopted, I approve of the corridor.

Q. What is your opinion of the comparative merits of plans of the Victoria and Bordeaux Hospitals, now submitted to you?

A. Preferring, as a principle, the separate blocks, I believe the plan of the Victoria Hospital to be an extremely good one.

Q. What is your opinion as to the arrangement of the water-closets, baths, &c., for which provision is made in the plan of the Victoria Hospital?

A. I consider them extremely good.

Q. Do you think the patients in these wards will be free from the foul air from the water-closets?

A. Most assuredly.

Dr. Barker, Physician, St. Thomas's Hospital.

Q. Whether do you consider large or small wards preferable?

A. I see no objection to wards containing from 20 to 25 men, or to having them for 10. I object to a very large number in one ward, if labouring under serious disease.

Q. As large wards admit of being arranged, as in France, in separate blocks, whereas small wards evidently cannot be so disposed, what is your opinion

of the system shown in the plan of the Victoria Hospital, of causing the small wards to open from a general corridor; and what is your opinion of the comparative merits of the two plans now submitted to you?

A. I very greatly prefer the plan of the Victoria Hospital to that of Bordeaux, and concur entirely with Dr. Burrowes in opinion as to the reasons for such preference.

Q. What is your opinion as to the arrangements of the water-closets, baths, &c., for which provision is made in the plan of the Victoria Hospital?

A. I think the arrangement a good one, and safe as regards contaminating the atmosphere of the wards.

On being asked his opinion as to ventilation generally, Dr. Barker stated he never finds, if the wards are not too crowded, that artificial ventilation is necessary, nor does he wish to have it.

Dr. Page, Physician to St. George's Hospital.

Q. Whether do you consider large or small wards preferable.

A. I consider small wards much better than large ones, as a large number of serious cases would create a contaminating atmosphere.

The same questions having been put to Dr. Page as were put to Dr. Barker, Dr. Page stated, that he concurred in opinion with Dr. Barker, as regarded the arrangements of the water-closets, and the advantages of the corridors, and considers the plan of the Victoria Hospital altogether a remarkably good one.

I have further to add, that the atmosphere in the corridors should be constantly changed by free introduction of the external air, and the temperature by this means, and the stoves, adapted to the season.

Dr. Guy, Physician to King's College Hospital, Dean of the Medical Department, King's College.

Q. Do you consider large or small wards should be preferred?

A. Small (*i. e.* about 12 beds).

Q. As large wards admit of being arranged, as in France, in separate blocks, whereas small wards evidently cannot be so disposed, what is your opinion of the system shown in the plan of the Victoria Hospital of causing the small wards to open from a general corridor?

A. I approve of the corridor, especially as the cubic space allotted to patients in the wards is such as, in my opinion, to prevent any danger of contagion spreading through it from ward to ward, provided that the air is subject to continual change.

Q. What is your opinion of the comparative merits of the plans of the Victoria and Bordeaux Hospitals now submitted to you?

A. Considering the nature of the English climate, I think the plan of Victoria Hospital is better suited to this country than that of the Bordeaux Hospital.

Q. What is your opinion of the arrangements of the water-closets, baths, &c., for which provision is made in the plan of the Victoria Hospital?

A. I entirely approve of them.

Dr. Guy added, that he was desirous of expressing an opinion, that double panes of glass, or single panes of plate glass, should be employed throughout the building, in conjunction with open fireplaces, in substitution for artificial heating and that with the space provided in the wards, no ventilation is required beyond that obtainable by opening the windows.

Dr. Guy considers that the floors of the building should be of wood.

The foregoing statement is intended to convey a condemnation of any attempt at warming or ventilating from a single centre, on the ground both of efficiency and economy.

Dr. Burrowes, Fellow of the Royal Society, Physician to St. Bartholomew's Hospital.

Q. Whether do you consider large or small wards preferable?

A. I think great inconvenience and discomfort would arise, in having wards for so large a number of patients as forty; the noise would be objectionable. I therefore consider that wards should not be for more than from ten to twenty patients.

Q. As large wards admit of being arranged, as in France, in separate blocks, whereas small wards evidently cannot be so disposed, what is your opinion of the system shown in the plan at the Victoria Hospital of causing all the wards to open from a general corridor?

A. I think the plan is good, judicious certainly; I think, also, that great advantages will result to convalescents from the use of this corridor, provided it be not in the power of the attendants to close it, and that it is naturally ventilated at all times, day and night.

Q. What is your opinion as regards the comparative merits of the plans of the Bordeaux and Victoria Hospitals now submitted to you?

A. I consider the plan of the Victoria Hospital in a northern climate, such as we have in England, a very superior one to that of Bordeaux, because by the latter plan, where buildings of considerable height are only separated by narrow intervals, the lower floors of those buildings must, to a great extent, be deprived of sun light, and the fog and moisture of the air in the winter months will not be dispersed by the sun's warmth, and hence the air in the intervening spaces will be unhealthy.

Q. What is your opinion as to the arrangements of the water-closets, baths, &c., and for which provision is made in the plan of the Victoria Hospital?

A. It is the best I ever saw.

Q. Do you think that the patients in these wards will be free from the effects of the foul air from these water-closets?

A. Quite so.

Dr. Rees, Fellow of the Royal Society, Physician to Guy's Hospital.

The same questions as those proposed to Dr. Burrowes, having, in his presence, been asked to Dr. Rees, that gentleman quite concurred in the several replies given by Dr. Burrowes, as recorded on this paper.

Dr. Dumbreck, C.B., Deputy Inspector-General of Hospitals.

Q. Whether do you think large or small wards preferable?

A. I like wards of various sizes; but in my opinion the maximum number of sick in any ward should never be beyond twenty.

Q. As large wards admit of being arranged, as in France, in separate blocks, whereas small wards evidently cannot be so disposed, what is your opinion of the system shown in the plan at the Victoria Hospital of causing the small wards to open from a general corridor?

A. I like the plan; and a large, spacious, well ventilated, roomy corridor, as an ante-chamber to the wards, I consider an excellent feature in the plan of the Victoria Hospital; it will form a cheerful airy promenade in all weathers, and will be a good intermediate spot between the sick chamber and the open air.

Q. What is your opinion as regards the comparative merits of the plan of the Bordeaux and Victoria Hospitals now submitted to you?

A. The excellence of the principle of the non-congregation of large masses of sick together must be admitted; but it is doubtful, for many reasons, if it could have been rendered applicable to an establishment so vast as that contemplated at Netley, the inmates of which need never suffer from hospital-generated miasms, as the means (almost even without artificial ventilation) for the admission of fresh air are ample.

Q. What is your opinion as to the arrangement of the water-closets, baths, &c., for which provision is made in the plan of the Victoria Hospital?

A. As shown in the modified plan, nothing can be better.

Q. Do you think the patients in these wards will be free from the effects of the foul air from these water-closets?

A. I believe the patients will neither suffer inconvenience nor injury from the water-closets, certainly not from their proximity, if they are, which they

doubtless will be, properly constructed with good wide pipes, plenty of water, and other modern improvements.

Dr. Neil Arnott.

Q. Whether do you consider large or small wards preferable?

A. As regards warming and ventilation only, with the means now known, the size of the wards is of little importance. For small wards the best means are exceedingly simple, although quite effectual, differing little in appearance from the ordinary fireplaces to which all are accustomed, and with which, in this climate, all have the most pleasing associations.

Q. As large wards admit of being arranged, as in France, in separate masses, whereas small wards evidently cannot be so disposed, what is your opinion of the system shown in the plans of the Victoria Hospital, of causing the small wards to open on a general corridor?

A. The advantage of having the power to admit pure air and light with complete freedom to a long ward, which has windows only at the ends, as proposed in the Netley Hospital, cannot be questioned. The proposed corridor, into which the windows at one end of all the wards are to open, will somewhat restrict this desirable freedom in both respects. In London, dining-rooms, of which the windows are shaded by the projecting verandah, three or four feet broad, of the drawing-room above, are deemed gloomy; and the colonnade in the Regent's Quadrant, which thus darkened the low rooms, was ultimately removed, because many of the houses remained untenanted. The corridor of the Hospital will be 12 feet broad instead of the verandah of 4 feet, and instead of an open colonnade there will be an external wall opened only by windows, so that the internal windows will have only a borrowed light; still the windows at the other end will be large and free, but directed towards the north-east. There will be the advantages of convenient approach to all the wards, and of comfort to the invalid and convalescent, who may take exercise in fitly tempered air away from the sick ward. To maintain moderate temperature in the corridor during the cold of winter by fires, and during the heat of summer with the direct sunshine of long days, by Venetian or other shades, and free openings above and below, will require skilful management.

Q. What is your opinion of the comparative merits of the plan of the Netley Hospital and that of Lariboisière, or Bordeaux?

A. That question is partly answered by what has been said in answer to the preceding. In a town the concentration of the buildings of a large establishment is often unavoidable, and therefore hospitals with a smaller number of large wards may be more befitting, giving also perhaps greater ease of supervision to the officials in charge; but in the country where the space is not limited, and where all the windows may command cheering views of the open landscape, almost as much as those of a detached country residence, the long line of building of the proposed Netley Hospital is anywhere the more appropriate.

Q. What is your opinion of the arrangement of the water-closets?

A. It would be difficult to overrate the importance of having the water-closets as much detached as possible from the dwelling-rooms, although in cold weather they should be maintained for sick people at a temperate heat; I approve, therefore, of the plan to have a lobby, or part of the passage, open to the atmosphere between them and the body of the hospital. There are various ways in which the two objects of separation and tempered ventilation may be attained, and the particular plan to be chosen will depend on the general plan adopted in the hospital.

Q. What system of ventilation do you recommend for the Netley Hospital?

A. I believe the best plan will be the open English fireplace, arranged for ventilation, as I have described in my late publication, "On the Smokeless Fire, &c." It will be seen that the arrangement produces a much more powerful and complete ventilation than had been obtained before, except by mechanical means, such as pumps, or fan wheels driven by steam-engines, or by steam-jets. This fireplace, although now generally known by name, and because for it and other devices connected with the art of warming and ventilating, the Council of the Royal Society awarded their Romford medal, and the authorities at the late

Paris Exhibition gave their highest medal, is still little understood by people generally. I shall be happy to exhibit and explain it and its modifications as now used in all the apartments of my own house, to the members of the Committee, and to prove to any scientific and competent judges that it possesses the following qualities: of being smokeless, of saving nearly all the trouble of fire management to attendants, of giving singular power of ventilation, and distributing the warmth more than common fires, of tempering the fresh air which enters the room, and of saving much fuel. But, further, to leave no uncertainty as to all desirable results being secured, I advise that the windows be made to open for through and through ventilation, if ever wanted, and that the simple ventilating pump described in my book, at page 162, be established with branching channels, so that pure air, and warmed air if wished for, in any desired quantity, may be forced into all or any of the wards. A Commission appointed by the General Board of Health is now engaged in investigations with regard to the working of the smokeless fire and others, and will be able to speak with authority on the subject. The members of the General Board of Health, with their engineers and other officers, examined the workings of the ventilating pump spoken of, and reported upon it as set forth in my book, at page 167. Further details respecting these matters I shall have pleasure in giving to the members of the Committee if desired. I had noted other observations on the proposed and possible plans, but I am prevented from writing more by the arrival of the time when I had undertaken to send my answer.

I send a copy of my book and of my report made to the Board of Trade on the Paris Exhibition.

No. 3.

Colonel O'Brien to Professor Phillips.

Sir, *War Office, Whitehall, S.W., April* 22, 1858.

I am directed by the Committee to acknowledge the receipt of your letter of the 19th instant, and to thank you for the courtesy with which you have acceded to the wishes of the Secretary of State for War.

I beg to inform you that the gentlemen whose names are noted in the margin* have also been so good as to place their services at the disposal of the Committee, with a view to assist them in their inquiry.

I inclose, for your consideration, a few questions respecting the geological formation of the ground at Netley, and the nature of the soil upon which the Hospital is being erected.

The Committee would esteem it a favour if you would be so good as to furnish them with your opinion on these points at your earliest convenience.

I am instructed, however, to say, that the Committee by no means desire to confine your attention to these points, but will feel much obliged if you will be good enough to report to them upon any other points which may suggest themselves to you during the course of your inquiry, and which may seem to you calculated to affect the healthiness of the site or the character of the climate.

I have, &c.
(Signed) T. O'BRIEN,
Colonel and President.

1. What is the geological formation of the ground at the spot chosen for the erection of the Hospital? What is the character of the principal strata, in what order do they occur, what is their depth, and in what direction do they slope or dip?

2. Is the general character of the formation such as would facilitate the draining off of surface or rain water, or is it such as would arrest that natural drainage and retain the water so as to form a wet soil, or engender a moist atmosphere?

3. Are there any beds of clay under the building, and if so, at what depth do they occur, and how may they be expected to affect the dryness of the building?

P.S.—Major Ravenhill, R.E., who is now in charge of the works at Netley, will be requested to afford you every information and assistance in his power in the prosecution of your inquiries.

Report of Professor Phillips.

Oxford, May 11, 1858.

The Royal Victoria Hospital, now in course of erection at Netley, near Southampton, is situated on gently rising ground, with a clear frontage open to the south-west. For a large space around Netley the country is open and dry, without stagnant water, and traversed by only a few inconsiderable rivulets. Towards the sea the small valleys of these streams become flat and peaty; the peat surfaces pass to some extent under the Southampton Water, and are there covered by a tidal deposit of silt a few feet in thickness.

Thirty-five feet above the high-water mark the floor-line of the Hospital extends for above a quarter of a-mile, parallel to the cliff, which is capped by a layer of flint pebbles, resting on coherent sand, in some places slightly

* Dr. Babington, F.R.S., Dr. Milroy, Professor Thomson, F.R.S., Dr. Mouat, Deputy Inspector-General of Hospitals, Dr. Cooper, 4th Dragoon Guards, John Simon, Esq., F.R.S., and William Ranger, Esq., General Board of Health

argillaceous. The flint gravel here referred to spreads from the cliff edge over a large tract of country round the new Hospital, and gives to it, for the most part, a dry healthy character. Beneath it the substrata vary; sands, and clays much mixed with sand, of different kinds, appearing at different places, under the same gravelly covering. These alternating strata yield water to many shallow wells.

The foundations of the Hospital are partly laid in the gravel, and a well which is near the centre is begun in that deposit, but in the rear of the building the gravel was thin and partial, and pale sandy clay was met with at or near the surface, and has been found useful in brickmaking.

It is not at all like the strong clays in the vicinity of London, but is more arenaceous, and appeared to be free from the bisulphuret of iron, which is so common in blue clays, and is subject to decomposition by atmospheric agencies.

Considering how small is the total surface of clay here exposed to the atmosphere, how completely and easily it may be covered up by gravel laid over it, in all the intervals between the walls of the wards and in the spaces around the building, and how little retentive of moisture it is when compared with other clays, I conclude that no injurious effect can really arise from it.

Even if the precautions alluded to were not attended to, it appears to me very unlikely that with walls guarded as these are by a layer of asphalt, and surrounded by grassy lawns or gravel walks, all drained by sewers which discharge under the sea water, a well ventilated Hospital in a country so dry and open as this can really be damaged by a few acres of argillaceous land.

In considering the geological constitution of the country and its effect on the quality and distribution of water below the surface, I have found it necessary to examine points at some distance from Netley.

Taking the stratification of the well sunk to 188 feet as my guide, and comparing it with that observed in the artesian well near Southampton, and the cliffs of the Isle of Wight, and near Lymington and Christchurch, I have arrived at the conclusion that the strata beneath the Hospital belong to the middle and lower part of the tertiary strata of the south of England. The Bracklesham beds, the London clay, and the strata of Woolwich and Thanet lie beneath the floor of the Hospital, and under them all is the chalk. I have no doubt they all have a slight dip to the southward, or from the interior of Hampshire towards the Isle of Wight. The sketch, Section No. 1, on a line from north to south, will show what is meant by this. The freshwater beds of the Isle of Wight do not appear in the country near Netley.

The strata in the well below the merely superficial deposits appear to me to belong to the series of Bracklesham sands and clays, and there is probably a great thickness of other sands and clays below what the auger has pierced, and above the chalk. Whether the well, now 188 feet deep, may ever require to be sunk to or near to the chalk, for the purpose of obtaining a further or better supply, must depend on the quantity and quality to be obtained from the actual perforation. I am informed the supply is now about 50,000 gallons in twenty-four hours. The quality will much depend on keeping out all springs from the thin clays which appear in the upper parts of the sinking, these being somewhat unfavourable to its purity.

I am informed that a reservoir is to be provided about two miles to the northward, and that the rain water falling on the large surface of the roof will be economized in two tanks.

The climate of Southampton is generally supposed to be rather damp, the temperature is mild and favourable. By a register kept by the late Mr. John Drew, and published in the Reports of the British Association for 1851, it appears that the mean temperature of Southampton is about 50·3 Fahr., the mean temperature of July 61·4, and of January 39·8; thus 21·6 is the difference of the mean temperature of the warmest and the coldest months. The quantity of rain 37·5 inches. Degree of humidity (1,000 being saturation) ·862.

On the whole I see no ground for imputing unhealthiness to the site of this Hospital.

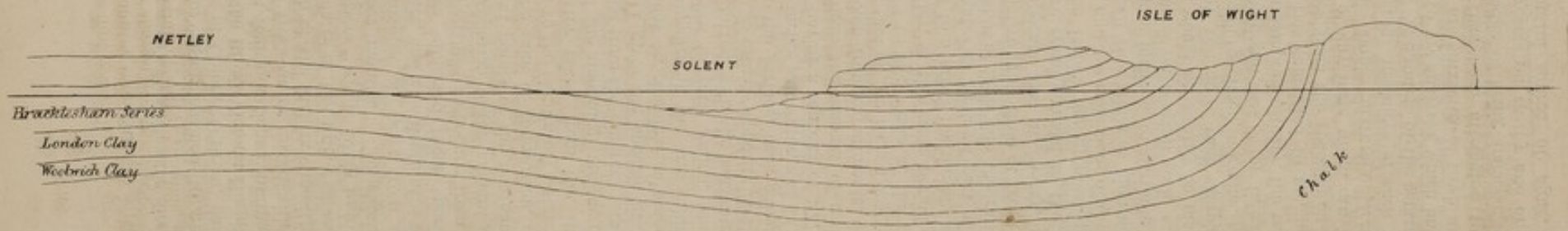
I have, &c.

(Signed) JOHN PHILLIPS, M.A., L.L.D.

Reader in Geology in the University of Oxford,

NORTH.

SOUTH.


NETLEY
SOLENT
ISLE OF WIGHT
Bracklesham Series
London Clay
Woolwich Clay
Chalk

No. 4.

Professor Thomson's Report on the Site of Netley Hospital.

For the purpose of being enabled to give a solution to the queries accompanying the letters of Colonel O'Brien, dated the 17th and 21st of April last, I visited the site of the Royal Victoria Hospital, at Netley, on the 26th and 29th of April. The first four questions contained in the letter of instructions refer to the amount of fresh water mixed with salt water at three different localities, viz., the mouth of the Itchen, opposite Netley, and opposite Calshot Castle, at high and low states of the tide, and as to whether such mixtures as may be found in these places "will be likely to give rise to the evolution of any gases during the summer months." To obtain data for replying to these inquiries I collected samples of water from each of the situations above enumerated at the surface, and at a depth of 4 feet under the surface at high and low water. I have subjected these specimens to a careful chemical analysis, and have been enabled to deduce from the results of these examinations a very close approximation to the amount of fresh water mixed with the salt water at the different points of the Southampton estuary enumerated. I have also added (for the sake of comparison, and to point out the gradual transition from the fresh to the salt water) a statement of the amount of saline matter contained in water taken from the Itchen ferry at Southampton. Table I affords a view of the amount of residue or foreign matter contained in each gallon of water taken from the different localities, and left when the water is boiled away. Table II gives the specific gravity of each sample, and the amount of each ingredient or chemical substance dissolved in the water in 1000 parts. Table III supplies, in the first column of figures, the amount of salt water in cubic inches in each gallon, and the last column shows the quantity of fresh water mixed with the salt water to make up the gallon; the table is read thus. In the estuary opposite Netley Hospital, at high water, at a depth of 4 feet from the surface, each gallon of the water existing there consists of 262·83 cubic inches salt water, and 14·44 cubic inches fresh water—the total imperial gallon having a capacity of 277·274 cubic inches. The basis of this calculation has been the amount of residue in the English Channel water, which has been taken from experimental data at 2535 grains per gallon. From this table we learn that at the Itchen ferry the proportion of fresh water to salt at low tide is as 1 to $2\frac{1}{2}$; while at the mouth of the Itchen the ratio was as 1 to $7\frac{1}{2}$. At Netley, at the same period of the tide, the proportion of fresh to salt water is as 1 to nearly 8; while at Calshot at half tide the relation is as 1 to 17. At high water at Netley 1 part of fresh water is mixed with 18 of salt water, and at Calshot at high tide the ratio is 1 fresh to $22\frac{1}{2}$ salt water. With reference to the relative proportion of fresh and salt water in the mixture at different depths, it appears that at Netley, both at high and low tide, the fresh and salt water were equally mixed at the surface as at 4 feet in depth, while at the mouth of the Itchen the greatest quantity of fresh water was on the surface, both at high and low conditions of the tide. At Calshot the waters seem equally mixed at half tide, while at high water there appears to be some difference, which I am more inclined to attribute to error of experiment, since as the experiment was made on a small scale any error when the calculation was applied to the gallon would necessarily be magnified. Table IV gives the chlorides in 1000 parts by volume of each sample, and Table V exhibits the chlorides in a gallon of each specimen in grains.

Since there can be no doubt that at low tide fresh water can be detected in the salt water of the Southampton estuary, the next subject for consideration, as contained in the queries submitted to me, has reference to any possible evolution of noxious gases, from the reaction on each other of fresh and salt water. I am not aware of any facts which can be cited as evidence of any injurious reaction by the simple mixture of fresh and salt water. On the contrary, there are numerous instances of such mixtures in nature where a healthy climate prevails. The waters of the central parts of the Black Sea and of the Baltic, according to my analyses, which have been corroborated by the investigations of others, are mixtures of fresh and salt water, and I am not aware that any disease has been attributed to such mixture, or that any chemical reaction is capable of being induced thereby. Fresh water alone, when it stagnates and reacts on earthy and organic particles, in an inland country, supplies a fruitful source of ague, as in Cambridgeshire and

Lincolnshire, and of continued or remittent fever in the central portions of South Africa. (Livingstone).

In marshy situations, bordering the banks of rivers, to which the tide has access, as in the Canton river in China, where I have had abundant opportunities of studying the conditions of the waters and the endemic diseases, the prevailing complaints of the climate are ague and remittent fever—maladies analogous to those occurring in inland positions on the marshy banks of rivers where salt water is not found.

The examples which have been cited by authors of the prejudicial influence of mixtures of salt and fresh water have occurred in localities where from the predominance of marshy ground, fresh water alone would have produced an unhealthy climate. But there is reason to infer, that in a marsh the presence of saline water tends to increase the amount of gaseous exhalation, which, in the case of fresh water reacting on the marshy soil, is partially generated by the decomposition of salts by the organic matters of the marsh, the salts having first been dissolved up from the substratum of soil by the fresh water. The mixture of salt water with the fresh water of the marsh supplies a ready formed saline solution, upon which the organic matter, in solution, or even in suspension, more speedily begins to act.* It is in this way we must explain the improvement of climate which has succeeded on the coast of France and of Tuscany, the exclusion of sea water from the neighbouring marshy ground of the shores of the Mediterranean. (Ann. de Chim. et de Physique, 2nd Ser. 29, p. 225). The vapour of water alone raised by the law of the diffusion of water, is capable of carrying with it a certain amount of organic molecules from an evaporating surface. Liebig, who has devoted his accurate analytic powers to the detection of ammonia in the atmosphere, considers it "worthy of observation, that the ammonia contained in rain and snow water possesses an offensive smell of perspiration and putrifying matter, a fact which leaves no doubt respecting its origin." And when he had distilled several hundred pounds of rain water, and evaporated the first two or three pounds, with the addition of a little muriatic acid, a very distinct crystallization was obtained; but the crystals had always a brown or yellow colour. This colour depended on the presence of organic matter which had accompanied the ammonia in its original evaporation from the surface of the earth. The reaction of organic matter in the soil, or in solution in water, upon the sulphates of the solution, gives origin to the evolution of sulphuretted hydrogen, which, as it escapes, has a tendency to carry with it organic molecules, as in the case of the evaporation of ammonia. Carbonic acid and carburetted hydrogen are also frequently discharged from marshy localities, and act prejudicially to health, less by their own direct influence than by the organic matter transmitted along with them. I know of no facts which support the idea entertained by some, that a gas can produce a disease characterized by a regular sequence of symptoms. Reasoning from analogy we cannot but infer, that disease, possessing a regular type, must be produced by an entire organic molecule, as exemplified by vaccine and variolous matter. (*See* my Report to the Board of Health in 1854, on the epidemic cholera of that year.)

2. The second subject to which the fifth and sixth queries refer is, as to the constitution of the mud in front of the Hospital on the shore, the amount of vegetable and animal matter contained in it, and the probable result, in a sanitary view, of the reaction of sea and fresh water upon its particles. In Table VI, the composition of seven samples of mud is given. Those marked 1, 2, and 3 were taken by myself, in company with Major Ravenhill, while A, B, C were taken in 1857, by Major Ravenhill, along the line of low water mark. The seventh sample was procured by Major Ravenhill, at a depth of 4 feet under the surface of the mud bank. The eighth specimen was obtained by myself, from the mud exposed in the neighbourhood of Haslar Hospital at Portsmouth, and is added for the sake of comparison. Table V shows that some of the mud is in a very moist state when first extracted from the bank. The first two samples yielded as much as about 81 to 83 of water per cent., and the third specimen contained less than half its weight of water. The sandy mud under the surface contained less than a fifth of its weight of water. The specimens marked A, B, and C had been air dried, and, therefore,

* Lancisi was aware of the necessity for the presence of *sordes* in these conditions.—"De Noxiis Paludum Effluviis," I., p. I, c. v. 8.

can only be compared with those marked with numerals, when they have been dried at the same temperature. This has been calculated in the lower part of the table, the samples having been dried at 300° Fahrenheit.

From these figures we learn, that while in the fresh state the mud marked 1 contained 3·43 per cent. of organic matter, in the dry state, this was equivalent to 20 per cent. The largest amount of organic matter is contained in the mud nearest the shore, the samples 1, 2, and 3 having been taken towards the land, while the others, A, B, and C were taken at the greatest distance from the shore.

The mud, microscopically examined, gave evidence of the presence of dead vegetable cells, and in certain portions, of live vegetation, but no particles could be detected of an organic animal nature, with the exception of some silicious diatomaceæ. From the existence of nitrogen in the mud, as ascertained by careful chemical analysis, we may infer the presence in it of nitrogenous matter, similar to that which constitutes animal structure; and as the products of decomposition are the same in albuminous bodies, whether they be of vegetable or animal origin, the fact of their having constituted a portion of the animal frame is immaterial. The amount of nitrogen in the worst sample of mud (No. 1) was ·791 in the dry state, which is equivalent to 4·31 per cent. of nitrogenous substance similar to animal matter. In the fresh state, as it existed in front of the Hospital, this mud contained only ·135 per cent. of nitrogen, equivalent to ·84 per cent. of albuminous matter. The mud itself consists essentially of sand and clay, originally entering into the composition of a sand-bed, which lies under the surface gravel. The portions of the mud bed under the surface consist principally of sand. Its composition is represented in the 7th column of Table VI. In order to compare the mud at Netley with that in the neighbourhood of Haslar Hospital, where a much larger tract of mud is laid bare at low tide than at Netley, I visited Portsmouth on the 10th of May, and collected specimens of the mud in the immediate neighbourhood of the Hospital at Haslar. The result of the analysis of this mud is given in the 8th column of Table VI. In the fresh state this mud consists of 40$\frac{1}{2}$ per cent. of water, 56$\frac{1}{4}$ of inorganic matter, and of nearly 3$\frac{1}{2}$ of organic matter. In the latter is present ·16 of nitrogen equivalent to 1 per cent. of albuminous matter, which is considerably greater than that present in the fresh mud at Netley. When the mud is dried at 300° Fahrenheit, it is found to consist of 94$\frac{1}{4}$ of mineral matter, and of 5$\frac{3}{4}$ of organic matter, of which upwards of $\frac{1}{4}$ (·268) per cent. is nitrogen, equivalent to 1·76 per cent. of albuminous matter. This is considerably less than that found in the sample analysed from Netley in the dry state; but an inspection of the table is sufficient to show that the amount of organic matter in the Netley mud varies greatly, and that the sample No. 1 analyzed, was probably the worst specimen that could be obtained, as in all the other samples the organic matter is much inferior in quantity to that in column 1 in the dry state.

The wettest portions of the mud at Netley are black-coloured, which appears to proceed from the presence of protosulphide of iron, a compound readily decomposed by an acid. On adding sulphuric acid to the mud, sulphuretted hydrogen and carbonic acid are evolved in abundance; but so far as my experiments warrant the conclusion, there seems to be no sulphuretted hydrogen evolved from the mud in its natural state; at least, I have not been able to detect a trace by the usual tests. I may further add, that I have kept some of the wet mud in a jar for a week without being able to detect the evolution of sulphuretted hydrogen. In the course of some weeks, however, on stirring the contents of the jar, that gas was distinctly appreciable both by its smell and by chemical tests. But although I may again add, that I have not been able to detect the evolution of sulphuretted hydrogen from the fresh mud, it must be remembered that the mud was examined in April, and at a season of the year when the conditions were not so favourable for the extrication of such a gas. The application of appropriate tests during a hotter period of the year would afford an *experimentum crucis* in reference to this point.*

During the period of my visit, the sulphuric acid of the sulphates in the sea water was obviously undergoing slow deoxidation by the agency of the vegetable matter in the mud; sulphur was thus liberated which united with the iron of the sand and produced black sulphide of iron. I am of opinion that this sulphide will have little tendency to accumulate, for, in its moist state, by access of air it must be converted into protosulphate of iron and be insensibly washed away into the estuary in a soluble form. It would thus appear that there

* It may be added that this experiment will be immediately repeated (7th June).

is supplied by nature a counteracting agency to fix the sulphuretted hydrogen as it is formed, and to prevent at least the greater portion generated from being elevated into the air. In further examining the air over the mud, I have not succeeded in discovering any emanations which can be considered injurious to health. At the same time I offer with caution any opinion upon this subject, because the limited time allowed me for the investigation has prevented me from making the analyses of the air on such a scale of magnitude as to be considered decisive. When the mud is stirred it undoubtedly yields an odour, and a somewhat similar modified smell is wafted by the wind when the mud is at rest; but this smell appears to me to be similar to that which is familiar on the sea shore in many localities where sea weed lies weathering on the beach.

Although I have not been able during a very limited inquiry to detect any offensive gases emanating from the mud, I consider it highly desirable to diminish as much as possible any probable contingency in this direction. It appears to me that by running a hard, a jetty or pier for some distance into the estuary on the Southampton side of the Hospital, a considerable portion of the mud next the shore would be rendered firmer and more capable of supporting two feet or more of gravel, so as to cover over much of the present surface of mud and vegetable matter, but the method of solidifying the mud so as to render it capable of retaining a bed of gravel on its surface, would fall within the province of an engineer.

3. The next topic to which my attention is called in query 7, respects the effect of the peat in acting on the sea water mixed with the fresh water. I have been supplied by Major Ravenhill with a sample of peat from a depth of 9 feet below the surface of the mud bed. I find it to be a common description of peat. I have subjected it for some weeks to the action of saline water taken from the estuary at Netley, and have not been able to detect any odour originating from the reaction, or any deleterious gas emanating from the mixture of peat and salt water, and I do not apprehend that any noxious influence can be communicated to the atmosphere by the influence of the peat at such a depth upon the salt water of the estuary.

The composition of the peat when air dried, was found to be

Water	37·03
Vegetable matter	37·70
Ash	25·27
	100·00

4. The last question in the letter of instructions, refers to the detection of Southampton sewage in the waters in front of the Netley Hospital. To settle this question I have carefully tested the water at low states of the tide, and have not been able to detect even a trace of sewage in it.

ROBERT DUNDAS THOMSON, M.D., F.R.S.,
Lecturer on Chemistry at St. Thomas's Hospital, and Examiner in Chemistry at the University of London.

St. Thomas's Hospital, May 27, 1858.

Table I.

Table exhibiting the Amount of Residue per imperial Gallon in each sample of Water from the Southampton Estuary, in grains.

			Weight of residue in grains, per gal.
April 26..	1	Opposite Netley, High Water, 4 feet deep ..	2403
,, ..	2	,, ,, surface	2410
,, ..	3	Opposite Calshot, Half Tide, 4 feet deep ..	2319
,, ..	4	,, ,, surface	2313
,, ..	5	Opposite Netley, Low Water, 4 feet deep ..	2240
,, ..	6	,, ,, surface	2251
,, ..	7	Mouth of Itchen ,, 4 feet deep ..	2193
,, ..	8	,, ,, surface	2149
April 29..	9	,, High Water, 4 feet deep ..	2279
,, ..10		,, ,, surface ..	2240
,, ..11		Opposite Calshot ,, surface ..	2396
,, ..12		,, ,, 4 feet deep ..	2426
,, ..13		Itchen Ferry, Low Water surface ..	1829

Table II.

Table showing the Composition of Water in 1,000 parts at different states of the tide, taken from the Estuary at Southampton on the 26th and 29th April, 1858.

		Specific Gravity.	Total Residue in 1,000 parts.	Chlorine in 1,000 parts.	Sulphuric Acid in 1,000 parts.	Magnesia.	Lime.	Potassium.	Sodium.
1	Opposite Netley, H.T., 4 feet deep ..	1025·9	34·3333	18·992	2·142	2·080	·553	·400	10·574
2	Do. do. surface	1025·9	34·4333	19·111	2 221	1·850	·562	..	..
3	Opposite Calshot, Half-tide 4 feet deep ..	1026·01	33·1300	18·886	2·226	2·268	·551	·364	10·319
4	Do. do. surface ..	1026·18	33·050	18·886	2·278	2·103	·554	·341	9·856
5	Opposite Netley, L.T., 4 ft. deep ..	1024·21	32·133	17·679	2·080	2·059	·562	·337	9·549
6	Do. do surface* ..	1024·21	32·160	17·679	2·101	2·112	.546	·373	9·714
7	Mouth of Itchen, L.T., 4 feet	1023·14	31·333	16·969	1·994	1·978	·532	·384	9·352
8	Do. do. surface	1022·96	30·700	16·969	1·994	1·936	·540	·425	9·390
9	Do. do. H.T., 4 feet ..	1024·81	32·566	17·892	2·142	2·021	·560	·494	10·111
10	Do. do. H.T., surface ..	1024·68	32·000	17·821	2·111	..	·548	·444	10·039
11	Opposite Calshot, H.T., surface	1026·47	34·233	19·099	2·276	..	·565	·415	10·756
12	Do. do. 4 feet	1026·47	34·666	19·099	2·322	1·971	·582	·516	10·755
13	Itchen Ferry, L.T., surface	1020·79	26·133	14·058	1·785	..	·436	·284	7·921

H.T.—High Tide. L.T.—Low Tide.

* The specific gravity was subsequently found, on three successive days at low water, respectively 1023·4, 1023·07, 1021·3 (7th June).

Table III.

Table showing the Amount of Salt and Fresh Water in each Gallon of the Southampton Estuary Waters, in cubic inches, each Gallon having a capacity of 277·27 cubic inches.

		Salt Water.	Fresh Water.
		Cubic Inches.	Cubic Inches.
April 26.. 1	Opposite Netley, High Water, 4 feet deep	262·83	14·44
,, .. 2	,, ,, surface	263·60	13·67
,, .. 3	Opposite Calshot, Half Tide, 4 feet deep	253·65	23·62
,, .. 4	,, ,, surface	252·99	24·28
,, .. 5	Opposite Netley, Low Water, 4 feet deep	246·27	31·00
,, .. 6	,, ,, surface	246·21	31·06
,, .. 7	Mouth of Itchen ,, 4 feet deep	239·87	37·40
,, .. 8	,, ,, surface	235·05	42·22
April 29.. 9	,, High Water, 4 feet deep	249·27	28·00
,, ..10	,, ,, surface	245·00	32·27
,, ..11	Opposite Calshot ,, surface	261·96	15·31
,, ..12	,, ,, 4 feet deep	265·35	11·92
,, ..13	Water from Itchen Ferry, Low Water, surface	200·	77·27

Table IV.

Table showing the Chlorides of Potassium, Sodium, and Magnesium present in Ten Samples of Water from Southampton Estuary in 1,000 parts by volume.

		Chloride of Potassium.	Chloride of Sodium.	Chloride of Magnesium.
1	Opposite Netley, H.T.*	·764	26·896	3·042
3	Calshot, Half Tide	·694	26·246	3·536
6	Netley, L.T.	·712	24·708	3·160
7	Mouth of Itchen, 4 feet, L.T.	·733	23·787	2·937
8	„ „ surface, L.T.	·810	23·910	2·741
9	„ „ 4 feet, H.T.	·941	25·719	2·423
10	„ „ surface, H.T.	·846	25·534	2·538
11	Opposite Calshot, surface, H.T.	·792	27·358	2·679
12	„ „ 4 feet, H.T.	·984	27·356	2·679
13	Itchen Ferry, L.T	·541	20·149	2·200

* H.T.—High Tide. L.T.—Low Tide.

Table V.

Table showing the amounts of Chloride of Potassium, Chloride of Sodium, and Chloride of Magnesium in a Gallon of each of Ten Samples of Water from Southampton Estuary in grains.

		Chloride of Potassium.	Chloride of Sodium.	Chloride of Magnesium.
1	Netley, H.T.*	53·48	1882·72	212·94
3	Calshot, Half-Tide..	48·58	1837·22	247·52
6	Netley, L.T.	49·84	1729·56	221·20
7	Mouth of Itchen, 4 feet, L.T.	51·37	1665·09	205·59
8	„ „ surface, L.T.	56·70	1673·70	191·87
9	„ „ 4 feet, H.T.	65·87	1780·33	169·61
10	„ „ surface, H.T.	59·22	1787·38	177·66
11	Calshot, surface, H.T.	55·44	1916·06	187·53
12	„ 4 feet, H.T.	57·88	1914·92	187·53
13	Itchen Ferry, L.T.	37·87	1410·43	154·00

*H.T.—High Tide. L.T.—Low Tide.

Table VI.

Table exhibiting the Composition of different Samples of Mud opposite Netley Hospital, in their natural and dried states.

	1	2	3	4	5	6	7	8
	No. 1.	No. 2.	No. 3.	A	B	C	Sandy Mud, 4 feet under surface of mud.	Portsmouth Mud.
	April 26, 1858.	April 29, 1858.	April 29, 1858.	Taken last year (1857) along the line of low-water mark.			May 1858.	May 10, 1858.
Water	82·94	80·79	47·39	5·59	2·68	3·35	18·65	40·32
Inorganic Matter	13·63	18·16	49·99	90·91	95·72	94·56	84·77	56·26
Organic Matter	3·43	1·14	2·62	3·50	1·60	2·09	·90	3·42
	100·	100·	100·	100·	100·			
Nitrogen in the Organic Matter (343 grains)	·135	..	..	..	..	..	..	·16
	Calculated in the dry state at 300° Fahrenheit:—							
Inorganic Matter	79·90	94·06	95·02	96·30	98·36	97·84	98·95	94·27
Organic Matter	20·10	5·94	4·98	3·70	1·64	2·16	1·05	5·73
	100·	100·	100·	100·	100·	100·	100·	100·
Nitrogen, per cent.	·791	..	..	..	..	..	..	·268

The Samples marked 1, 2, 3 were taken by myself at different points between the shore and low-water mark; A, B, C were collected in 1857, by Major Ravenhill, along the line of low-water mark; No. 7 was taken by Major Ravenhill, from a depth of four feet under the mud; and No. 8 was brought by myself from the neighbourhood of Haslar.

No. 5.

Report of W. Ranger, Esq., on the Site and Plans of the Victoria Military Hospital at Netley.

Sir,

Having been requested by your Committee to consider various questions set forth in your letter of the 22nd of April last, and to report thereon, also on such points as may have suggested themselves during my inquiry as calculated to affect the healthiness of the site and fitness of the building for a Hospital.

I beg to state that I have considered the various documents laid before me, and examined the district and the plans of the building.

I now inclose my report on such of the points as devolve properly on the engineer to consider, and, where necessary, to suggest measures of rectification.

I have the honour to be,
Sir,
Your obedient humble Servant,

W. RANGER, C.E.,
Superintending Inspector.

Colonel O'Brien,
Assistant Quartermaster-General.

Site.

The surface of the ground, starting from the cliff, 15 feet in height, on the eastern side of the estuary, rises pretty gradually, at the rate of 1 in 20, for a considerable distance to the north-east beyond the site.

On the northern and southern side, it is bounded by two narrow valleys, varying from 50 to 100 yards in width. These valleys open out south-west to the estuary, with a good fall.

The main building and offices stand on benching excavated for the purpose in the sloping ground, at a height of 35 feet above the level of the sea, high water spring tides.

The front of the centre building is placed at a distance of 430, and that of the wings from 530 to 590 feet back from the line of high water.

The estuary extends about 10¾ miles in a north-west direction from Calshot, or 6¾ miles above the site of the Hospital. Its width during high water, at the head, is 1,000 yards; at its confluence with the Solent, 2,500; opposite the site, it is 2,700 yards wide, and 700 at the 3-fathom line of low-water soundings. The shore extends about 23 miles.

The quantity of water discharged into this estuary in ordinary weather is about 16,600 cubic feet per minute, viz., 6,600 from the Test at the head, and 10,000 from the Itchen at its confluence, on the south side of Southampton, and 2¾ miles above the site (Netley), where the average flow of the ebb is about 1,000,000 cubic feet per minute.

The tidal wave from the Solent extends up the Itchen 7¾ miles (10½ above the site), where it is stopped by a mill-dam.

The shore on the eastern side of the estuary (11¾ miles in length) consists of shingle (beach) sand, and silt, with a small quantity of vegetable matter (chiefly grass). A glance at the formation and the Admiralty chart, with a knowledge of the abrading power of water, will clearly show the sources from whence the detrital materials at the sides of the estuary have been brought. These, from their nature, cannot possibly, I think, impart any perceptible impurity to the atmosphere.

There is a peculiarity in the tides of this estuary worthy of remark. The tidal wave coming up the Channel is divided by the Isle of Wight. The northern portion rushes by Hurst Castle and up the estuary (passing Netley),

producing high tide at Southampton quay, and then ebbing. About two hours after the first flood, the southern portion of that wave also reaches the quay, having gone round the island and come in at Spithead; hence is derived a second high tide before the final ebb. This meeting of the two tides has caused an accumulation of shingle, off Calshot, known by the name of the "Brambles," the extent of which is marked by buoys.

It is high tide at Calshot before the southern portion of the wave brings the flood from Spithead. When the second flood arrives, it adds to the ebbing current which has already set in, down the west Channel, and increases the rush by Hurst Castle, at which point the run of the tide is then extremely rapid.

The tide runs up the estuary about 6½ hours, the slack water at the top thereof holds for nearly 3 hours more, making a total of 9½ hours. The main ebb only lasts about 2½ hours. Its rise during the first 4½ hours is only about 4 feet. In the remaining two hours it rises 4½ feet. At spring tides it rises as much as 5½ feet in the same time.

Upon comparing the sections of the estuary from soundings made in 1783, with those of the Admiralty chart of 1851, I find a singular agreement. There is no diminution of depth of water in mid-channel; but on the eastern side there is a small increase in the depth of running water.

In the papers submitted to me for the purpose of reference, stress is laid on the effect which the sewage of Southampton has now or may hereafter have on the site of the Hospital. Now, a very slight observation is sufficient to show that no injurious effect can possibly arise from this source, however large the place may become. The fact is, none of the mischievous portion of the sewage (viz., the insoluble part), ever enters the estuary at all, but is confined entirely to the Itchen, and there only to the western shore.

The lowest point of outfall is about 1½ miles above the confluence of this river with the estuary.

The tide in the axis of the river runs at an average rate of about three miles an hour. Towards the sides it is less rapid, not more than 80 feet per minute, falling into slack close to the shore.

The specific gravity of ordinary insoluble sewage is 1·325.* In slow currents (under 170 feet per minute), it sinks at the rate of about 1 foot per minute. In slacks and along shore it sinks at all times of tide, also on the turn of tide at high water; when it becomes quiescent, or nearly so, it will precipitate, but in currents exceeding 170 feet per minute, it is always kept in a state of mechanical mixture.

In the Itchen as in all other tidal rivers, there is a disturbance caused by two contending forces—by the force of the freshet downwards, and that of the tide upwards. The ebb tide is under totally different conditions; all the water is then drawn away into the estuary, and there is no convolution. During 9½ hours out of 12, the sewage for the most part, is carried up the Itchen. The quantity is estimated at 152 cubic feet per minute.

I have made careful examinations of the shore of the Itchen and the outfalls of the sewers (which are unfinished). That nearest to the estuary is the principal one. Here I found the range or traverse of the precipitated sewage distinctly marked (by the material itself), and entirely confined within an area of 1,000 yards, viz., 200 yards below the unfinished outlet sewer, and 800 above it. This noxious material at the time of my examination varied from 3 yards to 25 in width, its greatest intensity being near the edge of low water.

The question may, however, be carried a step further by assuming the insoluble sewage drawn into the estuary; even then its resting place will not be on the Netley side, but on the western, nearly opposite Southampton, owing to the momentum of the water from the Itchen being about double that which comes in from the Test.

The river Thames and its condition having been quoted in the papers submitted, although it cannot have anything whatever to do with the case in question, it may be as well to show the relative quantities of water and sewage in the above-named river, as compared with the Itchen, and the flow of the estuary.

The flow of the Thames in 1852, when gaugings were made under my

* Mr. Gurney's Report on the Thames.

direction (for purposes connected with a Parliamentary inquiry into the state of the London water supply), was 261,008 cubic feet per minute. The population of the metropolis amounted to 2,362,236 persons, the quantity of sewage discharged daily into the Thames from London alone has been estimated at 15,249,777 cubic feet,* or 10,587 cubic feet per minute. The freshet of the Itchen is 10,000 cubic feet per minute; the town of Southampton numbers a population of 34,000 persons.

The quantity of sewage poured into the Itchen from the temporary outfall above the entrance to the docks is about 140 cubic feet per minute.

The district of Netley is entirely free from stagnant ponds, pools, or accumulations of foul and corrupting waters.

The upper strata favour a rapid transmission of the rain by gravitation to a considerable depth, and beyond the influence of the sun's rays. These strata are thoroughly washed and naturally drained to a great depth, whilst the upper soil gives off its moisture in about one-third of the time it would be necessary to evaporate it from a stiff clay. The only exceptional parts are the two small valleys, and the coppice on the southern side. These valleys should be efficiently drained, and the tidal waters excluded. If this be done, and the works properly maintained, nothing hurtful to the atmosphere can possibly arise.

In the coppice, vegetation has gone on year after year without being cropped, here much of it ripens, withers, and dies; and it has been allowed to accumulate and decay. The remedy for this evil is to clear away or open out the underwood and crop the surface, leaving most of the trees.

With regard to the shore between the cliff and line of low water, I learn that Major Ravenhill, R.E., has already given his attention to its condition and suggested the construction of a retaining wall, with an esplanade along the front of the building, extending 100 feet into the estuary beyond the line of high-water mark, where it will be washed by the sea daily 7 hours out of 12. In my judgment something of this kind should be done; the extent, however, will, I think, require further consideration.

I have already shown that the line of the shore is in a comparatively normal condition being nearly at the same level as in 1783. No injurious effects from this material are anywhere recorded. During the last ten years, at different seasons, I have made minute examinations into the sanitary condition of more than 200 towns, for the most part seated on the banks of the principal rivers; but in no case did the investigation show any hurtful results from the mud, except where mixed with sewage matter.

The aspect of the surface opposite Netley, between high and low water, is unsightly, and for this reason alone, it should be *beached* with proper ducts for carrying off the soakage. I have no hesitation in recommending this to be done, not only for the sake of appearance but for future security, care being taken to avoid constructing a pier or jetty, or any similar structure, which would be injurious. The chief outlay in carrying out the above suggestion would be for labour.

With regard to the effect to be anticipated from the mixture of fresh and salt water in the estuary, I may state that in the discharge of my official duty, I have examined sixteen towns, seated on the sides of the large estuaries in England and Wales. In fourteen I was unable to trace the least injury to health from the mixture of the waters. In two instances, however, owing to extensive marshes, with stagnant fresh and salt water combined, fever and ague specially prevailed,

With respect to the approaches, there can be no difficulty in the way of forming a suitable and easy landing for the sick at all times of the tide, combined with means for carrying them direct to the Hospital without a change of conveyance. Inland there are excellent roads, also coast and other lines of railway, which can, if necessary, be extended to the entrance of the Hospital.

Finally, in my opinion, the site is well suited for an Hospital. The plateau, from the nature of its soil and proximity to the estuary, is always well ventilated, at the same time sheltered from cold easterly winds, and if the works I have ventured to suggest are carried out, all local causes of vitiation of the atmosphere will be removed.

* Referees' Report on London Drainage, page 14.

Plans.

In proceeding with the consideration of the general design and internal arrangement of the building, as shown upon the plans, I have, in this, my preliminary report, confined my attention to the three great questions in which are involved the comfort of the patients, and the promotion of their recovery by lighting, warming, and ventilating, with such other matters as are compatible with fitness of purpose and stability of construction. At the same time I have not been unmindful of the original design, and the works already executed.

The wards for the most part are arranged in two wings, three stories in height, with an ambulatory 12 feet in width on each floor, and extending along the south-west parts, communicating with the central building on each floor, by means of short corridors, open at the sides, and affording easy and convenient access to every part.

The wards generally are 35 feet long, 24 feet wide, and 15 feet in height. Each ward is to contain nine beds, with a space of 1,400 cubic feet per man.

The windows at both ends of these wards are arranged in triplets, separated by narrow piers of brickwork. The area of glass in the north-east end of the ground floor wards is 53-180ths of that of the wall; and in the south-west end it is 33-90ths.

For the first floor wards the area of glass in the north-east end is 37-120ths, and in the south-west end 23-60ths of their respective walls.

On the second floor, the windows in the north-east end occupy 10-40ths, and in the south-west 19-60ths of the area of the ends of the ward.

When the great importance of light in rooms specially set apart for the constant occupation of the sick, is duly considered, it will be obvious that the rules laid down for proportioning the light for ordinary buildings must not be relied on for determining the quantity of light to be admitted into the wards under consideration. With a large number of facts and analogies, from time to time collected, relative to the quantity of light admitted into apartments under a variety of local conditions, and upon a due observance of the laws which govern its action, making all necessary allowance for the ambulatory, I find the provision made for lighting the several wards is amply sufficient.

For the purpose of warming, the arrangement made is for one open fire 17½ inches in length, to be placed in the side wall of each ward. The primary object of this class of fires being to afford warmth by radiant heat, "its gradation being pleasing to the senses at the moment, and calculated to prevent disease and its attendant evils."*

To set out in detail the investigation I have made into the several points, necessarily involved in determining the size proper for these fires, under the varied conditions of the seasons and uses of the wards, or even to enumerate the comparisons made by way of test, would extend this report to too great a length; for the present, therefore, I merely give the results at which I have arrived, viz., that the length of fire provided will be insufficient to afford adequate warmth to all parts of the respective wards, during the most unfavourable seasons of the year. 2. To insure an adequate amount of warmth at the periods of greatest need, it will not be safe to rely on a less length than 30 inches for the nine men wards: where there is a larger number, there should be two fires duly proportioned to obtain the greatest advantage from the coals consumed. The fires should be placed on the sides of the wards, opposite to those shown on the plans. In order to meet the varied conditions of temperature that take place during each year, means of contraction should be provided, without endangering the mass of fire.†

The plan of the fire and position of the coverings, respectively, should be so arranged as to offer the least possible obstruction to the radiation, and, at the same time, to reflect the heat with the greatest advantage into the wards. These conditions the stoves shown to me do not appear calculated to fulfil. A clear fire is an advantage; to attain it, the sides of the burning fuel should be at least half surrounded with slow conductors. If this is not done,

* Burke.

† Summary by Mr. Haile of the General Board of Health. Appendix.

much of the heat developed will pass off quickly, and that which ought to be radiated will be expended behind the fire. Iron being a rapid conductor should used as sparingly as possible about the fire. Fire brick, from its slow conducting power, is the most suitable material. Its use here will be attended with great advantage in every way.

The adoption of circular flues, made of stoneware, glazed, is a great improvement on the rectangular flues, formed with common bricks and pargetted. But to insure an ascending current at all times, prevent smoke from the wards, and to favour a slow combustion (necessary to the obtaining a clear fire), the area of these flues should be adjusted proportionately to the size of the grate and the height of the flue. The surveyor's consideration should be given to this subject.

Attached to each ward is a space (30 feet long by 7 feet 6 inches wide), set apart for orderly stores, a bath, and ablution rooms, a lobby, two water-closets, and a sink. The water-closets, sink, and lobby, only receive direct light by means of three separate windows.

The bath and ablution rooms, with the space set apart for the orderly and stores, will have borrowed lights; the two latter are also lighted partly from the room (for nurses), 15 feet by 12, which opens on the ambulatory between the wards. Upon investigation, I find a sufficient quantity may be obtained by a liberal use of glass in the partitions, &c., but there are great objections to borrowed lights at all times.

The proposed arrangement as shown on the plans, for the removal of the impure or vitiated air from the wards and rooms consists of rectangular flues, each 10 inches by 3, worked in the partition walls, each flue communicating with the wards by openings between the beds, one near the floor, the other close to the ceiling (both opening into a single flue). These flues terminate in a ventiduct, extending from one end of the building to the other (500 feet in in length), with a vertical extracting or vacuum shaft in the centre.

The fresh air is to be admitted by means of rectangular pipes, 11 inches by 7, inserted, with valves between the ceilings and floors, with openings through the front and back walls of the building, to the external air. These flues communicate with two ornamental hollow pedestals, 6 feet high, and covered with open wire work. These pedestals are to be placed in the axis line of the wards.

To prevent, as far as practicable, the possibility of derangement, mechanical and complicated appliances should be avoided. In a word, to be effectual, they should be simple.

The use of ventiducts has long been known and tried in this country; but not with complete success.

The instantaneous removal of the impure air cannot be safely relied on, whilst there is great doubt whether its escape can take place with sufficient velocity to prevent its condensation, in which case the noxious matter falling down will remix as it were with the air of the ward, notwithstanding the natural tendency of the air to ascend.

The cost of the ventiduct in the present instance is estimated at 6,000*l.** When the the importance of securing supplies of pure air for the sick in their rooms is considered, mere outlay will be of a secondary moment. This sum, however, may be saved.

Much difference of opinion exists with respect to the quantity of air required to keep the atmosphere of rooms (wards) salubrious. Looking at the numerous causes of vitiation, which invariably take place in wards of hospitals, the quantity required in the present case, is very much under-estimated, and according to my own observations and experience, it will be absolutely necessary to make provision for an additional quantity.

Many persons imagine that so long as the air does not feel very heated, it cannot be very impure; but no fallacy can be greater, for the absence or presence of the oxygenous principle, excess of carbonic acid gas, &c., is not indicated by heat, and the atmosphere we breathe may be as poisonous, impure, and deadly when cold, as when heated.

* Mr. Mennie.

When the object to be attained is that of an entire and complete removal of all polluted air, from whatever cause it may arise, without producing too much agitation, whilst securing the change with sufficient rapidity at all times, to purify every part of the building, at the same time securing means of concentrating supplies of fresh air, in a manner, if need be, to flood locally the sphere of any one bed at pleasure, under the circumstances of change of temperature, which is exceedingly variable every month in the year, as shown by the table annexed, in my opinion the arrangements shown on the plans, if carried out, will not meet these requirements, but they may be met by simple, sure, and direct means, alike applicable to the ambulatory, latrines, and every other part, the apprehensions expressed in some of the documents laid before me, rendered entirely groundless, and the outlay of several thousand pounds prevented, as I shall be prepared to point out in detail, if required.

In considering the arrangements for warming and ventilating the several wards, I have necessarily had under my notice the walls containing the different flues. These walls, I find, according to the laws of stability, to be of minimum thickness, I therefore strongly advise the working of all the flues against (not in) the several walls, at the same time to avoid making any projections (breasts). The fewer the corners in a ward the better. The proper place for these flues is that set apart for the orderly, a sort of recess out of the ward, and a very objectionable one it is. It will not be attended with loss of any really useful space; but, were it otherwise, the advantages to be attained would, in my judgment, be more than compensated by such sacrifice.

At each end of the wings there are several small rooms in close proximity with the wards. These rooms are set apart for stores, &c., without means of any direct light, at the same time interfering to some extent with a free circulation of air at the ends of the corridors and passages leading to the larger wards. I have to suggest the removal of the partitions and converting the space occupied by these rooms into large vestibules. This will not fail to add very greatly to the natural ventilation of the larger wards, by facilitating the movement of the air, at the same time affording accommodation for additional beds in cases of emergency.

The water-closets were originally designed to project only 8 feet beyond the line of the north-east front of the building. This distance has since been increased to 11 feet, solely, as I am informed, for the purpose of obtaining lobbies. By this alteration, the free action of the wind and circulation of air will be greatly impeded. The sunlight on several of the wards will also be shortened. This increased projection might have been avoided, all impediment in the circulation of air obviated, the entire cost of the work saved, and the water-closets as effectually cut off from the wards. Mr. Mennie is now fully aware of the arrangements necessary to be made for carrying off the fœtid air from the soil and waste water pipes attached to the closets, ablution places, and baths.

The bins for dust, garbage, and other solid refuse, should be portable, so as to facilitate the entire removal daily of all foul and offensive solid refuse from the precincts of the Hospital.

The wash-houses, dead-house, and post-mortem room, should be detached from the main building and offices. By their removal, the ventilation of the courts, &c., may be greatly improved.

No part of the solid sewage should, on any account, be discharged into the estuary, but defecated by Mr. Blythe's, or some other equally effectual process, the supernatant water only being allowed to run into the channel. There is every facility for this being done without the aid of engine power.

In the arrangement for lighting the interior of the building, simplicity is an essential condition. Gas may now be used, provided the sun burner is adopted, as then there will be no longer any risk of the products of combustion mixing with the atmosphere of the wards. This burner is specially suited for the wards, corridors, and their adjacent parts.

To do full justice to the subject referred to me, I feel I ought to lay before you the results of my experience and investigation touching the physical properties of materials best suited for use in and about wards, but pressure for my report prevents my embodying those results.

The division walls should be carried up through the roofs, and other means taken to prevent the spread of fire.

I learn from the report of Major Ravenhill, Royal Engineer, that it is intended to line the surface of the ground, under the boarded floors of the building, with clean gravel, I advise the use of a stratum of concrete in lieu as more efficient.

With regard to the capability of extension for obtaining additional wards without injury to its sanitary state, or sacrificing light, or creating unventilated courts, or impairing the administration of the entire building, or increasing the distance to be traversed for executive purposes, it seems to me there is no diffiulty of doing so in the event of its being required.

In the various suggestions I have felt it my duty to make (in which, I believe, Mr. Mennie, Surveyor to the Department, will, in the main, concur), I have been careful to avoid disturbing the design, also the combination of the plan. Throughout, I have kept in view the rendering of the wards suitable for occupation by a full complement of patients during the day as well as the night, and should these suggestions be acted upon, I believe very great benefit will result to the patients, saving in outlay will be effected, and the building well suited for a Hospital.

W. RANGER, C.E., *Superintending-Inspector.*

MAXIMUM and MINIMUM TEMPERATURES at the Board of Health, Whitehall, for each month of the years 1856 and 1857.

	1856.		1857.	
	Maximum.	Minimum.	Maximum.	Minimum.
	Degrees.	Degrees.	Degrees.	Degrees.
January	52·6	26·3	50·2	21·4
February	56·0	28·2	52·7	23·2
March	52·6	28·3	59·9	29·8
April	68·3	35·1	67·6	33·6
May	66·9	32·8	73·7	36·2
June	85·3	47·4	86·7	45·7
July	81·8	48·2	82·1	50·0
August	83·3	47·7	84·3	53·7
September	69·8	42·6	75·0	48·4
October	65·2	37·8	65·3	40·0
November	56·0	27·0	61·2	33·5
December	58·2	22·1	55·3	33·0

(Signed) J. C. HAILE.

No. 6.

Report of John Simon, Esq., F.R.S., on the Site of the Royal Victoria Hospital, Netley.

Sir, *General Board of Health, June 5,* 1858.

In answer to the questions which you recently proposed to me, with respect to the site selected at Netley for the Royal Victoria Hospital, I have now the honour of reporting to you my opinion, and the grounds on which I have formed it.

Your questions ask—"To what extent may the site be considered favourable or unfavourable for the erection of a great Military Hospital, for the reception of convalescents and sick from the Army serving in England, and of invalids from foreign stations, and of sick and wounded men returning from the seat of any foreign war?"

And you wish me in reply to have special regard—(1) *to the nature of the local climate,* and (2) *to the influence which may be exerted on its salubrity by the tidal changes of Southampton Water.*

I accordingly proceed to consider the subject under these two heads.

I.—*As to the influence exerted on the salubrity of the district by the tidal changes of Southampton Water.*

The estuary of Southampton Water is remarkable for the very great extent of mud-bank which is left uncovered at low tide.

In front of Netley, according to Major Ravenhill's report, "from 100 to 200 yards of mud is exposed at the ordinary tides, and about 300 at the spring tides. These last occur four days in each fortnight. The time during which the full extent of mud above mentioned is exposed is about one hour in each twelve, or two in twenty-four hours. On an average about four extraordinary spring tides* occur in the course of the year, when the mud is left bare beyond the distance last named above."

This tidal exposure of mud-banks is by no means confined to the neighbourhood of Netley. The same thing occurs all along that eastern shore of the Southampton Water, and for some distance up the rivers Hamble and Itchen. It occurs likewise all along the opposite shore, and for some distance up the river Test. Nor is it by any means restricted to the Southampton-Water and its tributaries. Something very similar is to be seen along great part of the south coast; namely, in all the line between Shoreham in Sussex and Swanage in Dorsetshire; a line, along which the shore is of tertiary geological formation; and where consequently the several harbours of Poole, Southampton, Portsmouth, Langston, and Chichester are all more or less characterized by extensive low-water mud-banks.

Under the influence of sunshine these large surfaces of spongy mud are even more evaporative than the same extent of water at high tide. No doubt therefore that, as compared with rocky or pebbly banks, they contribute considerably to the moisture of the local climate. I shall hereafter consider their influence in this respect; but first, I have to inquire whether they affect the local climate in any other important particular than by contributing to its humidity, especially whether they generate malaria, or act in any other manner hurtfully to health.

Accusations of this kind are suggested against them in the recent report†

* It is probably to these tides that reference is made by Mr. Witt, who says:—"On the occasion of my visit, there was at low tide about 100 yards of the mud exposed; but I am informed that at low spring tides there are 400 to 500 yards of the mud dry, though only for two hours at a time, twice in the twenty-four hours."

† Report on the Victoria Hospital, Netley, March 12, 1858.

of Mr. Sidney Herbert, Dr. Sutherland, Dr. Burrell, and Captain Galton. These gentlemen quote chemical testimony to the effect that "decomposition of organic matter is going on in the bed of the estuary; that the sulphuric acid of the sulphates in sea water is being decomposed and united with iron; that the mud contains sulphuretted hydrogen in combination; in fact, that similar changes are going on in the estuary to those to which the sea coast malaria of tropical climates has been attributed, though of course of greatly inferior intensity, on account of the much lower temperature of our climate; and that it is highly probable that in hot weather, offensive and deleterious effluvia may be disengaged." The same gentlemen further say:—"It is well known the admixture of fresh water with sea water in tidal estuaries is a common source of malaria, especially in hot weather."

If the last allegation were well-founded, it would be conclusive against the site of the Victoria Hospital. But I must say that I am unacquainted with any grounds to justify such an assertion. It is indeed believed, and has for centuries* been believed, that *marshes* to which sea water has access are *peculiarly fatal marshes*. But I am not aware of any evidence tending to show that the commixture of fresh and salt water can in itself, *apart from marsh land*, generate malaria, or act in any manner injuriously to health. Neither do I know any instance of malaria arising from a surface like that in question *twice daily covered by the tide*. Also I may observe (though it is of little importance to the practical bearings of this question) that the above-quoted supposition, as to the relations of sulphuretted hydrogen to the fevers of Western Africa, is one which long ago was shown to have originated in a fallacy.†

As to the chemical theory of what takes place in the mud banks there is probably not much difference of opinion. But after consulting with Mr. Blyth of this department (who has examined the mud for me, and who for a long while has been much engaged in similar investigations) I think the theory must be accepted with some qualification. According to Mr. Blyth, the organic matter of the mud at its contact-surface must have attained a certain stage of decomposition before it can affect the sea-water; the subsequent change, when it occurs, occurs very slowly; it will not occur at all except under the conjoint influences of high temperature and sunshine. And even after this qualification, before the theory can properly be made useful for argument, some estimate is necessary, whether the disengagement of sulphuretted hydrogen, when it occurs, is in any but infinitesimal proportion to the circumambient air and

* "Paludes, aquâ salsâ per vices inundatæ minus salubres quàm quæ aquâ dulci."—Bacon's "Hist. Vitæ et Mortis," 1623. Large districts on the south coast of France and the flats of Zealand may be referred to as illustrations. Admirable instances, given in Dr. Traill's Medical Jurisprudence, are quoted with others in Dr. McWilliam's work, referred to below.

† *See* Dr. McWilliam's "Medical History of the Expedition to the Niger during the years 1841-2," pages 161-175. There are differences of statement as to the perceptibility of offensive odour from the mud of Southampton Water. Some speak quite positively as to its occasional existence. No one pretends that it is common. Many declare that they never, under any circumstances, have perceived it. This difference of testimony probably implies a difference of perceptiveness as regards very fine shades of scent; and I have little doubt that, under certain circumstances, an offensive odour is perceptible to persons of good smelling powers. The case in which this appears most frequently to have been observed, is where the mud has been displaced to some depth, particularly when the displacing body (*e. g.* a ship) has remained for some time stationary in its bed, and has then been removed. I am led to believe that under these circumstances there may—perhaps generally—be observed by sharp-scented persons an effluvium having in it a dash of sulphuretted hydrogen. I can hardly believe that it amounts to more than this; and I am told that the nuisance (if it deserves so strong a name) is quite partial, not extending beyond the circle of a few yards, even within which, for obvious reasons, it can only be of short duration. As regards its origin, it may be noticed that, in the case described, a certain quantity of mud has been secluded from its usual daily washings by the tide. In other cases it may be only that a large surface of deep mud is suddenly brought for the first time into relations with the atmosphere. In either case fœtid products have had an opportunity of accumulating before escape is given to them. It seems quite certain that sewage has nothing to do with the effect. I have not been able to satisfy myself whether the essence of the odour, when it is noticed, consists in some small escape of sulphuretted hydrogen, nor do I think this practically of very great moment. There is no reason to believe that any one can become acclimatised to the influence of sulphuretted hydrogen gas in the manner wherein some become acclimatised to the influence of malaria. The fact that among persons (however few they may be) whose whole lives are passed on the Southampton Water, there is no evident impairment of health, shows that if sulphuretted hydrogen really be at times disengaged from the mud, its maximum formation can be but a very small one. Indeed, the nose is probably the finest test of the presence of sulphuretted hydrogen; and therefore the assertion made, in both Coast Guard ships, that no offensive odour from the mud had ever been matter of observation among the occupants, is one that deserves notice.

water which tend to dilute and neutralise the gas from the very moment of its formation. Dr. Thomson makes on this point the following important observation:—"During the period of my visit (April) the sulphuric acid of the sulphates in the sea water was obviously undergoing slow deoxidation by the agency of the vegetable matter in the mud; sulphur was thus liberated which united with the iron of the sand and produced black sulphide of iron. I am of opinion that this sulphide will have little tendency to accumulate, for, in its worst state, by access of air it must be converted into protosulphate of iron, and be insensibly wasted away into the estuary in a soluble form. It would thus appear that there is supplied by nature a counteracting agency to fix the sulphuretted hydrogen as it is formed, and to prevent at least the greater portion generated from being elevated into the air."*

But it seems to me that the real question which I have to answer can not be decided according to the strength or the weakness of a chemical theory. The injurious effects of malaria are definite. So are those of sulphuretted hydrogen. So are those of an atmosphere tainted with animal putridity. The object, as it appears to me, is to determine whether, under the tidal changes of Southampton-Water, any of those effects are produced on the resident population.

I may say without qualification that I can discover no trace of such effects.

Netley itself has little population except the labourers and others now engaged in the Government works. But (as I have mentioned) the questionable feature of the district is not confined to Netley. It extends along many miles of coast. Besides the town of Southampton, there are many small clusters of population, fully exposed to the influence of those mud-banks. The village of Hythe (nearly opposite to Netley) is one of such cases; and it seemed to me an important one, because according to Mr. Ranger, the sewage of Southampton tends to run specially in that direction. The village of Hamble seemed another important case, because around it there is probably a wider exposure of bank than at any other part of the district. Southampton itself (with due allowance for the habitually less salubrity of town populations) and its suburbs, Northam and Itchen, were of course to be inquired about; and there is a good deal of population, not included in these places, but exposed not less than their inhabitants to the influence in question, about whom I could procure information.

That information, I repeat, has been entirely negative: as may be seen in the following abstract of evidence which I collected in the course of my local inquiry.

Mr. Smith, of Hythe, has for more than 14 years been medical officer for the district in which that village is situated. This district is part of the New Forest union. It is well known that some inland parts of that union are malarious, though much less so than formerly; and at the present time Mr. Smith is attending a (non-parochial) case of ague at Marchwood or Marshwood, some distance above Hythe. Before this he had not seen a case of ague for some years. An abstract which Mr. Smith has made for me of his Medical Return Book from Jan. 1, 1856 to June 1, 1858, shows that during these 29 months he had had 459 parochial patients under treatment, and among these cases there have been but 17 of diarrhœa, none of continued fever, and none of ague. Neither has he observed intermittent neuralgia. Rheumatic gout is perhaps rather frequent in Hythe; but this is among boatmen who are exposed to weather, and are intemperate. He has never been led to suspect that residence in the immediate vicinity of Southampton Water is in any manner injurious to health.

Dr. Churchill has for eight years been resident at Fawley, has attended various clubs during this time, and has for two years been medical officer for the district in which Ashlet is situated. He has also for the whole time of his residence attended at Calshot Castle, where there are about 20 residents. His district is in the New Forest union. He speaks to the origin of ague-cases in the inland part of his district; where, however, for the last forty years, under improvement of cultivation and drainage, the disease has constantly been becoming less frequent. He has not seen ague arise in the part of his district nearest to Southampton-Water. A single case of intermittent neuralgia which he remembers at Ashlet was in a woman who had contracted the habit of ague before coming

to reside in the neighbourhood of Southampton-Water. When fever has occurred it has generally been imported, and has never that he remembers spread beyond the one house. Bowel-affections, where they have prevailed, have depended on home influences; some of which are very bad in parts of his district. He thinks the climate favourable to the cure of chronic rheumatism. His predecessor was of the same opinion. He has never been led to suspect that residence in the immediate neighbourhood of Southampton-Water is in any way prejudicial to health.

Dr. Orsborn has for 18 years been practising at Bitterne, and has for 10 years been medical officer for that district of the South-Stoneham union in which Itchen is situated. He has never seen there a case of ague. Of the very few cases of intermittent neuralgia which he remembers, he cannot say whether any were indigenous. In some autumns, when diarrhœa has been common throughout England, he has had a good deal of it in his district; but not more in the immediate vicinity of Southampton-Water than on the high ground at Bitterne. He has never been led to suspect that residence in the former vicinity is in any respect detrimental to health. He attends at Hamble Cliff, close to Netley, and at other houses of the better-off residents in Hamble parish.

Mr. Dusautoy has practised in Southampton for 27 years, and has for 10 years been medical officer to the district of which Northam (sometimes called Northam-Marsh) is situated. He also attends four large, and three small, clubs. He has never in his Southampton practice seen a single case of ague except such as have been imported. During all the time he may have seen perhaps half-a-dozen cases of intermittent neuralgia, but has no knowledge as to their having been indigenous. Formerly he used often to remark specially on the entire absence of ague from his practice, because he had previously lived in a malarious part of England. He has never been led to suspect that residence in the immediate vicinity of the Southampton-Water is in any way hurtful to health. An abstract of parochial cases attended by Mr. Dusautoy during the last four half-years shows the proportion of bowel complaints to the total number of cases to have been in the successive periods as follows:—$\frac{116}{700}$, $\frac{70}{746}$, $\frac{201}{1078}$, $\frac{98}{877}$. The smaller fractions belong to the summer half-years; the larger fractions to the winter half-years. Last summer (when 201 cases of bowel complaint occurred in this part of Southampton) diarrhœa, threatening to be choleraic, was very prevalent in other parts of the country.

Mr. Bates, of Botley, ever since the first constitution of the South-Stoneham union, has been medical officer to the Hamble district. He now attends, he believes, the whole population of the village of Hamble. He has never had there a case of ague, nor remembers to have had any case of intermittent neuralgia or of dysentery. There is not more hot-weather diarrhœa in Hamble than in other parts of his district, which extends eight or nine miles inland. He has had very few cases of fever there during his whole attendance, and does not remember to have lost one. In 1849 there was a single case of cholera—an old woman in a fish-boiling house. In 1832 a man was landed there with cholera, and died in a few hours: no other case occurred. He does not know of any illness to which the population of Hamble is subject, and has never been led to suspect that residence in the immediate vicinity of Southampton-Water is in any respect prejudicial to health.

Mr. Wiblin, Medical Superintendent of Quarantine at the port of Southampton, who is also in large local practice, informs me:—"I have been a medical practitioner in this town twenty years, and during that period I am not aware that the resident population nearest the banks of the Southampton-Water below Southampton, suffer either from ague, intermittent neuralgia, diarrhœa, dysentery, or rheumatism; and I am of opinion that those who reside in the immediate vicinity of Southampton-Water, do not suffer in any manner or degree from any kind of disease consequent upon such a residence."

The unanimous experience of the medical officers of the Royal South Hants Infirmary, communicated to me by Dr. Bullar, is, "that no malarious diseases arise from the salt water mud on the banks of this estuary, either in Southampton or in the village on the banks."

And in answer to questions specially relating to Hythe, Hamble, Warsash, Ashlet, Itchen, and other places where, at low water, the largest extent of mud is exposed to view, the medical officers of the Southampton Dispensary inform

me (also through Dr. Bullar), that "no true intermittent or malarious disease is known in these places."

The contractor's foreman at the Government works at Netley informs me that 600 men are employed there, of whom 250 sleep on the site, more than 100 at Hamble, 100 at Southampton and Woolston, and the others at various places around. He believes that during the eighteen months not half-a-dozen have desisted from work on account of illness. These few have been cases of cold; two or three of them from "chills in the brickfield." The informant's brother had ague very badly fifteen or sixteen years ago. He has now been a year on the Netley works, has had no aguish symptoms, and is altogether in improved health.

Two very important illustrations are, in my opinion, afforded by the experience of the two Coast Guard Stations. Each Station consists of a ship *moored on the mud*. One is at Netley; the other, at the mouth of the Hamble, below Warsash. All whom I saw of the inmates and frequenters of these Stations appeared in good health.

The officer in command of the Netley Station has been resident there eight years and a-half. During that time he has had under him twenty-four or twenty-seven men (he was not sure between these two numbers) and the wives and children of those who have been married. The ordinary complement of men is seven. At present, all are married, and there are ten children. No illnesses have arisen there. He can remember no medical attendance whatever, except on persons who have arrived ill. Of these there have been several, who, having been sent to the ship when in a state of serious illness, have there rapidly recovered. Among these he names a very bad case of ague from the Kent marshes. He has never experienced any offensive smell from the mud which surrounds the ship, or heard his people complain of any.

The officer in command of the Warsash ship has been resident for twenty months. With him are his wife and eight children. Under him are eleven men, nine of whom are married, with twenty-four children among them. Two of these families lodge at Warsash; the others are scattered about, within half-a-mile of the ship. Each man's duty keeps him about half his time on or near the water, with rota of night-watch. Orders for medical relief are given to the men when they require them. The officer, during twenty months, has given two. In one case, there was something wrong with the knee; in the other, a man who arrived in bad health (having, it is believed, had fever in the West Indies) suffered from what was described as congestion of the liver, and soon left the service. The officer himself has had an attack of quinsy.

It seems to me that no negative evidence can be stronger than that which I have quoted as to the non-prevalence of malarious disease on the banks of the Southampton-Water, and as to the general salubrity of the district.* I may add, that the death-rate of the sub-district of Hound (in which the Victoria Hospital is being built) is estimated by the Registrar-General as 18 per 1,000 per annum. Nine-tenths of the population of England suffer death-rates higher than seventeen; so that, as far as this estimate can guide us, the sub-district of Hound probably does not suffer more preventable mortality than might be occasioned by common insanitary household arrangements in a district naturally among the healthiest of England.

The gentlemen to whose report I have already adverted would, I believe, demur to this argument. They say—"What we seek is not a climate in which

* This negative evidence may be greatly strengthened by the result of inquiry in other places where similar conditions exist. I therefore add part of a letter with which I have been favoured by Dr. Hyde Salter in reference to one of such places:—"It is the case that an immense extent of mud bank is uncovered at Poole at every low tide. The harbour is of great extent, fifty miles in circumference, including all sinuosities, and the whole of this is laid bare at every low tide, with the exception of channels which intersect it. There is not a trace of malaria in any part of the country surrounding this harbour, except in one village called Lower Lytchett, where it is quite sufficiently explained from the topographical character of the village itself, which is very low, flat, and, till lately, badly drained. The mud at low water has not any bad odour whatever; on the contrary, the breeze blowing near it has a remarkable freshness, and a large dose of the peculiar marine freshness. I think a person standing on the shore, and shutting his eyes, would not know from the odour of the breeze whether it was high or low water, except, perhaps, from there being at low water a little more of that delicious sea side smell. I have enjoyed it thousands of times when I was a boy. Poole, standing on a peninsula surrounded on three sides by this harbour mud, has a population remarkable for its healthiness."

a healthy man, living an out-door life, will not be made ill, but one in which sick men, confined in-doors, shall get well." The reporters may have facts before them with which I am unacquainted. But, so far as my knowledge extends, the distinction which they draw in this paragraph has no practical existence. Indeed, if the distinction is to be conceived, it would seem not unlikely that out-door life may be even a finer test than in-door life as regards the demonstration of unwholesome influences from the soil. But, discarding this refinement, I will at least venture to say that, an atmosphere in which the "healthy man living an out-door life" enjoys average health, is not an atmosphere polluted by any emanations which can debar "sick men confined in-doors" from enjoying their average prospect of recovery. And if it be established that the ordinary population about Southampton Water is free from endemic disease, there cannot, in my opinion, remain any reason to doubt that a hospital population in the same locality will enjoy the same advantage.

II.—*As to the Local Climate generally.*

The general character of the climate about Southampton-Water, as throughout the greater part of the south coast of England, is mild and moist.*

Especially in the town of Southampton these characters predominate. Persons who thrive best in east winds, and on chalk soils, and at high levels, would find themselves uncomfortable on first taking up their residence in the town. They would call its climate "relaxing"—perhaps even "muggy." Part this quality of the climate of Southampton depends on the generally sheltered position of the town and its consequent gentleness of ventilation. To this extent the quality is less marked at Netley; for here the shelter is only towards the north and north-east, in which directions the rear of the hospital-site is protected by the very gradual rise of land towards Bursledon and Bitterne. And this difference is, probably, not unimportant; for one† of the gentlemen who have given me information on the influence of the local climate finds a practical distinction to the same effect.

* The climate of the town was elaborately described a few years ago by Mr. Drew, from observations made by him during the three years 1848-50. The sum of his results is given in the following words:—"It would appear that the climate of Southampton is mild, differing but little from that of the most southern towns of England; that the air is more generally laden with moisture than that of inland towns, arising from its proximity to the sea and fresh water, and from the prevalence of winds from the points between south and west and those inclusive, which are laden with aqueous vapour from the sea, that this moisture falls in copious showers on a fewer number of days than the less quantity in the inland towns with which it has been compared, occasionally in large quantities at a time, as on June 27, 1850, when nearly two inches of rain, accompanied with thunder and lightning, fell in twelve hours; that severe cold is less prevalent than at places inland, but the quantity of rain is greater, while the average amount of cloud appears, from comparison with about forty other places, to be a mean between the more and the less cloudy skies. Though the air may be less bracing than places higher and more inland, we have the advantage comparatively in mild winters, and the absence of that severity which is so trying to the invalid."—Report for 1851 of the British Association for the Advancement of Science, page 59.

† Mr. Wiblin, Medical Superintendent of Quarantine, already referred to. He observes that "strangers who come to reside in the town of Southampton do complain of a relaxing or depressing state of the atmosphere, but this complaint is of short duration. Those, on the other hand, who go to reside in the immediate neighbourhood do not experience a similar degree of malaise." A medical memorandum, contributed in 1851 to Mr. Drew's above-quoted meteorological report by Dr. Joseph Bullar, is of much interest; especially as it was written without reference to any such discussion as the present. "Inflammatory diseases of an acute kind," says Dr. Bullar, "are not at all common, nor do they require or bear active depletion when they occur. The town is quite free from ague; the mud sands do not produce it, as the water upon them is never stagnant. Intermittent neuralgias are not often met with. Fever is not common. Twenty years ago it was very rare, but since the town has increased greatly in numbers, it is more prevalent, though not of a malignant type. There is a considerable amount of complaint from uneasiness, discomfort, indisposition, and local pains produced by indigestion of an acute kind, as the result of want of general power. The system is not so vigorous as in a more bracing climate, and therefore not so able to digest the same quantity of food; and unless much greater attention is paid to quantity especially, and also quality, as well as to habits, headache, distention, constipation, and general debility are not uncommon. Young and vigorous persons who come here from a colder and drier air, usually complain at first of sleepiness, and an inability to perform the same amount of muscular and mental exertion. On the other hand, rather delicate and susceptible persons (especially women) who are never well in colder parts of England, enjoy much more bodily comfort here. For the same reason it suits children and elderly people, especially if they have been subject to inflammatory diseases of the air passages in colder and drier places. Gouty and rheumatic diseases are not common here, as might be expected, from the inability to digest a large quantity of food; in short, here is a greater amount of indisposition from indigestion, and a less than an average amount of active secondary diseases, such as fever and violent inflammations."

Of course there are no such local differences as regards the temperateness or the moisture of the district. Moisture of atmosphere characterises that whole range of country, English and Irish, on which the south-westerly winds first strike from over the Atlantic. And also in respect of temperature this range of country has the same general character; for proximity to the sea, especially proximity to it in those southern and westerly parts which are most affected by the warm oceanic current of the Gulf Stream, adds to the influence of a more southward latitude to produce a higher mean temperature and considerably milder winters than belong to other parts of the United Kingdom.

It may be noticed, however, that the country about Southampton-Water belongs to a part of the south coast where those general atmospheric influences are reinforced by the quality of soil. Anywhere between Shoreham and Swanage the sensation of a "relaxing" climate is much more distinctly perceived than a few miles further in either direction—on the chalk downs about Brighton or Dorchester. Throughout the same section of the south coast there is at all estuaries (as I have mentioned) a tendency to form broad low-water mud banks; which, with their great evaporating power, contribute to the humidity of the atmosphere.

Netley, in the middle of this line of coast, has the advantages and disadvantages of a mild, moist climate. But certainly not in an extreme degree: —for Dr. Bullar says of the climate, that "though mild it is bracing, and, in general, it is free from the extremes of dryness or moisture;" and Sir John Liddell, writing of the climate of Haslar (where the governing conditions must be substantially the same as at Netley) describes it as "mild, temperate, and bracing, not unlike other places on the south coast of England, but much drier than Cornwall and Devonshire."

According to my own impressions, I should not be disposed to use those terms in reference to the climate of Southampton-Water; but, while some describe it as "bracing," and some as "relaxing," the inference seems unavoidable (however vague may be these words) that the air is neither "bracing" nor "relaxing" to any flagrant degree.

To an immense majority of the native population of England, the difference between the "bracing" and the "relaxing" climates of their own country is but a small and soon-forgotten difference. The average healthy Englishman can pass from one to the other without finding himself the worse for the change. Probably, also, to a large proportion of invalids, such choice of climate (excepting, of course, unwholesome places) is not of appreciable importance.

There are persons, however, to whom very small differences of climate make sensible and perhaps permanent differences of comfort; and this sensibility to climate is greatly developed in certain diseased conditions of the body; so that to some patients it is undoubtedly an important question whether the locality in which they are to be domiciled may be characterized as "bracing" or "relaxing."

If patients, as regards their preference for one of these climates or the other, be considered as of two classes, it is difficult to say which of them numerically preponderates. The greatest happiness of the greatest number would commonly be consulted, I presume, by the choice of a climate not extreme in either direction. Netley answers to this description, but not impartially. It inclines away from those qualities of climate which the admirer calls "bracing," and the objector calls "bleak." It inclines towards those qualities of climate which the objector calls "relaxing," and the admirer calls "genial and mild."

I have no data which can enable me at all confidently to say whether this bias of the local climate makes it, on the whole, more suitable or less suitable than a colder and drier climate to the average requirements of a great Military Hospital: but I will venture to say that the difference either way cannot be considerable.

A proportion of from 50 to 60 per cent. of the admissions to a Military Hospital are described under three heads of disease, viz., "Pulmonic Disease," "Rheumatic Ailments," and "Infirmities of Age and worn out." Regard being had to this fact, as illustrating the nature of the diseases received in this Military Hospital, it seems not impossible that the milder climate may deserve preference. No doubt it was with this view that Sir James Clark originally recommended

Netley as the site for the Victoria Hospital; and I may add that, on the choice of a climate for invalids (the subject of his much-quoted work) Sir James Clark speaks with much authority. Sir John Liddell's experience, in a very similar field of observation at Haslar, leads him to consider that such a climate is "very healthy and has no injurious effects in hindering the recovery of patients suffering from different diseases."

An important class of patients consists of those who return from foreign service with the remaining consequences of tropical malaria. It is certain that our more relaxing climates do not agree with these patients. Mr. Martin (than whom, on this point, no higher authority can be quoted) states, in his well-known work*, that these invalids, whether sufferi ng from fevers or bowel complaints, thrive best in the bracing localities of the United Kingdom; and that the Highlands of Scotland, with their mixed influence of sea and mountain, furnish to such patients the most congenial climate. In a memorandum with which Mr. Martin has kindly favoured me, in aid of the present inquiry, he observes:—"There is another and opposite circumstance, which has occurred so often in my experience, that I consider it proper to mention it. I have so often been obliged to have persons suffering from bowel complaints especially, and others suffering from fevers, removed from Devonshire, that it has, during years, been the subject of remark. In the humid and comparatively warm atmosphere of the lower portions of Devonshire, convalescence I have found to be retarded, and I have, consequently, been constrained, in a great many instances, to remove the sufferers from the houses of their parents into higher localities, having a more bracing air. I may mention that generally humidity, whether joined to heat or to cold, is extremely injurious to tropical invalids of all classes." This important statement of Mr. Martin's, taken by itself, would certainly withhold me from recommending the banks of Southampton-Water as a desirable residence for the class of patients referred to: for the chief characteristics of the Devonshire climate are repeated here in a minor degree. But such direct evidence as I have been able to gather on the convalescence of tropical invalids in the climate of Southampton-Water does not seem to justify that apprehension. Mr. Wiblin, Medical Superintendent of Quarantine at the port of Southampton, writes to me:—

"In my official capacity I have had very special and extensive experience as to the effect of a residence in this town and neighbourhood on persons who arrive here on board ship, especially the West India steamers, suffering from ague, remittent and intermittent disorders. I have seen and attended from 200 to 300 persons suffering from the above diseases during the last ten years, and I have invariably remarked how speedily they became convalescent after a short sojourn in the town or its immediate vicinity, such patients seldom requiring even the ordinary remedial treatment by quinine. During the last five years I have seen perhaps a hundred patients land at this port, having suffered from yellow fever, and I have, on many occasions, urged upon the Superintendent of the Royal Mail Company the necessity of providing a house at Woolston or its neighbourhood for the reception of such cases. I am at this moment authorized by the Superintendent in question to take a house for the purposes above mentioned in the very neighbourhood to which your inquiries have reference; and I hope to be successful, as I consider Woolston and its vicinity a locality of undeniable salubrity."

On the whole, the views which I am disposed to take on the question of climate are these:—That no locality can be chosen which will be equally suited to all cases of disease; that the climate of Southampton-Water is likely to agree well with the vast majority of cases, and is not likely to be disadvantageous in many instances; that whether the site of the Hospital were the one selected, or any other which could be named, there must always be a few patients for whom, if they alone had to be considered, some different site would be preferred; that this difficulty is inseparable from the system of single large hospitals; and that the only way of meeting it effectually is by having branch-establishments in localities which differ widely in climate from the site of the principal buildings. The London civil hospitals are glad in this way to avail themselves of the assistance of the Hospital for convalescents a Walton, or of the Sea-

* "The influence of tropical climates on European constitutions, including practical observations on the nature and treatment of the Diseases of Europeans on their return from tropical climates," by James Ranald Martin: London, 1855.

Bathing Infirmary at Margate; and the Brompton Hospital for diseases of the chest has an auxiliary establishment at Bournemouth.

As regards the geology of the site selected for the Hospital, the report of Professor Phillips seems conclusive as to the absence of any conditions of soil which can injuriously affect the Hospital. Major Ravenhill's assertions that "both the nature of the subsoil and the contour of the Government land tend to facilitate natural drainage," and that he has "never known a district where less water is retained on the surface than on the land in the vicinity of the Hospital," accord with Professor Phillips' conclusions. And Dr. Babington, who happened to visit the locality after a day of very heavy rainfall, mentioned to me (and, no doubt, has already reported to you) the remarkable dryness of surface which then prevailed in the neighbourhood of the works.

I beg leave to add, that popular observation seems to have bred no misgivings as to the pleasantness and salubrity of the hospital-site. All along the banks of the Southampton-Water are the pleasure residences of nobility and gentry; and the Cistercians took Netley for their convent in days when the Church was not much restricted in her choice of building land.

III.—*As to the Building.*

General Board of Health, June 25, 1858.

In addition to my former report on the site of Netley Hospital, I beg now to have the honour of stating my opinion in answer to the supplemental question proposed in your letter of the 29th ultimo, viz., "whether—seeing the class of inmates for which the building has been designed, consisting of invalids, of whom only 15 in every 100 will be confined to bed, and who will generally be suffering from chronic diseases, the great majority of which will be thoracic—I think the general design and arrangements shown upon the plans well calculated to provide for their comfort and promote their recovery, or whether, on the contrary, I think that design and those arrangements inappropriate to the object in view."

The conditions described in your question are not those with which I am most familiar in hospital-practice. My official experience has lain in the surgical wards of civil hospitals, where the conditions are essentially different from those which you describe; first, in respect of the general progressiveness of the cases; and, secondly, in the proportionate number who are bedridden. Patients who during their treatment are constantly or chiefly in bed make up a large proportion of our total; and our arrangements are, therefore, primarily made with reference to a population of bed-keeping patients. The wards are great bedrooms. For patients who are not bedridden, there are seats and tables in the middle of our wards; but the case of convalescents and chronic invalids is not specially considered; and we have no sitting-rooms or dining-hall.

It is of immense importance in all Hospitals that the lighting and natural ventilation should be perfect. And I fully concur in the opinion (which is, I believe, almost universal) that these objects can be most easily attained under that system of ward-construction in which *rows of windows, facing one another, open directly into the external air from the two longer sides of every ward.* The greater difficulties of ventilation, incidental to other systems, may probably be got over by appropriate contrivances; but not the less they are difficulties; and in planning any civil hospital, I should seek to avoid them, and to obtain the advantage of light and air from both aspects, by adopting the form of construction I have described.

In planning the Netley Hospital, it has been requisite to give special consideration to patients who do not keep their beds. Regard being had to this fact, and to the assumed military necessity of having few beds in any one ward, I cannot say that I think the general arrangements inappropriate to the object in view. They provide in each section of the building a series of small (nine-bed) sleeping wards, which face and have windows towards the east, and open opposite to their windows into what may be regarded as a very large common hall, the glazed corridor, facing to the west. The bed-rooms are not placed on the better side of the building; but their communication with the corridor

is by glazed doors, occupying almost the entire breadth of each ward; and western sunlight falling through the corridor will do much to remedy, for the few patients who are constantly bed-ridden, the comparative disadvantage of that eastern aspect. It would not be doing justice to this arrangement to regard the bed-rooms as the only accommodation prepared for the patients; and taking the bed-rooms with the corridor, I think the arrangement to be one which, subject to such amendments of detail as trial may show necessary, is likely to give satisfaction.

Certain advantages, peculiar to the system of double window-rows, have undoubtedly been sacrificed. I regard the loss of these advantages as a real loss; but I regard the gain of the corridor as an equally real gain; and I am not prepared to say that the latter is outweighed by the former. It strikes me, however, when I regard the corridor as the common hall or sitting-room of the patients whose bed-rooms are in its rear, that, with its very large extent of glazed surface, it will prove in winter exceedingly difficult to warm; but with double panes of glass, this difficulty will probably not prove insuperable.

Care seems to have been taken for the due aeration of the wards. But I think it desirable that the ventilability of each ward should be independent of its door into the corridor; and it may deserve the consideration of the Committee, whether ventilating channels, shallow, but of considerable breadth, might not advantageously be conducted to each ward from the external air across the ceiling of the corridor, and open into the ward (instead of the proposed window from the corridor) between the door and the ceiling of the ward. It seems probable to me that this arrangement, if adopted, together with exactly corresponding openings made above the windows opposite, might be the means of securing natural ventilation more uniformly than the existing plans.* Insuggesting this for the consideration of the Committee, I would not be understood to recommend that the proposed ventilating channels in the floors should be omitted from the construction. Experience would show which of the two channels can better subserve its purpose; and nothing would be easier than to close whichever of the two should be found superfluous or less convenient.

In some of the papers which you have communicated to me, pointed allusion is made to a so-called *hospital-atmosphere*, as a danger specially incidental to buildings where many patients are congregated "under one roof." In reference to this I would observe (first repeating my conviction as to the paramount importance of adequate ventilation in every building intended for the sick) that, if by the above quoted expressions it be meant that *patients in clean, well ventilated, and not overcrowded wards, with separately well ventilated passages and staircases, are apt to breed an atmosphere dangerous to those under the same roof with them*, I have no information which would lead me to accept the doctrine. Under opposite circumstances, the continuity of foul atmosphere might indeed be dangerous. But, as regards wards kept as wards ought to be kept, I cannot conceive that the several clean items will make a dirty total; and, so far as my present knowledge extends, I have every reason to believe that, *subject to the qualifications I have stated*, a given number of patients may dwell under one roof as safely as under several roofs.

I have the honour to be,
Sir,
Your obedient servant,

JOHN SIMON.

* The advantages of such an arrangement are well taught by Dr. Roberton, of Manchester, in one of his papers on hospital-construction.

No. 7.

Major Ravenhill's Report on the Site of Netley Abbey.

Questions.

1. What is the geological formation of the ground at the spot chosen for the erection of the Hospital?

What is the character of the principal strata, in what order do they occur, what is their depth, and in what direction do they slope or dip?

Answers.

1. The Government land is of the Bagshot sand, or Bracklesham Bay formation, the strata dipping from north-east to south-west. The following table shows the strata traversed in carrying down the well in the right wing of the Hospital, which, as far as can be judged from the excavations carried on in other portions of the work, extend, with slight variation, over the site on which the Hospital is erected:—

	Ft.	In.
Vegetable soil, gravel, and sand, mixed with clay ..	16	6
Yellow sand	27	2
Brown sandy loam	11	9
Hard clay	1	0
Green sand	27	6
Hard brown clay	6	0
Hard brown clay of a darker hue	11	0
Hard brown clay of a darker hue	5	0
Sand and clay, with few fossils	11	0
Coarse sand, grey, with lignites and ironstone	9	0
Light coloured grey sand ..	6	0
Dark coloured grey sand ..	7	6
Grey sand with shells ..	11	0
Dark green sand with clay and shells	9	0
	159	5

2. Is the general character of the formation such as would facilitate the draining off of surface or rain water, or is it such as would arrest that natural drainage and retain the water, so as to form a wet soil or engender a moist atmosphere?

2. Both the nature of the subsoil and the contour of the Government land tend to facilitate natural drainage. I have never known a district where less water is retained on the surface than on the land in the vicinity of the Hospital, nor one in which the atmosphere was dryer.

3. Are there any beds of clay under the building, and if so, at what depth do they occur, and how may they be expected to affect the dryness of the building?

3. Four beds of clay, as stated in the foregoing table, have been arrived at beneath the foundation of the Hospital; one at a depth of 55 ft. 5 in. below the surface, and three others overlaying each other at a further depth of 27 ft. 6 in.

These beds of clay are too far below the surface to affect the dryness of the building.

4. What is the extent of mud left exposed at low water at the spot where the Hospital is being erected at ordinary and at spring tides, and how often do the latter occur?

4. From 100 to 120 yards of mud is exposed at the ordinary tides, and about 300 at the spring tides. These latter occur four days in each fortnight.

The time during which the full ex-

Questions.	*Answers.*
	tent of mud above-named is exposed is about one hour in each twelve, or two in twenty-four hours. On an average, about four extraordinary spring tides occur in the course of the year, when the mud is left bare beyond the distance last named above.
5. How many times in the twenty-four hours is that mud covered and left uncovered by the water?	5. The mud is covered and uncovered twice during the twenty-four hours; but a second high tide, two hours after the first, caused by the back water in the main channel, takes place in the Southampton estuary, which keeps the water up during a longer period than would be the case in ordinary localities. The mud is entirely covered with water ten hours out of every twenty-four; it is covered within 100 feet of the edge fourteen hours out of every twenty-four. Beyond this distance, the mud bank runs out comparatively level, and it is impossible to follow the course of the water. A strong wind, the state of the atmosphere, or other natural cause, affects the rise and fall of the tide, but in no case is the mud covered for a less period than those above named.
6. What is the character of the mud? What proportion of vegetable organic matter, and what proportion of animal matter does it contain, and what effect has the sea water, or the mixture of sea and fresh water, such as it exists at Netley, in decomposing these various substances?	
7. Do you anticipate that any gases or odours prejudicial to health are likely to be engendered by the action above referred to?	7. During my residence at the station, extending over a period of two years, I have not discovered any ill effects to have resulted to me from any vapours which may have arisen from the exposure of the mud, neither have I heard of any one having suffered from any such alleged vapours.
8. What is the character of the stratum of peat which lies under the mud opposite the site of the Hospital, and do you think that the salt water, or the mixture of salt and fresh water, such as it exists at Netley, is likely to exercise any action upon the peat, such as would cause the evolution of gases prejudicial to health?	8. The stratum of peat which lies in the bed of the Southampton Water, at an average depth of from six to seven feet below the mud, is for the most part decomposed, and cannot therefore, in my opinion, be acted upon by the water, so as to cause anything prejudicial to health.
9. What do you estimate to be the proportion of fresh to salt water in the estuary opposite to the site of the Hospital at high and low water, and what effect do you think that such	9. The water opposite the Hospital is perfectly clear, and free from any vegetable or organic matter. I have tested it out half-way across mid-channel, and find the specific gravity

Questions.	*Answers.*
admixture may have in influencing the character of the atmosphere?	to be 1020, or the same as that of sea water, any admixture of fresh with the salt water at this point is therefore not perceptible.
10. Do you consider that any appreciable effect is produced upon the water of the estuary opposite Netley by the discharge of the sewage of the town of Southampton, and do you consider the amount of sewage sufficient to influence the purity of the atmosphere?	10. Certainly not.
11. What is the general character of the climate at Netley? What is the comparative purity of the air as contrasted with that of other places within your knowledge? Do you consider the air to be mild or otherwise, dry or moist, bracing or relaxing, and what effect do you anticipate that the climate would exercise upon different classes of patients?	11. I have always found the climate at Netley to be genial, the air particularly pure, and the neighbourhood to be unusually free from fogs.
12. What is the comparative longevity of the inhabitants of the Netley district as compared with other places?	
13. What will be the means of access by water? Can patients be landed direct from vessels or must boats be used? To what extent must a pier be carried to enable patients to be landed at all times of tide?	13. Access to the Hospital may be obtained at all hours of the tide by carrying out either a pier or a hard a distance of 400 yards from high water mark. No engineering difficulties would have to be contended with in carrying out either of these methods. It will also be expedient to form an esplanade along the front of the building extending 100 feet in breadth beyond high water mark. The foot of the retaining wall of the esplanade would be washed by the sea seven hours out of 12. As one general system would, probably, be adopted for landing the sick, it may be expedient to consider that boats especially constructed for the purpose would have to be made use of at all hours of the tide.

P. RAVENHILL, *Major, Royal Engineers.*

April 23, 1858.

No. 8.

Thomas Mann, Esq., to Colonel O'Brien.

Sir, *General Register Office, Somerset House, May* 8, 1858.

With reference to your letter of the 5th instant, requesting to be furnished, for the use of the Committee appointed to report upon Netley Hospital, with mortality returns of the registration districts in which certain towns and places are situated, I am directed by the Registrar-General to transmit to you the accompanying return of the number and annual proportion of deaths in the districts referred to during the ten years 1841—1850, the results of a comparison of the mortality during that period with the population enumerated in 1841 and 1851 being more precise than if a later period had been chosen.

I am further directed to forward to you herewith a copy of the sixteenth Report of the Registrar-General, in which, at pp. 144, 149, the annual rate of mortality in each of the registration districts of England and Wales is given for the same period.

I have, &c.

(Signed) THOMAS MANN, *Chief Clerk.*

Inclosure 1 in No. 8.

Statement of the Number of Deaths, and average Annual Rate of Mortality in the five years 1849 to 1853, in the undermentioned parishes and places :—

Parish or Place.	Population	Deaths.						Average Annual Mortality to 1000 living.
	1851.	1849.	1850.	1851.	1852.	1853.	In the 5 years 1849-53.	
Hound Parish in which the Royal Victoria Hospital is situated	827	15	10	17	18	11	71	17·7
Hamble Parish (the next parish to Hound)	443	8	4	4	10	12	38	17·9
Southampton.—Superintendent Registrar's District	34,098	1,004	840	828	830	892	4,394	25·6
South Stoneham.—Superintendent Registrar's District (in which the parishes of Hound and Hamble are situated)	15,974	346	316	255	292	331	1,540	19·2
St. Mary Extra.—Registrar's Sub-District (in which the parishes of Hound and Hamble are situated) ..	3,215	72	49	41	52	53	267	17·3

In calculating the mortality of the sub-district of Saint Mary Extra, and of the parishes of Hound and Hamble, situated in the district of South Stoneham, an approximate correction has been made for the deaths in the workhouse (82), by distributing them proportionally over every parish in the district.

The increase here shown in the annual rate of mortality, in the districts of Southampton and South Stoneham, in the five years 1849—53, as compared with that given in the sixteenth Report of the Registrar-General, deduced from the deaths in the ten years 1841—50, is partly attributable to the high mortality from the cholera epidemic of 1849, having been distributed over a period of ten years in that report, while in the statement now given it is spread over five years only. The deaths from cholera and diarrhœa, in 1849, in these districts were—Southampton, 293, South Stoneham, 57.

The Superintendent Registrar's district of Southampton comprises the parishes of St. Mary, All Saints, St. Lawrence, St. John, Holy Rood and St. Michael.

The Superintendent Registrar's district of South Stoneham comprises the parishes of St. Mary Extra, Hound, Hamble le Rice, Bursledon (these four

parishes form the Registrar's sub-district of St. Mary Extra), Botley, South Stoneham, consisting of the tithings of Allington, Barton, and Eastley, Bitterne and Pollock, Shamblehurst and Portswood, North Stoneham, Chilworth, and Millbrook.

(Signed) GEORGE GRAHAM,
Registrar-General.

General Register Office, Somerset House, May 20, 1858.

Inclosure 2 in No. 8.

RETURN of the Population in 1841 and 1851, number of Deaths in the ten years 1841–1850, and Average Annual Mortality to 1,000 living in the Registration Districts in which the undermentioned towns or places are situated; also the Mortality of the most healthy as well as the most unhealthy District in England. (*Note.*—The Population, Deaths, and Mortality refer to the Districts and not to the Towns.)

Towns or Places.	Districts in which situated.	Population.		Deaths in the 10 Years 1841–1850.	Average Annual Mortality.
		1841.	1851.		Deaths to 1,000 living.
Hull	Hull	41,150	50,670	14,062	31
	Sculcoates	36,217	44,719	10,141	25
Chatham	Medway (including Rochester, Chatham, and Hospitals)	37,616	42,796	10,239	25
	Medway (excluding Fort Pitt and Fort Clarence)	36,899	42,448	9,362	24
Gosport	Alverstoke (including Haslar Hospital and the Hulks)	13,510	16,908	4,396	29
	Alverstoke (excluding Haslar Hospital and the Hulks)	12,458	15,419	3,309	24
Richmond (Surrey)	Richmond	13,558	15,906	2,900	20
Ulverstone	Ulverstone	26,747	30,556	5,019	18
Plymouth	Plymouth	36,520	52,221	11,013	25
	East Stonehouse (including Royal Naval Hospital)	9,712	11,979	3,198	29
	East Stonehouse (excluding Royal Naval Hospital)	9,405	11,800	2,728	25
	Stoke Damerel	33,820	38,180	9,494	26
Hound (in which parish R. V. Hospital is situated)	South Stoneham	12,693	15,974	2,603	18

MORTALITY of the most healthy as well as of the most unhealthy Districts in England.

Most HEALTHY Districts.					
There are three districts in England in which the Mortality was only 15 in 1,000	Rothbury	7,297	7,431	1,082	15
	Glendale	14,217	14,348	2,156	15
	Eastbourne	7,950	8,347	1,237	15
Most UNHEALTHY Districts	Liverpool *	223,003	258,236	94,373	36
	Manchester	192,403	228,483	69,615	33
	St. Saviour, Southwark †	32,975	35,731	10,698	33

* In calculating the Mortality of Liverpool, the year 1847 (the year of the Irish famine and immigration) has been omitted; including that year, the Mortality was 39 annually to every 1,000 persons living.

† In calculating the Mortality of St. Saviour's, Southwark, a correction has been made for the number of deaths in the Hospital.

THOS. MANN, *Chief Clerk.*

General Register Office, Somerset House, May 8, 1858.

No. 9.

George Graham, Esq., Registrar-General, to Colonel O'Brien, President of the Committee on Netley Abbey.

General Register Office, Somerset House,
May 20, 1858.

Sir,

In compliance with the wish expressed to me personally by yourself and Dr. Mapleton, I have the honour to transmit to you tabular statements of the number of deaths from each disease, at different periods of age, in the parishes of Hound and Hamble-le-Rice, and in the Superintendent-Registrar's district of Southampton, which is nearly co-extensive with the town.

In order that the information as to the fatal diseases in these places might be recent, the details are given for the five years ending 31st December, 1857; but I have not added the calculated proportion of deaths to the population living during that period, because any calculation which I could furnish would be uncertain and unsatisfactory, unless the means of correcting the census returns for increase of population since 1851 were at hand.

To supply this omission, however, I beg to enclose a table showing the number of deaths and rate of mortality in the places referred to during the five years 1849 to 1853, comprising the year of the census, and two years before and after it. The results sufficiently approximate to accuracy for all practical purposes.

I have the honour to be,

Sir,

Your faithful servant,

GEORGE GRAHAM,
Registrar-General.

Inclosure 1 in No. 9.

CAUSES OF DEATH in the Parish of HOUND, in the Superintendent Registrar's District of South Stoneham, Hants, at different Ages, during the Five Years 1853–57 (Males and Females).

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	97	28	7	5	2	2	44	5	5	3	5	7	8	7	8	5		
I.	1	Small-pox	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	2	Measles	1	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..
	3	Scarlatina	3	..	1	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..
	4	Hooping Cough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	5	Croup	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	6	Thrush	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	7	Diarrhœa	2	2	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
	8	Dysentery	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	9	Cholera	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	10	Influenza	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
	11	Purpura	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	12	Ague	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	13	Remittent Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	14	Infantile Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	15	Typhus	5	..	..	1	1	..	2	1	1	..	1	..	..	..	..	..	..	..
	16	Metria	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	17	Rheumatic Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	18	Erysipelas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	19	Syphilis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	20	Noma	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	21	Hydrophobia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
II.	22	Hæmorrhage	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	1	..	..	..	..
	23	Dropsy	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	24	Abscess	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	25	Ulcer	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	26	Fistula	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	27	Mortification	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	28	Cancer	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	29	Gout	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
III.	30	Scrofula	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	31	Tabes Mesenterica	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	32	Phthisis	11	1	..	..	..	..	1	..	1	1	2	3	2	..	1	..	..	..
	33	Hydrocephalus	2	..	1	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
IV.	34	Cephalitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	35	Apoplexy	4	..	..	..	..	..	..	..	..	..	1	..	2	1	..	..	..	..	..	..
	36	Paralysis	2	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..
	37	Delirium Tremens	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	38	Chorea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	39	Epilepsy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	40	Tetanus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	41	Insanity	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	42	Convulsions	4	3	..	1	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..
	43	Brain	1	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
V.	44	Pericarditis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	45	Aneurism	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	46	Heart	8	..	..	..	1	..	1	..	..	..	..	1	1	2	2	1	..	..	..	..
VI.	47	Laryngitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	48	Bronchitis	8	4	2	1	..	..	7	..	..	..	..	..	1	..	..	..	..	..	..	..
	49	Pleurisy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	50	Pneumonia	5	2	..	1	..	1	4	..	..	..	..	..	..	..	..	1	..	..	..	..
	51	Asthma	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	52	Lungs	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
VII.	53	Teething	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
	54	Quinsey	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	55	Gastritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	56	Enteritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	57	Peritonitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	58	Ascites	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	59	Ulceration of Intestines	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	60	Hernia	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
	61	Ileus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	62	Intussusception	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	63	Stricture of Intestinal Canal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	64	Disease of Stomach	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
	65	Disease of Pancreas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	66	Hepatitis	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
	67	Jaundice	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	68	Liver	2	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..
	69	Disease of Spleen	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..

CASES OF DEATH in the Parish of HOUND—*continued.*

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	97	28	7	5	2	2	44	5	5	3	5	7	8	7	8	5		
VIII.	70	Nephritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	71	Nephria, or Bright's Disease	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	72	Ischuria	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	73	Diabetes	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	74	Stone	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	75	Cystitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	76	Stricture of Urethra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	77	Disease of Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
IX.	78	Paræmia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	79	Ovarian Dropsy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	80	Childbirth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	81	Uterus	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
X.	82	Arthritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	83	Rheumatism	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	84	Disease of Joints, &c.	2	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
XI.	85	Carbuncle	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	86	Phlegmon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	87	Disease of Skin, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XII.	88	Cyanosis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	89	Spina Bifida	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	90	Other Malformations	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XIII.	91	Premature Birth and Debility	6	6	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..
XIV.	92	Atrophy	7	6	1	..	..	..	7	..	..	..	..	..	..	..	..	..	..	..
XV.	93	Age	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..	..
XVI.	94	Sudden	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XVII.	95	Intemperance	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	96	Privation of Food	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	97	Want of Breast Milk	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	98	Neglect	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	99	Cold	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	100	Poison	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	101	Burns, &c.	2	1	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..
	102	Hanging, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	103	Drowning	3	..	1	..	..	..	1	..	..	2	..	..	..	..	..	..	..	..
	104	Fractures and Contusions	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
	105	Wounds	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	106	Other Violence	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
	107	Causes not specified	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

GEORGE GRAHAM, *Registrar-General.*

General Register Office, Somerset House,
May 20, 1858.

Inclosure 2 in No. 9.

CAUSES OF DEATH in the Parish of HAMBLE-LE-RICE, in the Superintendent Registrar's District of South Stoneham, Hants, at different ages, during the Five Years 1853-57 (Males and Females).

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	35	4	1	1	2	..	8	..	..	4	2	5	..	6	6	2	2	..
I.	1	Small-pox	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	2	Measles	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	3	Scarlatina	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	4	Hooping Cough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	5	Croup	2	..	..	1	1	..	2	..	..	..	..	..	..	..	..	..	..	..
	6	Thrush	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	7	Diarrhœa	1	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..
	8	Dysentery	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
	9	Cholera	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	10	Influenza	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	11	Purpura and Scurvy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	12	Ague	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	13	Remittent Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	14	Infantile Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	15	Typhus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	16	Metria (or Puerperal Fever)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	17	Rheumatic Fever	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	18	Erysipelas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	19	Syphilis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	20	Noma (or Canker)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	21	Hydrophobia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
II.	22	Hæmorrhage	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	23	Dropsy	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
	24	Abscess	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	25	Ulcer	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	26	Fistula	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	27	Mortification	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
	28	Cancer	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	29	Gout	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
III.	30	Scrofula	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	31	Tabes Mesenterica	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	32	Phthisis (or Consumption)	8	..	..	..	..	..	..	..	..	3	2	3	..	..	..	..	..	..
	33	Hydrocephalus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
IV.	34	Cephalitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	35	Apoplexy	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
	36	Paralysis	2	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..
	37	Delirium Tremens	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	38	Chorea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	39	Epilepsy	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
	40	Tetanus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	41	Insanity	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	42	Convulsions	2	1	1	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
	43	Disease of Brain, &c.	2	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..
V.	44	Pericarditis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	45	Aneurism	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	46	Disease of Heart, &c.	2	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..
VI.	47	Laryngitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	48	Bronchitis	2	1	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..
	49	Pleurisy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	50	Pneumonia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	51	Asthma	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	52	Disease of Lungs, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
VII.	53	Teething	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	54	Quinsey	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	55	Gastritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	56	Enteritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	56	Peritonitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	58	Ascites	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	59	Ulceration (of Intestines)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	60	Hernia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	61	Ileus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	62	Intussusception	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	63	Stricture (of the Intestinal Canal)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	64	Disease of Stomach, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	65	Disease of Pancreas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	66	Hepatitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	67	Jaundice	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	68	Disease of Liver	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
	69	Disease of Spleen	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

CAUSES OF DEATH in the Parish of HAMBLE-LE-RICE—*continued.*

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	35	4	1	1	2	..	8	..	..	4	2	5	..	6	6	2	2	..
VIII.	70	Nephritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	71	Nephria (or Bright's Disease)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	72	Ischuria	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	73	Diabetes	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	74	Stone	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	75	Cystitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	76	Stricture of Urethra ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
	77	Disease of Kidneys ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
IX.	78	Paramenia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	79	Ovarian Dropsy ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	80	Childbirth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	81	Disease of Organs of Generation ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
X.	82	Arthritis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	83	Rheumatism	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	84	Disease of Joints, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XI.	85	Carbuncle	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	86	Phlegmon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	87	Disease of Skin	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..
XII.	88	Cyanosis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	89	Spina Bifida	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	90	Other Malformations	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XIII.	91	Premature Birth & Debility	2	2	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
XIV.	92	Atrophy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XV.	93	Age	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..
XVI.	94	Sudden (causes unascertained) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XVII.	95	Intemperance	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	96	Privation of Food ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	97	Want of Breast Milk	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	98	Neglect	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	99	Cold	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	100	Poison	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	101	Burns and Scalds ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	102	Hanging and Suffocation	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	103	Drowning	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	104	Fractures and Contusions	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
	105	Wounds	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	106	Other Violence	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	107	Causes not specified ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

(Signed) GEORGE GRAHAM, *Registrar-General.*

General Register Office, Somerset House,
May 20, 1858.

Inclosure 3 in No. 9.

CAUSES OF DEATH in the Superintendent Registrar's District of SOUTHAMPTON, Hants, at different Ages, during the Five Years 1853-57 (Males and Females).

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	4,997	1,271	440	255	152	106	2,224	198	109	305	428	397	337	360	319	242	71	7
I.	1	Small-pox	97	15	14	8	14	13	64	7	2	5	14	4	1	..	..	..	..	..
	2	Measles	91	19	29	20	13	3	84	5	..	..	1	1	..	..	..	..	..	..
	3	Scarlatina	218	12	21	41	31	25	130	58	14	6	5	5	..	..	..	..	..	..
	4	Hooping Cough	186	40	52	20	13	7	132	4	..	..	..	..	..	..	..	..	..	..
	5	Croup	27	1	5	6	9	4	25	2	..	..	..	..	..	..	..	..	..	..
	6	Thrush	12	10	2	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..
	7	Diarrhœa	214	129	40	7	5	1	182	2	2	1	3	2	5	2	7	6	2	..
	8	Dysentery	28	11	2	..	..	..	13	..	..	..	6	4	3	2	..	..	..	..
	9	Cholera	58	6	3	4	2	4	19	8	1	6	10	6	4	2	1	1	..	..
	10	Influenza	10	3	1	..	..	..	4	..	..	..	..	..	1	1	1	3	..	..
	11	Purpura and Scurvy	6	..	1	..	..	1	2	..	..	1	1	1	..	1	..	..	..	..
	12	Ague	3	..	..	..	..	..	..	..	1	..	1	..	..	..	1	..	..	..
	13	Remittent Fever	7	2	..	..	2	..	4	..	..	..	1	..	1	1	..	..	..	..
	14	Infantile Fever	10	3	2	1	1	2	9	1	..	..	..	..	..	..	..	..	..	..
	15	Typhus	233	4	9	24	9	11	57	27	16	28	37	23	17	18	8	..	2	..
	16	Metria (or Puerperal Fever)	17	..	..	..	..	..	..	..	..	4	8	5	..	..	..	..	..	..
	17	Rheumatic Fever	15	..	..	..	..	..	..	1	2	8	1	1	2	..	..	..	..	..
	18	Erysipelas	26	5	..	..	..	..	5	..	1	4	3	3	2	1	5	1	1	..
	19	Syphilis	29	18	2	2	..	..	22	..	..	2	2	1	1	..	1	..	..	..
	20	Noma (or Canker)	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
	21	Hydrophobia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
II.	22	Hæmorrhage	16	2	1	..	..	..	3	..	..	3	2	..	5	..	1	2	..	..
	23	Dropsy	66	2	..	3	4	2	11	7	3	1	1	5	6	12	9	8	3	..
	24	Abscess	25	9	..	..	..	2	11	1	..	2	3	1	2	2	2	1	..	..
	25	Ulcer	4	..	..	..	..	..	..	..	..	1	1	..	..	1	1	..	..	..
	26	Fistula	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
	27	Mortification	11	1	..	1	..	..	2	..	..	..	..	2	1	2	3	1	..	..
	28	Cancer	69	1	2	..	..	..	3	..	1	..	3	11	17	18	14	2	..	..
	29	Gout	14	..	..	..	..	..	..	..	..	..	..	3	5	3	3	..	..	..
III.	30	Scrofula	24	..	3	..	3	1	7	3	6	2	2	4	..	..	..	..	..	..
	31	Tabes Mesenterica	63	28	13	10	5	3	59	2	..	1	..	..	1	..	..	..	..	..
	32	Phthisis (or Consumption)	631	9	9	9	5	2	34	10	13	122	190	143	79	28	12	..	..	..
	33	Hydrocephalus	112	29	41	17	6	3	96	11	5	..	..	..	..	..	..	..	..	..
IV.	34	Cephalitis	52	13	4	4	3	1	25	9	6	1	5	4	2	..	..	..	..	..
	35	Apoplexy	104	2	..	1	..	..	3	1	..	3	9	18	12	31	14	10	3	..
	36	Paralysis	96	..	..	..	..	..	..	..	1	2	7	10	10	21	28	14	3	..
	37	Delirium Tremens	5	..	..	..	..	..	..	..	..	1	1	2	1	..	..	..	..	..
	38	Chorea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	39	Epilepsy	23	..	1	..	..	..	1	..	2	1	5	6	..	1	4	3	..	..
	40	Tetanus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	41	Insanity	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
	42	Convulsions	205	144	29	13	7	2	195	6	1	2	1	..	..	..	..	..	..	..
	43	Disease of Brain, &c.	42	6	2	1	3	2	14	2	1	3	1	4	5	7	3	2	..	..
V.	44	Pericarditis	8	..	..	..	..	..	..	..	..	2	3	..	1	1	1	..	..	..
	45	Aneurism	3	..	..	..	..	..	..	..	..	..	..	1	1	1	..	..	..	..
	46	Disease of Heart, &c.	173	1	..	1	..	..	2	3	4	10	13	23	34	42	30	12	..	..
VI.	47	Laryngitis	22	5	4	4	..	2	15	2	..	2	..	2	..	1	..	..	..	..
	48	Bronchitis	293	86	49	12	..	1	148	2	2	1	7	7	16	34	38	31	7	..
	49	Pleurisy	20	2	1	..	1	..	4	1	1	3	3	2	2	1	2	..	1	..
	50	Pneumonia	265	130	50	29	4	5	218	2	1	5	7	9	6	10	6	1	..	..
	51	Asthma	35	..	..	..	..	..	..	..	..	1	..	4	6	12	7	5	1	..
	52	Disease of Lungs, &c.	29	2	3	2	..	..	7	..	1	3	5	5	1	6	1	..	..	..
VII.	53	Teething	32	17	13	2	..	..	32	..	..	..	..	..	..	..	..	..	..	..
	54	Quinsey	2	..	1	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..
	55	Gastritis	11	..	1	1	..	1	3	..	..	1	2	1	1	3	..	..	..	..
	56	Enteritis	24	5	1	1	..	1	8	2	1	6	2	2	2	1	..	..	..	..
	57	Peritonitis	16	2	..	1	..	..	3	3	1	2	..	3	..	2	2	..	..	..
	58	Ascites	16	..	..	..	..	..	..	..	..	1	2	5	4	2	2	..	..	..
	59	Ulceration (of Intestines)	8	1	1	..	..	..	2	1	..	1	1	..	..	3	..	..	..	..
	60	Hernia	3	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..
	61	Ileus	23	4	2	..	..	..	6	2	..	2	..	1	2	6	4	..	..	..
	62	Intussusception	2	1	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..
	63	Stricture (of the Intestinal Canal)	3	..	..	..	..	..	..	..	..	1	..	..	..	1	1	..	..	..
	64	Disease of Stomach, &c.	22	1	1	..	..	..	2	..	..	1	4	6	1	3	4	1	..	..
	65	Disease of Pancreas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	66	Hepatitis	6	..	..	..	..	..	..	..	..	..	..	1	2	2	1	..	..	..
	67	Jaundice	10	3	..	..	..	1	4	..	..	..	..	2	2	..	..	2	..	..
	68	Disease of Liver	69	..	..	..	..	..	..	..	1	1	6	12	23	16	8	2	..	..
	69	Disease of Spleen	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Causes of Death in the Superintendent Registrar's District of Southampton—*continued.*

Class.	No.	Causes of Death.	All Ages.	Total under 1 year.	1	2	3	4	Total under 5 years.	5	10	15	25	35	45	55	65	75	85	95 and upwards.
		All Causes.	4,997	1,271	440	255	152	106	2,224	198	109	305	428	397	337	360	319	242	71	7
VIII.	70	Nephritis	4	..	..	..	..	..	..	..	..	..	..	2	1	1	..	..	..	..
	71	Nephria (or Bright's Disease)	24	..	..	..	..	..	..	..	..	1	6	4	4	5	2	2	..	..
	72	Ischuria	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
	73	Diabetes	4	..	..	..	..	..	..	1	..	..	..	1	2	..	..	..	..	..
	74	Stone	5	..	..	..	1	1	2	..	..	..	..	..	..	1	..	2	..	..
	75	Cystitis	2	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..
	76	Stricture of Urethra	4	..	..	..	..	..	..	..	..	..	1	..	1	..	1	..	1	..
	77	Disease of Kidneys, &c.	25	..	..	..	..	..	..	..	2	3	2	4	4	2	4	3	..	1
IX.	78	Paramenia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	79	Ovarian Dropsy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	80	Childbirth	17	..	..	..	..	..	..	..	..	6	6	5	..	..	..	..	..	..
	81	Disease of Organs of Generation	5	1	..	..	..	..	1	..	..	..	1	2	..	..	1	..	..	..
X.	82	Arthritis	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
	83	Rheumatism	9	1	..	..	..	..	1	..	..	2	3	1	..	1	1	..	..	..
	84	Disease of Joints, &c.	20	1	1	..	..	..	2	1	5	4	2	2	2	..	2	..	..	..
XI.	85	Carbuncle	4	..	..	..	..	..	..	..	..	..	1	1	..	1	1	..	..	..
	86	Phlegmon	2	1	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..
	87	Disease of Skin, &c.	8	8	..	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..
XII.	88	Cyanosis	2	2	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
	89	Spina Bifida	3	3	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
	90	Other Malformations	3	3	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
XIII.	91	Premature Birth & Debility	401	359	11	2	4	1	377	..	1	1	1	..	3	15	3	..	..	..
XIV.	92	Atrophy	126	63	9	5	4	..	81	1	2	1	1	1	2	16	21	..	..	..
XV.	93	Age	223	..	..	..	..	..	..	..	..	..	..	..	..	..	47	123	47	6
XVI.	94	Sudden (causes unascertained)	15	5	..	..	..	..	5	..	..	..	1	1	2	3	3	..	..	..
XVII.	95	Intemperance	4	..	..	..	..	..	..	..	..	..	..	2	1	..	1	..	..	..
	96	Privation of Food	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	97	Want of Breast-milk	9	9	..	..	..	..	9	..	..	..	..	..	..	..	..	..	..	..
	98	Neglect	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
	99	Cold	4	4	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..
	100	Poison	4	1	..	..	..	..	1	1	..	..	1	..	1	..	..	..	..	..
	101	Burns and Scalds	16	..	2	3	1	1	7	1	1	4	1	..	1	..	..	..	..	..
	102	Hanging and Suffocation	17	12	..	..	..	..	12	1	..	1	..	..	2	1	..	..	..	..
	103	Drowning	48	2	1	..	1	..	4	1	5	15	5	4	10	1	3	..	..	..
	104	Fractures and Contusions	65	1	1	..	1	2	5	3	3	13	10	9	8	8	3	3	..	..
	105	Wounds	6	..	..	..	..	..	..	..	..	..	4	2	..	..	..	..	..	..
	106	Other Violence	3	3	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
	107	Causes not specified	15	7	..	..	..	1	8	..	..	..	2	1	2	1	..	1	..	..

(Signed) GEORGE GRAHAM, *Registrar-General.*

General Register Office, Somerset House,
May 20, 1858.

No. 10.

Dr. Smith to Colonel O'Brien.

Sir, *Army Medical Department, April* 12, 1858.

I HAVE the honour to acknowledge the receipt of your letter of the 6th instant, and, in reply thereto, I beg to forward, for the information of the Committee, a return, showing the diseases for which men were admitted into the General Military Hospital at Chatham during the five years which preceded the late war with Russia.

With reference to the inquiry contained in the last part of your letter, I have to inform you, that I have requested the Principal Medical Officer at Fort Pitt, Chatham, to furnish me with what information he can on the subject, and I will forward his reply to you as soon as I receive it.

I have, &c.

(Signed) A. SMITH, *Director-General.*

Inclosure in No. 10.

RETURN showing the cases of Disease and Injury treated in the General Hospital, Fort Pitt, Chatham, during the Five Years from the 1st of April, 1849, to the 31st of March, 1854, indicating those which remained under treatment on the 31st of March, 1849, and those admitted in each year of the period.

CLASS OF DISEASES.	Date	April 1st, 1849 to March 31st, 1850.		Ap. 1850 to Mar. 1851.	Ap. 1851 to Mar. 1852	Ap. 1852 to Mar. 1853.	Ap. 1853 to Mar. 1854.	Total Admitted.	
	Specific Disease.	Remained on 31st Mar. 1849.	Admitted.	Admitted.	Admitted.	Admitted.	Admitted.	By each Disease.	By each Class of Disease.
I. Fevers.	Febris Intermittens	..	5	15	7	3	7	37	77
	„ Com. Cont.	..	5	15	13	..	4	37	
	„ Remittens	..	..	..	2	..	..	2	
	„ Typhus	..	..	..	..	1	..	1	
II. Eruptive Fevers.	Variola	..	..	3	..	3	8	14	47
	Varicella	..	1	4	..	..	1	6	
	Rubeola	..	..	1	3	..	..	4	
	Erysipelas	2	5	7	4	2	3	23	
III. Diseases of the Organs of Respiration.	Pleuritis	..	..	4	5	2	3	14	1,984
	Pneumonia	..	4	8	8	4	3	27	
	Hæmoptysis	..	5	9	3	2	3	23	
	Phthisis Pulmonalis	13	90	93	165	164	195	720	
	Catarrhus Acutus	..	17	83	104	111	214	529	
	„ Chronicus	11	83	107	60	100	140	501	
	Bronchitis	5	14	10	1	6	3	39	
	Dyspnœa	1	23	19	8	30	23	104	
	Asthma	..	5	3	6	7	4	25	
	Influenza	..	1	..	..	..	..	..	
	Hydrothorax	..	1	1	..	..	..	2	
IV. Diseases of the Heart and Blood-Vessels	Morbus Cordis	4	68	75	51	73	87	358	444
	Carditis, Pericard, &c.	..	..	..	3	..	..	3	
	Aneurisma	..	1	5	1	..	6	13	
	Varix	..	5	14	12	22	17	70	
V. Diseases of the Liver and Spleen.	Hepatitis Acuta	..	1	1	..	..	1	3	256
	„ Chronica	1	96	41	45	66	62	241	
	Icterus	..	1	..	1	..	..	2	
	Splenitis, &c.	..	..	2	..	2	6	10	
VI. Diseases of Stomach and Bowels.	Peritonitis	..	..	..	..	1	..	1	469
	Enteritis	..	..	..	..	1	..	1	
	Dysenteria Acuta	..	3	2	1	1	..	7	
	„ Chronica	2	27	46	24	29	40	168	
	Diarrhœa	..	16	24	9	18	37	104	
	Colica	..	1	1	..	3	5	10	
	Gastritis	..	..	1	3	..	..	4	
	Obstipatio	..	..	1	3	1	8	13	
	Hæmorrhois	..	3	1	2	4	5	15	
	Hernia	..	7	16	3	11	13	50	
	Dyspepsia	2	10	15	12	16	41	96	

RETURN showing the cases of Disease and Injury treated in Fort Pitt—*continued*.

CLASS OF DISEASES.	Specific Disease.	April 1st, 1849, to March 31st, 1850. Remained on 31st Mar. 1849.	April 1st, 1849, to March 31st, 1850. Admitted.	Ap. 1850 to Mar. 1851. Admitted.	Ap. 1851 to Mar. 1852. Admitted.	Ap. 1852 to Mar. 1853. Admitted.	Ap. 1853 to Mar. 1854. Admitted.	Total Admitted. By each Disease.	Total Admitted. By each Class of Disease.
VII. Diseases of the Nervous System.	Dementia, &c.	..	61	75	72	85	73	366	700
	Apoplexia	..	1	..	..	..	1	2	
	Paralysis	3	21	34	26	36	26	146	
	Delirium Tremens	..	1	2	1	..	..	4	
	Epilepsia	1	38	40	29	39	33	180	
	Chorea	..	..	..	1	..	1	2	
VIII.	Cholera Spasmodica	..	4	..	..	..	..	4	4
IX. Rheumatic Diseases.	Rheumat. Acutus	1	6	9	4	6	17	43	553
	„ Chronicus	6	82	91	86	94	128	487	
	Arthritis, &c.	..	3	1	3	5	6	18	
	Lumbago	..	..	..	..	..	1	1	
	Anchylosis	..	..	..	4	3	2	9	
X. Boils, Ulcers, &c.	Phlegmon et Abscessus	1	17	36	21	45	99	219	506
	Paronychia	..	2	3	1	..	3	9	
	Ulcus	2	46	44	40	38	58	228	
	Fistula in Ano	..	6	6	7	9	7	35	
	„ in Perineo	..	3	3	4	1	2	13	
	Prolapsus Ani	..	2	..	..	..	..	2	
XI. Venereal Diseases.	Syphilis Primitiva	..	38	51	48	87	141	365	1175
	„ Consecutiva	..	28	43	38	78	60	247	
	Ulcus Penis	..	32	38	16	5	10	101	
	Bubo	..	7	15	11	9	22	64	
	Gonorrhœa	..	21	60	62	63	93	299	
	Verrucæ & Condylom.	..	1	..	..	1	4	6	
	Hernia Humoralis	..	3	6	3	9	16	37	
	Cachexia Syphil.	..	4	8	12	27	5	56	
XII. Diseases of the Genito-Urinary Organs.	Hydrocele	2	5	4	5	9	7	32	159
	Strictura Urethræ	..	4	10	13	14	14	55	
	Ischuria and Dysuria	..	..	..	..	2	..	2	
	Diabetis	..	..	..	..	1	2	3	
	Nephritis & Albumen.	..	1	..	1	2	..	4	
	Cystitis, &c.	..	..	..	..	..	1	1	
	Phymosis & Paraphy.	..	4	8	5	4	4	25	
	Enuresis	..	5	..	1	3	4	13	
	Sarcocele	..	11	2	3	5	3	24	
XIII. Wounds and Injuries.	Luxatio	..	6	..	1	1	4	12	225
	Subluxatio	..	7	6	8	12	12	46	
	Vulnus Sclopitorum	..	5	22	3	10	12	52	
	„ Incisum	..	4	7	2	3	9	25	
	Contusio	..	6	6	5	11	11	39	
	Fractura	1	11	2	7	4	4	29	
	Ambustio	..	..	1	2	..	3	6	
	Amputatio	3	3	..	4	3	3	16	
XV.	Gelatio	..	1	..	..	..	..	1	1
XVI.	Scorbutus	..	4	4	6	..	2	16	16
XVII.	Morbi Oculorum	17	181	149	133	168	161	809	809
XVIII.	Morbi Cutis	..	2	3	12	10	17	44	44
XIX. All other Diseases.	Cynanche	1	15	55	34	30	63	198	782
	Otitis, Otorrhœa	..	3	4	4	2	6	19	
	Vermes	..	..	..	..	1	..	1	
	Scrofula	5	64	56	60	48	42	275	
	Morbus Coxarius	..	1	3	..	1	8	13	
	Dysecoea	..	12	7	6	19	20	64	
	Contractura	..	9	7	4	21	33	74	
	Tumores	1	5	1	3	..	4	14	
	Necrosis, Caries, &c.	..	1	..	2	3	5	11	
	Scabies	..	..	..	..	..	1	1	
	Dropsy	..	9	12	6	8	5	40	
	Cephalalgia, Vert., &c.	..	6	5	3	4	2	20	
	Nostalgia	..	..	..	..	..	1	1	
	Odontalgia	..	..	..	..	..	1	1	
	Atrophia	..	3	..	..	..	1	4	
	Apostema Tambau	..	..	2	7	1	2	12	
	Polypus Nasi	..	..	1	..	..	..	1	
	Observatio	13	12	1	1	..	5	32	
	Morbi Varii	..	..	..	..	..	1	1	
	Total	98	1255	1570	1390	1725	2220	8256	

*** This Return includes some cases of illness derived from the Garrison at Chatham, which could not be accurately separated from those of the Invalids; but they were chiefly instances of primary syphilitic disease and gonorrhœa: a certain deduction should, therefore, be made in this class of diseases.

No. 11.

Dr. Smith to Colonel O'Brien.

Sir, *Army Medical Department, April* 17, 1858.

Referring to your letter of the 6th, and my reply of the 12th instant, I have now the honour to transmit, for the information of the Committee, the inclosed copies of a communication and return which I have received from the Principal Medical Officer at Chatham.

I have, &c.
(Signed) A. SMITH, *Director-General.*

Inclosure 1 in No. 11

Deputy Inspector-General Taylor to Dr. Smith.

Principal Medical Officer's Office, Fort Pitt, April 14, 1858.

Sir, In reply to your letter of the 12th instant, and its inclosure, I would take the liberty to refer to Return 4 at page 482 of Appendix to "Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army," &c., as giving a tolerably correct idea of the proportions of different classes of diseases amongst invalids arriving at the depôt. The proportions admitted into Hospital, and constantly confined to bed, are perhaps sufficiently illustrated by the annexed Return.

Dividing the number arrived by the number admitted into Hospital, it would seem that 1 of every 1·5 invalids passes through the Hospital, and if 1 in every 10 of the full diets, 1 in every 6 of the half diets, and all the low spoon and milk diets be taken as representing the patients confined to bed, it follows that on the average 1 of every 4·4 patients is confined to his bed. Having made this estimate, I was curious to ascertain how far it was correct as applied to the patients in Hospital this day, and I found it right within one, the total in Hospital being 132, and the number confined to bed being 29. If 30 had been in bed, the proportion would have been to a fraction as according to the estimate.

I have, &c.
(Signed) J. R. TAYLOR.

Inclosure 2 in No. 11.

Return showing the number of Invalids arrived, the number treated in Hospital, with the numbers of each Class of Diets issued, for each Year, from 1848 to 1857.

Years.	Total Arrivals of Invalids.	Total Admissions into Genl. Hosp.	Class of Diet.					
			Full.	Half.	Low.	Spoon.	Milk.	Total Diets.
For 1848	3,038	1,805	1,406	63,133	5,112	8,479	3,080	81,210
,, 1849	2,209	1,256	2,330	54,859	3,768	8,741	620	70,318
,, 1850	2,482	1,572	497	61,899	3,570	8,519	823	75,308
,, 1851	1,980	1,390	313	51,896	4,066	8,215	722	65,212
,, 1852	2,861	1,725	86	40,747	2,783	7,695	456	51,767
,, 1853	2,902	2,220	3	36,843	4,219	9,721	522	51,308
,, 1854	2,630	2,396	1,068	33,833	2,487	5,644	1,044	44,076
,, 1855	7,528	4,435	45,518	24,587	1,150	14,193	342	85,790
,, 1856	7,172	3,899	40,368	27,432	1,251	13,019	648	82,718
,, 1857	3,638	2,744	27,060	29,211	1,219	12,812	343	70,645
Totals	36,440	23,442	118,649	424,440	29,625	97,038	8,600	678,352
Yearly Average ..	3,644	2,344	11,865	42,444	2,962	9,704	860	67,835

Fort Pitt, *April* 14, 1858.

(Signed) J. R. TAYLOR,
Deputy Inspector-General.

No. 12.

Lieutenant-Colonel James to Colonel O'Brien.

Ordnance Survey Office, Southampton,
May 31, 1855.

Sir,

In compliance with the request contained in your letter of the 20th instant, I send herewith abstracts of the Meteorological Observations which have been taken here during the last three years, and also the mean results for the three years. These observations have been taken with great care and regularity, and with instruments which have been compared with the standard instruments at the Kew Observatory.

I have not had any observations taken at any other place upon the south coast of England, but we have published the observations taken at the Ordnance Survey Office, Dublin, and also those taken at Edinburgh. I send with this a copy of the observations taken at all the foreign stations of the Engineers, and in this you will find the Edinburgh observations, should you wish to refer to them for comparison.

The British Meteorological Society have published the observations taken at several stations along the south coast, and these will enable you to compare the temperature and humidity of the air at those stations, with that of Southampton.

I have, &c.,
(Signed) HENRY JAMES,
Lieutenant-Colonel and Colonel, R.E.

MEAN MONTHLY AND YEARLY ABSTRACT OF METEOROLOGICAL OBSERVATIONS TAKEN AT THE ORDNANCE SURVEY OFFICE, SOUTHAMPTON, 1855–6.

Latitude, 50° 54′ 50″ North. Longitude, 1° 24′ 0″ West.

From Daily Observations.	Hours of Observation.	February 1855.	March 1855.	April 1855.	May 1855.	June 1855.	July 1855.	August 1855.	September 1855.	October 1855.	November 1855.	December 1855.	January 1856.	For the Year.
Mean height of the Barometer at the temperature of 32°, and corrected for altitude above the mean level of the sea, for each month, and for the year, at	9·30 a.m.	29·765	29·727	30·139	29·862	30·045	29·951	30·045	30·156	29·699	30·043	29·927	29·633	29·914
	3·30 p.m.	29·738	29·708	30·094	29·826	30·029	29·923	30·031	30·111	29·679	30·019	29·902	29·621	29·890
Mean range of Barometer (observed)	..	0·027	0·019	0·045	0·036	0·016	0·008	0·014	0·045	0·020	0·024	0·025	0·012	0·024
Mean temperature of the air for each month, and for the year, at	9·30 a.m.	30·8	40·5	49·1	52·3	59·5	64·8	65·5	61·4	53·8	43·0	38·6	40·6	50·0
	3·30 p.m.	34·4	43·5	54·8	54·7	62·5	67·1	67·9	64·4	55·7	44·7	40·2	43·0	52·7
Range of temperature of the air	..	3·6	3·0	5·7	2·4	3·0	2·3	2·4	3·0	1·9	1·7	1·6	2·4	2·7
Mean temperature of the evaporation for each month, and for the year, at	9·30 a.m.	29·3	38·0	44·0	46·4	53·7	59·5	59·8	56·7	51·4	41·3	36·8	39·3	46·3
	3·30 p.m.	32·1	39·1	46·7	47·2	55·1	60·8	60·3	57·7	52·1	42·3	37·6	40·6	47·6
Range of temperature of evaporation	..	2·8	1·1	2·7	0·8	1·4	1·3	0·5	1·0	0·7	1·0	0·8	1·3	1·3
Mean humidity for each month, and for the year, at	9·30 a.m.	·753	·795	·661	·640	·705	·745	·728	·745	·837	·839	·800	·843	·757
	3·30 p.m.	·719	·711	·574	·610	·651	·711	·661	·691	·782	·778	·745	·803	·703
Mean maximum temperature of the air..	..	36·3	46·2	56·5	58·9	65·1	70·7	70·8	67·3	59·1	47·7	44·2	46·1	55·7
Mean minimum temperature of the air..	..	25·8	33·5	38·4	42·2	49·6	54·6	54·2	49·5	47·2	38·5	33·8	37·1	42·0
Approximate mean temperature of the air	..	31·1	39·8	47·5	50·5	57·3	62·7	62·5	58·4	53·1	43·1	39·0	41·6	48·9
Mean maximum temperature in the sun	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mean minimum temperature on the grass	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mean maximum temperature of evaporation	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mean minimum temperature of evaporation	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Quantity of rain in each month — On the ground ..	..	2·158	2·406	0·398	2·347	1·725	3·972	1·890	3·479	7·384	1·109	2·280	3·679	32·817
Quantity of rain in each month — 18 ft. 6 in. above the ground.. ..	..	1·759	1·962	0·301	2·028	1·555	3·561	1·582	2·784	6·359	1·038	1·713	2·502	27·144
Greatest quantity of rain in 24 hours	..	0·817 Date 3	0·404 Date 22	0·231 Date 4	0·401 Date 11	0·550 Date 1	0·684 Date 24	0·487 Date 24	2·356 Date 30	1·202 Date 26	0·230 Date 21	0·549 Date 27	0·467 Date 5	2·356 Date Sep. 30

Height above the Sea, 78 feet.

Wind.	Number of Days from each Point, and number of Days on which there was Rain.																								Total.	
	Direction.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.
Direction at 9·30 a.m.	N.	1	..	4	1	5	1	4	2	2	1	1	..	3	..	6	..	4	4	4	2	2	1	5	2	41	14
	N.E.	15	3	7	1	8	2	10	4	8	1	..	..	3	..	6	..	2	1	12	3	3	..	6	3	80	21
	E.	6	2	4	3	4	..	1	..	1	..	2	1	..	..	3	1	1	1	3	..	5	..	2	1	32	9
	S.E.	2	1	3	3	1	..	3	3	2	..	3	1	1	..	2	..	..	..	3	2	1	..	5	3	23	13
	S.	1	1	1	1	2	2	4	2	4	3	5	3	8	4	1	..	8	8	1	1	6	5	5	5	46	35
	S.W.	..	..	6	4	3	1	4	2	5	3	11	5	7	3	..	..	4	3	2	2	2	2	7	6	51	31
	W.	..	..	2	2	3	1	..	..	6	1	2	2	4	2	..	..	6	4	..	..	1	1	..	..	24	13
	N.W.	..	..	4	2	4	1	3	3	2	1	7	4	5	2	7	2	4	3	4	..	10	..	1	..	51	18
	Calm.	3	3	..	..	..	..	2	..	..	..	..	..	..	..	5	2	2	2	1	1	1	..	..	..	14	8
Direction at 3·30 p.m.	N.	1	..	1	..	1	..	6	..	2	..	1	..	4	..	4	..	2	..	7	..	1	..	4	..	34	..
	N.E.	13	..	8	..	9	..	6	..	4	..	..	..	1	..	5	..	2	..	7	..	4	..	7	..	66	..
	E.	6	..	5	..	3	..	1	..	2	..	..	..	..	..	3	..	2	..	4	..	5	..	3	..	34	..
	S.E.	2	..	5	..	2	..	4	..	4	..	2	..	3	..	3	..	..	..	3	..	3	..	4	..	35	..
	S.	1	..	3	..	3	..	3	..	4	..	10	..	5	..	3	..	4	..	3	..	3	..	6	..	48	..
	S.W.	1	..	3	..	5	..	8	..	7	..	10	..	11	..	..	..	7	..	2	..	4	..	5	..	63	..
	W.	1	..	2	..	4	..	1	..	3	..	5	..	3	..	2	..	8	..	..	..	1	..	1	..	31	..
	W.	1	..	4	..	3	..	2	..	3	..	3	..	3	..	7	..	4	..	2	..	8	..	1	..	41	..
	Calm.	2	..	..	..	..	..	..	..	1	..	..	..	1	..	3	..	2	..	2	..	2	..	..	..	13	..
	—	—	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	Max. & Min. for the Year.	
Maximum height of Barometer (observed)	9·30 a.m.	30·093	18	30·536	30	30·546	22	30·103	1	30·438	20	30·256	2	30·373	16	30·512	7	30·294	20	30·353	26	30·350	16	30·712	13	30·712	Jan. 13
	3·30 p.m.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Minimum height of Barometer (observed)	9·30 a.m.	..	..	..	..	..	..	..	..	..	..	29·539	17	..	..	..	..	29·165	30	29·556	8	29·125	26	..	..	..	..
	3·30 p.m.	29·319	4	28·877	22	29·415	10	29·321	13	29·359	15	..	..	29·673	8	29·457	30	..	..	..	..	..	..	29·084	7	28·877	Mar. 22
Extreme range of Barometer (observed)	..	..	0·774	..	1·659	..	1·131	..	0·782	..	1·079	..	0·717	..	0·700	..	1·055	..	1·229	..	0·797	..	1·225	..	1·728	..	1·835	..
Maximum temperature of the air	..	..	48·9	26	55·3	17	69·8	17	80·0	27	77·6	7	76·5	7	78·2	17	75·3	24	64·8	2	57·5	7	53·0	29	54·8	23	80·0	May 27
Minimum temperature of the air	..	..	14·9	21	24·3	9	27·7	1	30·6	5	41·5	20	48·5	21	42·0	10	38·2	27	34·8	15	29·4	15	15·2	22	23·8	29	14·9	Feb. 21
Extreme range of temperature	..	..	34·0	..	31·0	..	42·1	..	49·4	..	36·1	..	28·0	..	36·2	..	37·1	..	30·0	..	28·1	..	37·8	..	31·0	..	65·1	..
			Feb. 1855.		Mar. 1855.		Apr. 1855.		May 1855.		June 1855.		July 1855.		Aug. 1855.		Sept. 1855.		Oct. 1855.		Nov. 1855.		Dec. 1855.		Jan. 1856.			

HENRY JAMES,
Lieutenant-Colonel and Colonel, Royal Engineers.

Observations registered by Corporal J. DOWNING,
Royal Engineers.

MEAN MONTHLY AND YEARLY ABSTRACT OF METEOROLOGICAL OBSERVATIONS, &c.—1856-7.

Latitude 50° 54′ 50″ North. Longitude 1° 24′ 0″ West.

From Daily Observations.	Hours of Observation.	February 1856.	March 1856.	April 1856.	May 1856.	June 1856.	July 1856.	August 1856.	September 1856.	October 1856.	November 1856.	December 1856.	January 1857.	For the Year.
Mean height of the Barometer at the temperature of 32°, and corrected for altitude above the mean level of the sea, for each month, and for the year, at	9·30 a.m.	30·080	30·172	29·775	29·823	30·069	30·023	29·929	29·847	30·150	30·129	29·858	29·842	29·975
	3·30 p.m.	30·049	30·134	29·746	29·820	30·048	30·001	29·896	29·817	30·147	30·100	29·828	29·832	29·953
Mean range of Barometer (observed)	..	0·031	0·038	0·029	0·003	0·021	0·022	0·033	0·030	0·003	0·029	0·030	0·010	0·023
Mean temperature of the air for each month, and for the year, at	9·30 a.m.	42·6	42·4	50·3	52·3	61·8	64·1	67·1	58·9	54·8	43·0	41·1	37·4	51·3
	3·30 p.m.	46·0	45·1	52·2	55·4	66·0	67·1	69·3	61·1	57·4	45·7	43·5	40·5	54·1
Range of temperature of the air	..	3·4	2·7	1·9	3·1	4·2	3·0	2·2	2·2	2·6	2·7	2·4	3·1	2·8
Mean temperature of the evaporation for each month, and for the year, at	9·30 a.m.	40·9	38·8	45·7	47·9	55·3	58·1	61·0	53·5	52·7	41·2	39·6	36·0	47·6
	3·30 p.m.	42·9	40·2	46·7	49·2	57·3	59·7	62·0	54·3	53·9	42·4	41·3	37·9	49·0
Range of temperature of evaporation	..	2·0	1·4	1·0	1·3	2·0	1·6	1·0	0·8	1·2	1·2	1·7	1·9	1·4
Mean humidity for each month, and for the year, at	9·30 a.m.	·857	·746	·704	·722	·679	·711	·737	·713	·866	·841	·854	·846	·773
	3·30 p.m.	·773	·664	·680	·650	·628	·668	·688	·660	·793	·758	·824	·776	·713
Mean maximum temperature of the air..	..	48·1	48·0	55·9	59·4	67·4	69·8	72·7	64·5	60·2	49·9	46·9	44·5	57·3
Mean minimum temperature of the air	..	38·4	38·4	40·1	43·5	50·4	52·8	55·9	47·8	48·1	36·3	36·2	32·8	43·1
Approximate mean temperature of the air	..	43·3	41·2	48·0	51·4	58·9	61·3	64·2	56·1	54·1	43·1	41·5	38·6	50·1
Mean maximum temperature in the sun	..	57·2	58·5	66·6	70·4	80·1	81·9	89·3	77·0	68·8	54·0	48·5	49·1	66·8
Mean minimum temperature on the grass	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mean maximum temperature of evaporation	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mean minimum temperature of evaporation	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Quantity of rain in each month { On the ground ..	..	1·988	1·429	5·004	2·184	1·582	0·648	2·548	2·663	2·927	1·527	3·427	2·846	28·773
Quantity of rain in each month { 18 ft. 6 in. above the ground ..	..	1·293	1·028	4·080	1·966	1·355	0·696	2·607	2·361	2·485	not registrd.	2·951	2·531	..
Greatest quantity of rain in 24 hours	..	0·521 Date 14	0·979 Date 17	0·849 Date 27	0·650 Date 7	0·383 Date 14	0·307 Date 16	0·863 Date 21	1·098 Date 28	0·762 Date 4	0·520 Date 29	0·840 Date 13	0·840 Date 10	1·098 Date Sept. 28

Wind.	Direction.	Number of Days from each Point, and number of Days on which there was Rain.																						Total.	
		No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.
Direction at 9·30 a.m.	N.	1	..	3	1	5	2	5	1	3	2	1	..	3	2	4	2	2	2	7	2	7	1	4	1	47	16
	N.E.	5	3	11	..	5	2	5	2	2	..	1	..	4	2	2	1	7	4	2	..	3	1	7	3	54	18
	E.	7	..	10	..	1	..	3	2	..	..	3	1	2	..	3	1	4	1	1	..	..	..	..	..	34	5
	S.E.	..	..	2	1	6	1	3	2	..	..	1	..	5	2	3	..	3	1	..	..	..	..	1	..	24	7
	S.	6	3	..	..	3	2	4	2	2	2	1	1	4	3	..	..	4	2	..	..	3	3	2	1	29	19
	S.W.	6	4	..	..	5	3	4	1	3	..	9	1	8	2	5	4	2	3	1	1	7	5	3	3	53	27
	W.	1	..	..	..	3	2	4	3	8	2	6	3	3	2	3	1	2	1	6	2	6	2	4	4	46	22
	N.W.	3	..	5	3	2	1	3	1	10	3	9	3	2	2	8	5	1	..	7	2	2	..	7	3	59	23
	Calm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	6	3	6	3	3	1	3	..	20	8
Direction at 3·30 p.m.	N.	2	..	2	..	3	..	10	..	2	..	1	..	2	..	4	..	2	..	6	..	7	..	4	..	45	..
	N.E.	6	..	10	..	6	..	2	..	1	..	..	..	2	..	2	..	5	..	3	..	2	..	7	..	46	..
	E.	4	..	9	..	1	..	..	..	..	..	..	..	2	..	4	..	5	..	1	..	1	..	2	..	29	..
	S.E.	2	..	3	..	2	..	3	..	1	..	1	..	3	..	1	..	6	..	2	..	..	..	..	..	24	..
	S.	4	..	3	..	9	..	2	..	6	..	6	..	5	..	5	..	6	..	..	..	3	..	1	..	50	..
	S.W.	7	..	..	..	4	..	9	..	5	..	10	..	10	..	4	..	2	..	..	..	7	..	5	..	63	..
	W.	2	..	..	..	3	..	2	..	6	..	5	..	4	..	4	..	1	..	1	..	4	..	3	..	35	..
	N.W.	2	..	4	..	2	..	3	..	9	..	8	..	2	..	6	..	3	..	12	..	5	..	7	..	63	..
	Calm.	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	5	..	2	..	2	..	11	..
		—	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	Max. & Min. for the Year.	
Maximum height of Barometer (observed)	9·30 a.m.	30·597	25	30·683	1	30·351	20	30·233	9	30·348	7	30·317	30	30·267	5	30·340	3	30·552	25	30·664	7	30·642	16	30·426	17	30·683	Mar. 1
	3·30 p.m.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Minimum height of Barometer (observed)	9·30 a.m.	..	..	..	..	..	..	29·459	7	..	..	29·523	8	29·298	21	28·894	28	..	..	..	..	..	..	..	..	28·894	Sep. 28
	3·30 p.m.	29·727	18	29·806	18	29·226	8	..	..	29·534	19	..	..	..	..	..	..	29·494	15	29·491	11	28·915	25	29·077	12	..	..
Extreme range of Barometer (observed) ..	..	0·870	..	0·877	..	1·125	..	0·774	..	0·814	..	0·794	..	0·969	..	1·446	..	1·058	..	1·173	..	1·727	..	0·349	..	1·789	..
Maximum temperature of the air	..	55·3	14	54·0	27	62·2	24	74·2	11	79·2	26	79·3	30	89·4	3	72·0	11	64·8	7	61·0	1	59·0	7	53·3	18	89·4	Aug. 3
Minimum temperature of the air	..	28·8	3	27·0	29	31·0	20	30·2	4	44·0	15	44·2	9	44·2	22	37·2	20	32·5	28	21·5	28	20·2	1	16·8	29	16·8	Jan. 29
Extreme range of temperature	..	26·5	..	27·0	..	31·2	..	44·0	..	35·2	..	35·1	..	45·2	..	31·8	..	32·3	..	39·5	..	38·8	..	36·5	..	72·6	..
		Feb. 1856.		Mar. 1856.		Apr. 1856.		May 1856.		June 1856.		July 1856.		Aug. 1856.		Sept. 1856.		Oct. 1856.		Nov. 1856.		Dec. 1856.		Jan. 1857.			

HENRY JAMES,
Lieutenant-Colonel and Colonel, Royal Engineers.

Observations registered by Corporal J. DOWNING,
Royal Engineers.

MEAN MONTHLY AND YEARLY ABSTRACT OF METEOROLOGICAL OBSERVATIONS, &c.,—1857–8.

Latitude, 50° 54′ 50″ North. Longitude, 1° 24′ 0″ West.

From Daily Observations.	Hours of Observation.	February 1857.	March 1857.	April 1857.	May 1857.	June 1857.	July 1857.	August 1857.	September 1857.	October 1857.	November 1857.	December 1857.	January 1858.	For the Year.
Mean height of the Barometer at the temperature of 32°, and corrected for altitude above the mean level of the sea, for each month, and for the year, at	9·30 a.m.	30·139	29·915	29·813	29·958	30·025	30·047	30·022	29·965	29·873	30·110	30·353	30·376	30·050
	3·30 a.m.	30·102	29·882	29·795	29·927	30·003	30·032	29·995	29·939	29·849	30·087	30·327	30·347	30·024
Mean range of Barometer (observed)	..	0·037	0·033	0·018	0·031	0·022	0·015	0·027	0·026	0·024	0·023	0·026	0·029	0·026
Mean temperature of the air for each month, and for the year, at	9·30 a.m.	40·7	44·4	48·8	57·9	66·4	66·2	68·9	63·6	56·0	48·4	46·9	39·5	53·9
	3·30 p.m.	45·1	46·5	51·4	61·2	68·5	68·9	71·5	65·5	58·0	49·8	49·2	43·1	56·5
Range of temperature of the air..	..	4·4	2·1	2·6	3·3	2·1	2·7	2·6	1·9	2·0	1·4	2·3	3·6	2·6
Mean temperature of the evaporation for each month, and for the year, at	9·30 a.m.	39·3	41·2	45·0	51·7	58·1	59·9	62·0	59·4	53·7	46·7	45·2	37·8	50·0
	3·30 p.m.	41·6	41·9	45·8	53·1	58·8	61·0	62·4	59·5	54·1	47·6	46·6	40·0	51·0
Range of temperature of evaporation	..	2·3	0·7	0·8	1·4	0·7	1·1	0·4	0·1	0·4	0·9	1·4	2·2	1·0
Mean humidity for each month, and for the year, at	9·30 a.m.	·869	·760	·744	·662	·640	·711	·695	·785	·858	·872	·875	·836	·775
	3·30 p.m.	·738	·683	·664	·612	·598	·659	·631	·714	·783	·845	·815	·747	·707
Mean maximum temperature of the air..	..	47·4	50·0	54·1	63·7	72·1	71·8	75·3	68·8	61·7	53·7	52·2	46·6	59·8
Mean minimum temperature of the air	..	33·8	36·7	40·0	45·8	52·1	55·1	57·2	53·5	49·4	43·0	42·1	34·0	45·2
Approximate mean temperature of the air	..	40·6	43·3	47·0	54·7	62·2	63·4	66·2	61·1	55·5	48·3	47·2	40·3	52·5
Mean maximum temperature in the sun	..	59·3	62·3	70·1	85·0	95·3	91·4	95·1	85·7	73·6	59·8	54·5	51·9	73·7
Mean minimum temperature on the grass	..	25·1	31·0	35·4	39·8	46·6	50·2	52·8	48·3	43·9	38·0	36·9	29·4	39·8
Mean maximum temperature of evaporation	..	45·2	48·1	51·8	59·6	68·7	66·6	69·5	66·6	59·6	52·0	50·6	44·5	56·9
Mean minimum temperature of evaporation	..	32·7	34·6	38·8	43·5	50·1	53·1	55·1	51·4	47·5	41·6	40·9	32·4	43·5
Quantity of rain in each month { On the ground ..	..	0·415	2·141	2·393	0·748	1·507	1·723	2·611	3·679	7·533	2·246	0·984	1·062	27·042
Quantity of rain in each month { 18 ft. 6 in. above the ground	..	0·336	2·019	2·074	0·711	1·491	1·596	2·355	3·383	6·405	1·900	0·786	0·694	23·750
Greatest quantity of rain in 24 hours	..	0·179 Date 9	0·747 Date 13	0·700 Date 4	0·237 Date 25	0·660 Date 19	0·350 Date 5	0·774 Date 14	1·093 Date 8	2·365 Date 7	0·656 Date 23	0·248 Date 18	0·351 Date 29	2·365 Date Oct. 7

Wind.	Number of Days from each Point, and number of Days on which there was Rain.																								Total.	
	Direction.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.
Direction at 9·30 a.m.	N.	1	..	3	1	3	1	3	..	1	..	2	1	2	1	1	..	2	1	2	..	1	..	5	1	26	6
	N.E.	1	..	1	..	3	1	9	1	4	1	1	1	7	..	3	1	2	1	8	2	..	..	4	..	43	8
	E.	4	..	3	..	4	3	4	..	4	..	1	..	4	1	1	..	1	..	8	1	..	..	3	..	37	5
	S.E.	3	1	7	4	5	3	3	1	4	1	2	..	2	1	3	2	6	5	2	2	4	1	5	1	46	22
	S.	6	2	2	1	4	3	6	2	3	..	2	2	..	..	2	1	..	..	1	..	4	2	2	1	32	14
	S.W.	1	..	4	4	3	2	3	..	7	3	6	..	7	2	10	4	3	2	..	..	9	5	4	2	57	24
	W.	4	1	7	2	3	2	1	..	1	..	9	2	2	1	2	2	2	1	2	2	4	1	6	2	43	16
	N.W.	2	..	1	..	3	1	2	1	3	2	6	3	4	2	2	2	4	3	..	..	2	..	2	..	31	14
	Calm.	6	1	3	1	2	1	..	..	3	1	2	1	3	1	6	3	11	7	7	4	7	..	..	..	50	22
Direction at 3·30 p.m.	N.	1	..	4	..	3	..	1	..	1	..	1	..	1	..	1	..	1	..	3	..	..	..	5	..	22	..
	N.E.	2	..	2	..	1	..	6	..	3	..	..	..	4	..	1	..	1	..	8	..	..	..	3	..	31	..
	E.	2	..	3	..	2	..	4	..	2	..	..	..	4	..	2	..	2	..	6	..	..	..	3	..	30	..
	S.E.	5	..	6	..	7	..	8	..	2	..	2	..	3	..	3	..	4	..	4	..	3	..	4	..	51	..
	S.	4	..	5	..	6	..	4	..	7	..	4	..	2	..	3	..	1	..	1	..	4	..	1	..	42	..
	S.W.	6	..	1	..	4	..	5	..	10	..	11	..	6	..	10	..	6	..	1	..	11	..	6	..	77	..
	W.	3	..	8	..	3	..	2	..	1	..	7	..	4	..	1	..	4	..	..	..	5	..	3	..	41	..
	N.W.	3	..	2	..	4	..	1	..	1	..	4	..	3	..	3	..	2	..	1	..	3	..	3	..	30	..
	Calm.	2	..	..	..	..	..	..	..	3	..	2	..	4	..	6	..	10	..	6	..	5	..	3	..	41	..
	—	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	—	Date.	Max. & Min. for the Year.	
Maximum height of Barometer (observed)	9·30 a.m.	30·595	28	30·588	1	30·353	21	30·279	5	30·390	25	30·379	13	30·340	27	30·427	19	30·279	2	30·765	12	30·733	12	30·763	17	30·765	Nov. 12
	3·30 p.m.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Minimum height of Barometer (observed)	9·30 a.m.	..	..	29·181	14	29·085	13	..	..	..	..	..	..	29·721	7	..	..	28·820	8	29·263	24	..	..	..	..	28·820	Oct. 8
	3·30 p.m.	29·484	2	..	..	..	..	29·363	25	29·564	30	29·733	5	..	..	29·439	8	..	..	..	..	29·775	3	30·005	30	..	..
Extreme range of Barometer (observed)	..	1·111	..	1·407	..	1·268	..	0·916	..	0·826	..	0·646	..	0·619	..	0·988	..	1·459	..	1·502	..	0·958	..	0·758	..	1·945	..
Maximum temperature of the air	.. ..	56·0	28	56·5	18	65·0	18	74·5	16	83·5	28	81·0	15	84·5	23	76·0	17	67·8	12	61·8	3	57·0	2	53·0	29	84·5	Aug. 23
Minimum temperature of the air	.. ..	22·7	4	27·0	9	30·0	28	33·8	6	44·0	13	46·0	7	50·0	14	42·7	28	36·0	30	31·0	12	28·8	19	23·8	23	22·7	Feb. 4
Extreme range of temperature	.. .. ..	33·3	..	29·5	..	35·0	..	40·7	..	39·5	..	35·0	..	34·5	..	33·3	..	31·8	..	30·8	..	28·2	..	29·2	..	61·8	..
		Feb. 1857.		Mar. 1857.		Apr. 1857.		May 1857.		June 1857.		July 1857.		Aug. 1857.		Sept. 1857.		Oct. 1857.		Nov. 1857.		Dec. 1857.		Jan. 1858.			

HENRY JAMES,
Lieutenant-Colonel and Colonel, Royal Engineers.

Observations registered by Corporal J. DOWNING,
Royal Engineers.

METEOROLOGICAL OBSERVATIONS TAKEN AT THE ORDNANCE SURVEY OFFICE, SOUTHAMPTON.—MEAN RESULTS FOR 1855–6, 1856–7, 1857–8.

Latitude, 50° 54′ 50″ North. Longitude, 1° 24′ 0″ West.

From Daily Observations.	Hours of Observation.	1855–6.	1856–7.	1857–8.	Means.
Mean height of the Barometer at the temperature of 32°, and corrected for altitude above the mean level of the sea, for each month, and for the year, at	9·30 a.m.	29·914	29·975	30·050	29·979
	3·30 p.m.	29·890	29·952	30·024	29·955
Mean range of Barometer (observed)	..	0·024	0·023	0·026	0·024
Mean temperature of the air for each month, and for the year, at	9·30 a.m.	50·0	51·3	53·9	51·7
	3·30 p.m.	52·7	54·1	56·5	54·4
Range of temperature of the air	..	2·7	2·8	2·6	2·7
Mean temperature of the evaporation for each month, and for the year, at	9·30 a.m.	46·3	47·6	50·0	48·0
	3·30 p.m.	47·6	49·0	51·0	49·2
Range of temperature of evaporation	..	1·3	1·4	1·0	1·2
Mean humidity for each month, and for the year, at	9·30 a.m.	·757	·773	·775	·768
	3·30 p.m.	·703	·713	·707	·708
Mean maximum temperature of the air	..	55·7	57·3	59·8	57·6
Mean minimum temperature of the air..	..	42·0	43·1	45·2	43·4
Approximate mean temperature of the air	..	48·9	50·1	52·5	50·5
Mean maximum temperature in the sun	..	..	66·8	73·7	..
Mean minimum temperature on the grass	..	..	..	39·8	..
Mean maximum temperature of evaporation	..	..	..	56·9	..
Mean minimum temperature of evaporation	..	..	..	43·5	..
Quantity of rain in each month: On the ground ..	..	32·817	28·773	27·042	29·544
Quantity of rain in each month: 18 ft. 6 in. above the ground.. ..	..	27·144	..	23·750	..
Greatest quantity of rain in 24 hours	..	2·356 Date Sep. 30	1·098 Date Sep. 28	2·365 Date Oct. 7	1·939

Wind.	Number of Days from each Point, and number of Days on which there was Rain.								
	Direction.	No.	Rain on.	No.	Rain on.	No.	Rain on.	No.	Rain on.
Direction at 9·30 a.m.	N.	41	14	47	16	26	6	38	12
	N.E.	80	21	54	18	43	8	59	16
	E.	32	9	34	5	37	5	34	6
	S.E.	26	13	24	7	46	22	32	14
	S.	46	35	29	19	32	14	36	23
	S.W.	51	31	53	27	57	24	54	27
	W.	24	13	46	22	43	16	38	17
	N.W.	51	18	59	23	31	14	47	18
	Calm.	14	8	20	8	50	22	28	13
Direction at 3·30 p.m.	N.	34	..	45	..	22	..	34	..
	N.E.	66	..	46	..	31	..	48	..
	E.	34	..	29	..	30	..	31	..
	S.E.	35	..	24	..	51	..	37	..
	S.	48	..	50	..	42	..	47	..
	S.W.	63	..	63	..	77	..	68	..
	W.	31	..	35	..	41	..	36	..
	N.W.	41	..	63	..	30	..	45	..
	Calm.	13	..	11	..	41	..	22	..
	—	—	Date.	—	Date.	—	Date.	—	Date.
Maximum height of Barometer (observed) ..	9·30 a.m.	30·712	Jan. 13	30·683	Mar. 1	30·765	Nov. 12	30·720	..
	3·30 p.m.	..	..	..	..	..	..	..	..
Minimum height of Barometer (observed) ..	9·30 a.m.	..	..	28·894	Sep. 28	28·820	Oct. 8	28·864	..
	3·30 p.m.	28·877	Mar. 22	..	..	..	..	..	..
Extreme range of Barometer (observed)	..	1·835	..	1·789	..	1·945	..	1·856	..
Maximum temperature of the air	..	80·0	May 27	89·4	Aug. 3	84·5	Aug. 23	84·6	..
Minimum temperature of the air	..	14·9	Feb. 21	16·8	Jan. 29	22·7	Feb. 4	18·1	..
Extreme range of temperature	..	65·1	..	72·6	..	61·8	..	66·5	..
	Yearly means for	1855–6.		1856–7.		1857–8.		Means.	

HENRY JAMES,
Lieutenant-Colonel and Colonel, Royal Engineers.

No. 13.

James Glaisher, Esq., to Colonel O'Brien.

Sir, *Blackheath, June 7, 1858.*

With this I send the Mean Monthly a. Annual Fall of Rain, Temperature and Humidity of the Air for the last four years, at several places extending from the south of England to the Midland Counties.

To obtain the annual values as you desired, I have had to collect the monthly values, and conceiving they may be of use in your investigation I have included them. The particulars I send are contained in 15 Tables, as follows :—

Tables I to IV—contain the Monthly and Annual Fall of Rain.

Table V—contains the Annual Fall of Rain collected together.

Tables VI to IX—contain the Monthly and Annual Temperature of the Air at the several places.

Table X—contains the Annual Temperature for the four years collected together.

Tables XI to XIV—ontain the Mean Monthly Degree of Humidity, on the suppposition that saturation is represented by 100.

Table XV—contains the Annual Degree of Humidity for the four years collected together.

If there be any other information in my possession of value to the Committee, I shall be glad to send it to you.

I have, &c.
(Signed) JAMES GLAISHER.

P.S.—Perhaps you will kindly let Dr. Babington see these Tables, who also wrote to me respecting them for the same investigation.

TABLE I.

The Monthly and Total Fall of Rain, in the year 1854, at the undermentioned places.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Helkham.	Nottingham.	Liverpool.	Wakefield.
1854.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	3·3	5·6	3·2	2·7	3·2	1·7	1·3	2·1	2·2	2·5	2·3	2·5	3·7	2·8	2·5	2·9	1·7	2·1
February	0·8	1·4	0·8	0·9	1·0	1·0	1·0	0·9	0·8	1·0	0·7	1·4	0·5	0·8	1·5	0·8	1·5	0·8
March	0·4	1·1	0·4	0·1	0·7	0·4	0·4	0·4	0·5	0·4	0·3	0·5	0·7	0·6	0·5	0·5	0·7	0·5
April	0·2	0·6	0·1	0·2	0·0	0·6	0·3	0·8	0·5	1·5	0·5	0·7	0·8	0·5	0·8	0·5	1·0	0·4
May	4·1	3·8	2·7	3·1	3·4	3·3	3·5	3·2	2·7	3·0	2·6	4·8	2·0	2·3	3·7	2·2	0·9	2·2
June	3·3	3·7	2·1	2·0	3·1	1·0	1·0	1·8	0·7	0·4	1·2	0·4	1·0	1·6	1·0	1·0	2·1	3·0
July	1·0	1·7	0·4	0·8	2·3	1·7	1·9	1·5	1·0	1·4	2·1	2·0	1·5	2·6	4·0	2·1	2·8	2·9
August	1·5	1·0	1·2	1·4	1·3	2·9	3·0	1·8	1·6	1·9	1·4	4·8	1·8	1·9	3·1	1·4	2·4	1·6
September	1·3	1·5	1·3	1·3	1·1	0·7	0·6	0·4	0·4	0·8	0·6	0·7	0·6	0·9	1·3	0·9	1·8	0·6
October	7·2	4·8	4·3	4·1	3·3	2·6	2·3	2·3	2·0	2·1	1·6	2·4	1·3	0·8	3·0	0·9	2·3	1·4
November	4·1	2·3	1·9	1·6	1·0	1·4	1·2	1·3	0·9	1·4	1·3	2·7	1·6	1·1	2·3	1·8	3·1	2·5
December	3·0	2·0	1·5	1·9	2·0	1·4	1·5	1·2	1·5	1·6	1·4	3·2	2·1	2·4	3·2	2·4	2·5	2·3
Sum	30·2	29·5	19·9	20·1	22·6	18·7	18·0	17·7	14·8	18·0	16·2	26·1	17·6	18·3	26·9	17·5	22·8	20·3

TABLE II.

The Monthly and Total Fall of Rain, in the year 1855, at the undermentioned places.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Hoikham.	Nottingham.	Liverpool.	Wakefield.
1855.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	1·0	0·7	0·3	0·2	0·3	1·5	0·6	0·3	1·1	0·8	0·3	1·1	0·7	0·2	1·2	0·5	0·5	0·5
February	2·9	3·3	2·6	1·0	1·5	1·0	1·0	1·1	1·1	1·9	1·5	1·9	2·4	1·5	2·8	1·5	1·1	2·3
March	3·0	4·6	1·8	1·8	2·2	2·0	1·5	1·7	1·8	1·6	1·1	1·2	1·5	1·1	1·5	1·1	1·9	1·1
April	0·3	0·6	0·4	0·1	0·4	0·1	0·3	0·4	0·4	0·3	0·5	0·3	0·5	0·7	0·2	1·0	0·4	0·8
May	3·0	4·1	2·7	2·8	2·2	1·8	1·6	1·8	1·5	1·9	1·5	1·3	1·1	1·4	1·2	1·9	1·4	1·6
June	2·8	3·7	0·9	1·3	3·6	0·9	1·3	2·4	1·6	2·0	2·7	2·7	3·0	3·1	2·4	2·4	3·0	2·4
July	4·3	3·1	3·1	2·6	3·5	5·3	5·3	5·1	4·0	5·1	3·2	3·5	4·1	4·8	3·6	4·6	5·2	3·8
August	0·6	2·1	0·7	0·8	2·8	1·4	1·2	1·7	2·1	1·6	1·2	1·4	1·4	1·2	2·1	1·1	2·7	1·9
September	2·6	0·3	2·7	1·1	0·8	2·0	1·0	2·3	1·3	1·3	1·2	0·8	0·3	0·5	0·7	0·7	0·7	0·4
October	6·0	4·5	6·2	5·7	6·0	5·2	5·1	5·6	4·7	5·0	3·9	3·7	5·2	3·4	5·0	4·7	3·9	4·9
November	2·0	1·1	1·0	2·0	0·5	1·5	1·9	1·0	1·1	2·6	2·1	3·3	2·1	0·3	3·2	1·0	0·5	0·9
December	2·0	2·2	1·3	1·3	1·0	1·1	1·1	1·1	0·8	0·9	0·9	1·9	0·8	0·7	2·3	0·8	1·1	0·8
Sum ..	30·5	30·3	23·7	20·7	24·8	23·8	21·9	24·5	21·5	25·0	20·1	23·1	23·1	18·9	26·2	21·3	22·4	21·4

TABLE III.

The Monthly and Total Fall of Rain, for the year 1856, at the undermentioned places.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Hoikham.	Nottingham.	Liverpool.	Wakefield.
1856.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	4·4	3·5	2·9	2·6	3·4	2·3	1·5	2·9	..	2·3	2·1	3·0	3·2	2·5	2·5	2·9	2·9	2·8
February	1·9	2·6	1·1	1·6	1·9	0·9	1·0	1·3	..	0·9	0·9	1·4	1·5	2·0	0·9	1·9	1·2	1·7
March	0·8	1·8	1·1	1·2	1·2	1·2	1·0	0·9	0·5	0·4	0·5	0·5	0·3	1·0	0·4	1·0	0·7	0·6
April	4·0	4·7	3·7	3·5	3·5	2·3	1·9	2·5	2·2	1·4	1·4	1·3	1·7	2·1	1·2	2·4	1·7	2·3
May	3·0	2·6	3·3	3·3	3·1	3·5	3·4	4·3	3·7	2·6	2·3	3·1	2·1	3·4	2·0	3·8	1·5	3·4
June	1·9	2·2	1·5	2·3	1·7	1·6	1·0	2·5	1·8	1·5	1·8	1·0	1·5	1·5	1·0	1·5	1·9	2·6
July	2·8	1·9	1·1	1·8	1·7	0·9	1·4	0·6	1·8	1·2	1·2	2·7	2·0	2·6	2·0	2·6	3·2	2·4
August	2·4	1·9	3·5	3·1	4·7	2·4	3·1	3·2	2·4	2·7	3·6	2·6	3·4	3·9	2·2	4·0	1·8	6·5
September	3·7	2·6	3·8	4·5	5·2	2·8	2·5	3·2	2·0	2·8	2·2	3·6	3·1	3·3	4·3	2·6	3·1	4·1
October	2·6	6·4	3·5	2·4	2·7	1·6	2·0	1·9	1·7	2·2	2·0	2·2	3·0	2·4	1·4	3·8	1·5	2·2
November	1·6	2·2	0·8	1·4	0·7	1·0	1·4	0·7	1·3	2·3	1·3	2·7	1·9	1·6	3·0	1·9	2·0	1·1
December	4·9	4·7	3·1	3·1	2·4	1·3	1·7	1·8	2·0	1·7	1·2	1·3	1·5	1·2	2·3	1·8	1·9	1·7
Sum ..	34·0	37·1	29·4	30·8	32·2	21·8	21·9	25·8	..	22·0	20·5	25·4	25·2	27·5	23·2	30·2	23·4	31·9

TABLE IV.

The Monthly and Annual Fall of Rain, for the year 1857, at the undermentioned places.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1857.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in	in.
January..	5·1	4·8	2·3	1·8	2·7	2·6	2·8	3·1	3·9	3·3	3·0	3·6	4·1	2·8	3·9	3·2	1·8	2·1
February	0·5	1·6	0·3	0·2	1·5	0·2	0·1	0·3	..	0·4	0·2	0·1	0·5	1·1	0·4	0·7	0·7	0·6
March ..	1·6	4·3	2·1	1·5	1·9	0·8	1·0	1·4	1·2	1·4	1·2	0·9	1·8	1·6	1·4	1·9	2·0	2·8
April ..	3·6	4·3	2·0	1·5	2·9	1·4	1·8	2·2	1·5	2·0	1·8	2·5	2·5	2·2	2·2	3·1	2·2	3·5
May ..	1·3	2·1	0·9	1·0	2·1	0·6	1·2	1·2	0·5	1·0	1·6	0·9	0·5	1·3	0·9	1·1	2·2	2·0
June ..	1·8	1·5	1·4	2·1	2·1	2·7	..	2·9	2·2	2·0	1·9	2·6	..	2·4	1·2	3·2	3·8	4·1
July ..	1·3	3·0	4·6	1·0	2·5	1·1	1·8	3·3	1·8	2·9	1·7	0·5	2·2	2·1	2·2	1·7	2·3	1·9
August ..	1·2	2·3	5·3	4·4	4·0	2·6	3·2	2·9	2·7	2·4	3·5	2·4	4·5	5·5	3·0	6·2	3·1	5·1
September	4·5	3·5	4·3	3·0	2·2	3·4	3·2	3·4	3·2	4·0	3·1	4·9	2·1	3·1	2·8	3·0	2·9	1·4
October..	5·7	4·7	5·8	4·4	3·3	4·2	4·2	4·5	4·3	5·7	5·2	2·8	2·5	1·7	3·8	2·3	2·1	1·6
November	3·8	3·1	3·8	2·6	1·7	1·3	1·6	1·6	1·5	2·5	1·5	1·5	1·3	1·0	2·7	1·4	1·5	1·5
December	1·3	1·4	3·9	0·6	1·1	0·5	0·5	0·7	0·4	0·5	0·2	0·4	0·3	0·5	0·4	0·5	1·4	0·4
Sum ..	31·7	36·6	36·7	24·1	28·0	11 months 21·4	21·4	27·5	11 months 23·2	28·1	24·9	23·1	11 months 22·3	25·3	24·9	28·3	26·0	27·0

TABLE V.

The Total Fall of Rain, at the undermentioned places, for the years 1854, 1855, 1856, and 1857, respectively.

Year.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1854	30·2	29·5	19·9	20·1	22·6	18·7	18·0	17·7	14·8	18·0	16·2	26·1	17·6	18·3	26·9	17·5	22·8	20·8
1855	30·5	30·3	23·7	20·7	24·8	23·8	21·9	24·5	21·5	25·0	20·1	23·1	23·1	18·9	26·2	21·3	22·4	21·4
1856	34·0	37·1	29·4	30·8	32·2	21·8	21·9	25·8	..	22·0	20·5	25·4	25·2	27·5	23·2	30·2	23·4	31·9
1857	31·7	36·6	36·7	24·1	28·0	21·4	11 months 21·4	27·5	11 months 23·2	28·1	24·9	23·1	11 mths. 22·3	25·3	24·9	28·3	26·0	27·0

TABLE VI.

Mean Monthly Temperature, at the undermentioned places, for the year 1854; and also the Mean Annual Temperature of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1854.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January ..	43·0	45·0	42·1	40·2	39·0	39·0	40·5	39·2	38·1	38·4	37·9	36·3	37·3	36·7	37·4	37·0	39·1	37·1
February ..	42·7	44·8	43·0	40·2	40·0	39·5	41·1	39·7	38·4	39·5	39·4	39·0	39·2	39·1	38·2	39·2	42·0	39·7
March ..	44·6	47·0	46·1	42·4	43·2	43·8	45·0	43·4	43·0	44·9	44·2	43·5	43·7	44·0	43·4	43·7	45·2	44·2
April ..	48·1	50·7	51·2	48·4	48·6	48·4	51·4	47·9	48·8	49·5	48·8	46·7	46·4	46·8	45·5	46·4	49·1	47·0
May.. ..	50·7	52·3	52·3	50·2	49·6	50·9	52·0	50·3	52·4	51·0	51·7	50·8	50·3	49·1	50·5	50·0	51·5	49·1
June.. ..	53·7	56·0	56·7	55·1	54·0	55·7	55·5	55·6	54·8	55·4	57·1	54·0	55·2	54·5	55·6	55·2	57·0	55·5
July.. ..	58·6	60·6	62·0	60·2	58·9	60·3	61·3	60·3	60·0	60·1	60·3	61·3	58·8	58·1	59·8	59·4	59·3	58·8
August ..	60·5	62·6	62·9	59·6	59·2	60·9	60·4	59·3	59·5	60·5	61·4	60·4	59·1	58·0	59·4	59·4	59·9	58·8
September ..	59·5	61·7	62·0	58·4	58·1	58·1	60·2	57·1	58·0	58·4	57·9	57·2	57·1	56·2	57·0	56·9	59·1	56·8
October ..	53·5	53·9	53·6	50·3	49·0	49·4	50·8	49·3	48·2	49·5	49·1	49·6	48·0	46·8	48·6	47·6	50·2	47·5
November ..	46·5	46·3	44·7	41·7	41·0	40·5	41·6	41·2	39·5	40·3	40·2	40·7	39·7	40·1	40·8	39·7	43·6	40·8
December ..	46·4	47·3	44·9	42·0	42·3	41·3	42·3	41·8	40·1	41·1	40·7	41·0	40·9	40·3	40·2	40·7	44·0	41·2
Sum ..	7·8	28·2	22·5	108·7	102·9	107·8	2·1	105·1	100·8	108·6	108·7	100·5	95·7	89·7	96·4	95·2	0·0	96·5
Mean ..	50·7	52·4	51·9	49·1	48·6	49·0	50·2	48·8	48·4	49·1	49·1	48·4	48·0	47·5	48·0	47·9	50·0	48·0

TABLE VII.

Mean Monthly Temperature, at the undermentioned places, for the year 1855; and also the Mean Annual Temperature of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1855.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	40·1	41·1	38·7	36·5	36·2	34·8	35·7	36·1	34·7	34·1	35·5	32·5	35·7	36·4	35·8	36·1	38·9	36·2
February	36·5	36·8	33·7	30·8	29·3	29·1	30·6	29·2	28·3	28·3	27·8	30·0	27·7	29·1	29·0	28·4	31·9	29·0
March	41·4	43·1	41·1	37·9	37·9	37·9	38·5	38·2	37·6	38·0	37·8	36·2	36·9	36·9	35·7	37·0	38·4	37·3
April	44·5	48·4	47·6	43·8	44·5	45·9	46·3	45·3	45·8	45·6	45·3	44·2	44·3	44·4	42·9	44·9	45·6	45·0
May..	48·8	49·9	49·8	47·9	48·2	49·0	49·2	48·8	48·4	48·4	48·6	48·3	46·8	46·3	46·6	49·6	48·2	47·0
June	53·8	55·2	56·6	55·1	55·1	58·0	57·2	56·3	56·4	56·4	56·6	57·1	55·6	54·6	55·2	56·2	55·5	56·2
July..	59·2	62·5	61·5	59·9	62·0	62·2	63·3	62·7	61·9	62·4	62·5	60·8	60·1	60·8	60·7	61·0	62·3	60·2
August	60·5	62·0	62·8	61·4	60·5	62·4	63·0	61·5	60·7	61·9	61·5	62·2	60·5	60·3	61·3	60·7	61·1	60·5
eptember	57·5	59·5	60·5	58·1	55·8	57·2	58·4	56·8	55·5	57·0	56·2	56·9	56·2	56·3	56·1	56·2	57·4	54·5
October	53·7	53·8	54·6	53·4	50·0	51·2	52·3	50·7	49·5	50·8	50·4	51·2	49·1	49·2	50·3	48·6	50·9	48·1
November	46·1	46·9	44·6	42·1	41·2	41·3	42·3	41·8	40·7	41·1	40·8	43·4	41·2	41·8	42·2	41·1	43·3	41·9
December	43·0	44·6	40·4	37·7	37·6	35·6	37·7	37·2	35·9	36·3	35·8	36·0	35·6	36·3	36·1	35·8	38·7	36·4
Sum.. ..	105·1	3·8	111·9	84·6	78·3	84·6	94·5	74·8	75·4	80·3	78·8	78·8	69·8	62·4	71·9	75·6	91·4	72·3
Mean ..	48·8	50·3	49·3	47·1	46·5	47·1	47·9	46·2	46·3	46·7	46·6	46·6	45·8	45·2	46·0	46·3	47·6	46·0

TABLE VIII.

Mean Monthly Temperature, at the undermentioned places, for the year 1856; and also the Mean Annual Temperature of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1856.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	44·0	45·1	42·6	40·4	40·0	39·4	40·9	39·9	38·9	38·9	38·9	37·9	37·6	38·0	38·2	37·6	40·0	37·2
February	43·5	46·6	43·9	41·4	41·7	42·0	43·0	41·9	41·7	41·6	41·5	40·7	41·5	41·4	40·8	41·5	43·3	41·7
March ..	41·2	44·6	43·1	39·9	39·6	38·7	39·8	37·7	38·9	39·1	39·0	38·8	38·8	39·7	38·3	39·2	41·7	39·5
April ..	46·7	49·1	48·5	44·2	46·0	46·8	47·6	46·3	46·7	47·0	47·0	46·8	46·0	45·5	46·1	46·1	46·0	46·0
May ..	49·3	51·4	51·0	48·6	48·3	49·5	49·4	48·4	49·2	48·9	48·9	47·7	48·2	46·5	48·8	48·5	48·7	48·2
June ..	55·3	57·9	58·7	56·9	56·2	58·5	59·3	57·5	57·5	58·2	58·3	58·2	56·5	55·8	57·7	56·2	54·9	56·5
July ..	58·9	61·4	63·9	59·1	60·0	61·1	61·8	60·6	60·3	60·5	60·9	64·0	58·8	59·7	60·2	53·9	59·2	58·6
August ..	61·6	64·7	66·6	63·5	61·7	63·6	64·3	62·2	63·6	63·3	62·4	63·0	61·7	61·8	62·3	62·4	63·4	60·6
September	56·3	57·9	62·7	56·0	54·0	55·2	56·0	53·7	53·8	55·2	54·8	54·3	53·8	56·3	54·0	54·0	55·6	53·9
October ..	54·9	55·8	56·2	54·0	51·5	51·7	53·1	50·0	50·0	51·3	51·1	51·7	50·5	50·4	52·9	50·8	52·3	50·1
November	47·5	48·1	45·3	42·7	41·9	40·7	42·0	41·3	40·3	41·1	40·6	40·9	40·4	40·7	41·7	40·3	43·5	39·3
December	46·6	46·7	43·9	41·0	41·5	40·2	41·1	40·5	39·4	40·8	39·4	38·9	39·8	39·5	39·6	39·1	42·8	40·2
Sum ..	5·8	29·3	26·4	107·7	102·4	107·4	118·3	100·0	100·3	105·4	102·6	102·9	93·6	95·3	100·6	89·6	111·4	91·8
Mean ..	50·5	52·4	52·2	49·0	48·5	49·0	49·8	48·3	48·4	48·8	48·6	48·6	47·8	47·9	48·4	47·5	49·3	47·7

TABLE IX.

Mean Monthly Temperature, at the undermentioned places, for the year 1857; and also the Mean Annual Temperature of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1857.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	42·5	42·5	40·0	37·6	37·3	36·6	37·9	36·7	35·2	36·6	36·3	35·2	36·2	36·4	37·2	35·9	39·5	36·3
February	41·7	45·2	43·1	40·0	39·5	39·2	40·5	39·0	38·8	39·1	38·9	38·5	38·4	39·6	38·0	39·2	40·9	40·0
March	43·3	45·2	44·7	41·6	41·3	41·8	42·5	41·1	41·2	40·9	41·7	41·0	41·0	41·0	40·7	41·4	41·5	41·1
April	45·9	48·1	47·8	44·0	45·2	45·7	46·3	45·0	45·2	44·8	45·3	44·9	45·3	44·7	44·5	45·5	46·2	44·8
May	51·7	53·5	54·2	51·7	52·9	54·0	54·5	51·7	53·7	53·6	53·3	53·8	51·9	52·7	52·1	52·5	53·2	51·6
June	57·9	60·9	62·1	59·5	60·9	61·8	62·8	60·0	61·1	61·7	61·5	58·2	..	61·7	58·4	60·9	61·3	59·4
July	61·9	63·7	63·8	61·5	61·1	64·5	65·3	61·9	63·0	63·1	63·9	63·4	62·3	62·5	61·9	61·3	61·7	61·5
August	62·6	65·1	66·3	62·8	63·2	65·8	66·3	63·0	63·8	65·6	64·1	64·3	63·2	63·3	63·1	63·2	63·9	63·0
September	60·5	62·0	63·0	60·0	58·4	59·7	60·9	58·1	58·2	59·1	59·0	59·7	58·3	58·3	59·1	58·4	59·0	57·2
October	55·8	56·4	57·4	55·7	52·4	52·9	53·9	51·8	51·7	52·3	52·3	53·2	52·0	53·5	53·6	52·1	53·5	51·5
November	50·9	50·6	50·8	47·3	44·9	45·8	47·0	45·2	45·0	45·8	45·9	47·4	44·6	45·0	47·4	43·9	46·6	43·5
December	48·6	51·2	49·2	48·0	46·7	45·1	46·0	45·0	44·5	44·8	44·6	44·4	44·7	46·0	44·5	44·4	48·3	44·9
Sum ..	23·3	44·9	42·4	9·7	3·3	12·9	23·9	18·5	1·4	7·4	6·8	4·0	7·9	4·7	0·5	18·7	15·8	14·8
Mean ..	51·9	53·7	53·5	50·8	50·3	51·1	52·0	49·9	50·1	50·6	50·6	50·3	48·9	50·4	50·0	49·9	51·3	49·6

TABLE X.

The Mean Temperature of the Air, at the undermentioned places, for the years 1854, 1855, 1856, and 1857, respectively.

Year.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1854	50°·7	52°·4	51°·9	49°·1	48°·6	49°·0	50°·2	48°·8	48°·4	49°·1	49°·1	48°·4	48°·0	47°·5	48°·0	47°·9	50°·0	48°·0
1855	48·8	50·3	49·3	47·1	46·5	47·1	47·9	46·2	46·3	46·7	46·6	46·6	45·8	45·2	46·0	46·3	47·6	46·0
1856	50·5	52·4	52·2	49·0	48·5	49·0	49·8	48·3	48·4	48·8	48·6	48·6	47·8	47·9	48·4	47·5	49·3	47·7
1857	51·9	53·7	53·5	50·8	50·3	51·1	52·0	49·9	50·1	50·6	50·6	50·3	48·9	50·4	50·0	49·9	51·3	49·6

TABLE XI.

Mean Monthly Degree of Humidity of the Air, at the following places, for the year 1854; and also the Mean Annual Degree of Humidity of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1854.																		
January	89	88	88	93	93	92	89	90	91	92	93	..	90	96	92	89	87	91
February	85	83	80	88	85	84	84	80	81	84	82	85	83	81	86	83	85	85
March	87	83	82	88	84	79	81	79	84	79	79	82	80	72	81	80	80	77
April	84	77	75	75	70	78	73	70	68	71	69	77	74	61	79	77	76	69
May	89	81	83	83	80	85	74	81	71	78	80	81	76	76	82	84	78	76
June	93	87	85	83	85	83	78	84	83	76	72	83	76	76	84	81	77	75
July	91	83	82	82	84	78	74	80	78	78	82	74	79	79	79	82	77	80
August	83	80	85	81	83	77	76	78	84	75	77	80	80	75	82	82	80	83
September	87	79	79	76	79	77	78	76	81	71	77	82	75	..	79	83	75	80
October	89	85	89	86	88	85	79	81	88	82	83	81	81	..	81	77	84	83
November	84	83	86	90	86	92	85	77	91	91	89	89	87	90	80	88	87	89
December	83	85	85	87	85	87	83	83	85	86	85	89	74	85	80	86	85	86
Sum ..	1046	994	999	1012	1005	997	954	959	985	963	968	903	955	791	985	992	971	974
Mean ..	87	83	83	84	84	83	80	80	82	80	81	82	80	79	82	83	81	81

TABLE XII.

Mean Monthly Degree of Humidity of the Air, at the following places, for the year 1855; and also the Mean Annual degree of Humidity of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1855.																		
January	86	84	84	88	93	91	92	90	89	91	91	96	88	88	92	89	82	90
February	91	89	83	84	89	91	87	92	85	86	84	86	81	92	91	93	83	91
March	92	88	81	89	88	86	84	85	87	84	82	87	84	83	90	84	82	86
April	88	80	79	80	83	78	89	73	80	74	77	83	73	70	81	71	76	73
May	91	78	86	81	83	80	81	77	81	75	74	75	75	77	76	73	75	75
June	83	85	81	81	84	74	73	83	83	73	78	81	76	74	81	75	85	76
July	89	87	91	91	86	80	79	93	85	77	80	88	84	73	87	75	80	81
August	84	84	90	82	86	76	73	81	89	75	80	83	77	73	82	85	77	79
September	85	80	91	82	88	80	82	80	91	79	82	83	79	72	85	82	79	80
October	83	86	89	87	91	89	86	87	90	84	91	86	84	80	89	85	82	87
November	81	75	87	89	88	92	89	86	88	92	92	76	88	79	89	78	83	87
December	78	86	85	84	87	79	86	86	88	88	88	91	89	91	89	88	85	88
Sum ..	1031	1002	1027	1018	1046	996	1001	1013	1036	978	999	1014	978	952	1032	978	969	993
Mean ..	86	84	86	85	87	83	83	84	86	82	83	84	82	79	86	82	81	83

TABLE XIII.

Mean Monthly degree of Humidity of the Air, at the following places, for the year 1856; and Mean Annual degree of Humidity of the same.

Month.	Guernsey.	Helston.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1856.																		
January	84	92	86	92	90	91	89	87	93	93	92	91	92	88	91	89	92	90
February	78	84	90	84	92	87	88	91	90	88	95	91	87	92	90	80	85	87
March	89	78	76	93	82	82	81	92	87	81	79	77	80	92	80	81	72	77
April	86	85	82	80	84	74	78	81	95	75	80	81	77	83	70	82	82	76
May	86	78	86	83	84	77	80	83	88	81	83	83	78	..	80	79	78	79
June	87	82	83	80	86	79	72	78	80	73	75	81	74	71	78	78	87	75
July	87	84	80	85	82	79	69	65	84	72	76	83	76	66	73	77	78	77
August	84	79	84	82	80	78	76	80	85	72	77	79	77	69	76	76	72	79
September	83	81	71	83	90	75	76	77	82	78	83	84	77	81	85	78	78	82
October	84	88	85	85	89	87	87	89	87	89	93	91	87	93	82	87	84	88
November	80	88	83	81	85	88	86	87	87	90	88	86	87	88	85	87	86	88
December	79	91	82	93	88	90	89	87	84	87	88	86	88	94	88	87	81	81
Sum ..	1003	1010	988	1021	1032	987	971	997	1042	979	1009	1013	980	917	978	981	975	979
Mean ..	84	84	82	85	86	82	81	83	87	82	84	84	82	84	82	82	81	82

TABLE XIV.

Mean Monthly Degree of Humidity of the Air, at the following places, for the year 1857; and also the Mean Annual Degree of Humidity of the same.

Month.	Guernsey.	Heleton.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1857.																		
January	80	88	77	91	89	92	91	93	88	95	93	89	91	96	89	88	85	92
February	86	89	86	93	90	87	88	97	88	87	90	89	88	88	89	87	85	86
March	80	87	84	89	85	84	83	89	89	85	86	85	92	84	88	81	87	84
April	83	87	84	95	85	82	81	88	89	85	84	86	78	85	86	78	78	78
May	82	82	84	87	68	74	77	78	87	70	76	80	76	77	80	73	70	77
June	85	77	80	80	71	72	69	73	80	63	71	74	..	54	83	73	70	69
July	81	80	86	88	80	71	73	72	73	70	69	74	74	68	76	83	73	76
August	78	80	83	80	78	73	78	76	83	71	72	80	78	73	88	80	75	79
September	85	85	86	85	81	86	87	84	84	81	88	88	82	83	93	82	73	84
October	84	86	87	90	89	92	91	87	89	82	91	89	85	89	83	86	83	89
November	79	88	87	87	93	94	92	91	92	93	94	94	91	93	90	89	89	91
December	78	89	87	86	90	90	87	80	86	88	91	89	87	89	88	88	81	87
Sum ..	981	1018	1011	1051	999	997	997	1008	1028	960	1005	1017	922	979	1033	988	949	992
	82	85	84	88	83	83	83	84	86	80	84	85	84	82	86	82	79	83

TABLE XV.

The Mean Degree of Humidity for the years 1854, 1855, 1856, and 1857, respectively, at the undermentioned places.

Year.	Guernsey.	Heleton.	Ventnor.	Worthing.	Clifton.	Greenwich.	Paddington.	Oxford Observatory.	Hartwell.	Royston.	Cardington.	Norwich.	Grantham.	Derby.	Holkham.	Nottingham.	Liverpool.	Wakefield.
1854	87	83	83	84	84	83	80	80	82	80	81	82	80	79	82	83	81	81
1855	86	84	86	85	87	83	83	84	86	82	83	84	82	79	86	82	81	83
1856	84	84	82	85	86	82	81	83	87	82	84	84	82	84	82	82	81	82
1857	82	85	84	88	83	83	83	84	86	80	84	85	84	82	86	82	79	83

No. 14.

The Right Hon. H. Corry to Colonel O'Brien.

Sir, *Admiralty, May* 3, 1858.

With reference to your communication, addressed to the Captain Superintendent of Haslar Hospital, dated the 17th ultimo, containing certain questions with regard to the salubrity of Haslar Hospital, I am commanded by my Lords Commissioners of the Admiralty to transmit to you the answers of the Medical Director-General of the Navy to the queries alluded to.

I am, &c.

(Signed) H. CORRY.

Inclosure in No. 14.

Report of Sir John Liddell on Haslar Hospital.

Questions.	*Answers.*
1. What is the general character of the climate at Haslar?	The climate of Haslar is mild, temperate, and bracing, not unlike other places on the south coast of England; but much drier than Cornwall and Devonshire. The Hospital is founded on a deep bed of gravel, and the site has been hitherto healthy and convenient. The Hospital is nearly insulated, and has a sea constantly in motion on either side. It is rather a windy place, and the whole Hospital is freely fanned by the prevailing south-west wind, which is admitted, by one side of the quadrangle being left open.
2. Do you consider that the purity of the air is affected, to any injurious extent, by emanations from the tracts of mud in the vicinity which are left exposed at low water?	I have never been able to trace the cause of any disease occurring in the Hospital, to the emanations from the exposed mud at low water, and no case of ague has ever, to my knowledge, occurred there, nor has any extension of erysipelas, epidemic hospital gangrene, or infectious fevers, occurred in the Hospital, from the numerous cases of these diseases that are admitted almost daily from the fleet, Royal Marines, and dockyards. The tracks of mud which the Government had been assiduously reclaiming into rich green pastures, is now being covered with new houses, and a dockyard, with drainage into Haslar Lake, which I fear will eventually deteriorate the climate of Haslar, as it has already destroyed the supply of good water.

Questions.	*Answers.*
3. What effect do you think the climate has on the recovery of patients suffering from different kinds of disease?	I consider the climate very healthy, and has no injurious effect in hindering the recovery of patients suffering from different diseases.
4. What is the general number of patients under treatment at Haslar?	The number of patients this day in Haslar (27th April) is 523, which is about the average number in peace.
5. What proportion of that number do you estimate as consisting of bed-ridden patients, as compared with those convalescents who are enabled to move about?	In the medical wards, this day, there are 183 patients who are able to move about, and 66 confined to bed. In the surgical wards there are 110 who move about, and 47 confined to bed. In the asylum 127 who move about, and four confined to bed, which I think is about the usual proportion of cases confined to bed.
6. Do the convalescents dine in the sick wards, or are there dining or day rooms provided for them?	All the patients live entirely, and dine in their own wards. There are no day rooms provided for them.
7. What number of patients are placed in each of the ordinary wards?	Fourteen patients are placed in each ordinary ward. There are two central wards for 40 patients, which are never used but on an emergency, and are considered very inconvenient. There are also smaller wards for special cases of sickness, or for those who have undergone surgical operations, that require seclusion.
8. Do you consider that number the best, or would you be disposed to recommend in the construction of a new Hospital, the provision of wards, calculated for a larger or smaller number?	I consider wards to contain 14 patients a very suitable and convenient size. I would not recommend any change.
9. How many attendants are allotted to each ward? What is the ordinary routine of duty of these attendants, and how are they distributed by day and night?	There are two nurses for each ward of 14 patients. The practice of all our Naval Hospitals, is to allot, on ordinary occasions, one nurse to every seven patients. I would not suggest any alteration in the number of patients and nurses to each ward.
10. Do you consider that the proportion of attendants to patients, as it exists at Haslar, is that which best provides for the careful treatment of the sick, or are you of opinion that in a new Hospital the number of attendants might be diminished without disadvantage, by constructing wards of larger size, so as to allow of each nurse having the charge of a greater number of patients?	As in the preceding query.

Questions.	*Answers.*
11. What number of patients are provided at Haslar Hospital under one roof?	I don't quite understand the meaning of this query about roofs. If it is meant by "under one roof," the whole number of patients that Haslar is calculated to contain, I answer 1,100 or 1,200.
12. Do you think, from your experience at Haslar, or elsewhere, that any inconvenience arises from such a number being under one roof; or that that circumstance has any prejudicial effect in retarding the recovery of patients, or of favouring the spread of contagious disease?	I see no objection to a large number of patients being accommodated in one Hospital, provided the space in the wards and airing ground be not abridged. It facilitates the administration of the Hospital, and necessarily economizes the strength of the staff. I have already stated that, by keeping the wards well ventilated, and never crowding the patients, so as to allow about 1,400 cubic feet of air for respiration to each patient, that erysipelas, &c., originating in the wards of Haslar is unknown.
13. Are you of opinion that any such effects follow from the circumstance of the wards, as at Haslar, opening into one another?	The two adjoining wards at Haslar communicate with each other by a door only, which is closed; but these wards open into lobbies, ample landings, and wide wooden staircases.
14. Do you not find that the circumstance of Haslar Hospital, consisting everywhere of a double row of lofty buildings, divided by a narrow court-yard, prevents the sun from ever reaching that side of the wards which looks into the court-yard, and prevents also the free access of air on that side?	The outer buildings are freely exposed to sunlight, which is frequently an inconvenience in summer, and has to be shut out, and there is no want of free ventilation by the windows, doors, chimneys, and apertures communicating with the external air that exists in the roof of the wards. The courts in the front wing of the Hospital are too close and confined; but I have never found any difficulty in keeping the wards sweet and well aired, or any inconvenience from the sun's rays not playing upon that side of the ward.
15. Do you not consider that disadvantage arises to the patients from such a disposition of the wards?	No.

(Signed) JOHN LIDDELL,
Director-General of the Naval Medical Department.

No. 15.

The Secretary of the Admiralty to Colonel O'Brien.

Sir, *Admiralty, May 25, 1858.*

AGREEABLY with the request contained in your letter of the 19th instant, I am commanded by the Lords Commissioners of the Admiralty to transmit to you a Report by Captain Heath of H.M.S. "Arrogant," respecting the facilities for landing Invalids at the Royal Victoria Hospital.

I am, &c.

(Signed) W. G. ROMAINE.

Inclosure 1 in No. 15.

Captain Heath to Admiral Seymour.

Sir, *H.M.S. "Arrogant," Southampton, May 22, 1858.*

I BEG to acknowledge the receipt of your letter of the 20th instant, with its inclosure, relating to the facilities, or otherwise, of landing invalids at the Victoria Hospital, and I beg to make the following report:—

The rise and fall of tide in Southampton water is 13 feet at spring, and 6 feet at neap tides.

The distance between the high water mark abreast of the Hospital, and the 3-fathom line of low water soundings is about 800 yards.

In order, therefore, to allow of a large steamer discharging sick without the aid of boats, a pier 800 yards in length must be run out, and as the tides are strong, it must have a T head 60 yards long, to which the steamer might secure in a direction parallel to the set of the tides. If such a pier were built of open pile work, the currents would pass freely through, and no mud would silt up, but it would impede the navigation to a considerable extent, and on that account I should not recommend the adoption of this plan.

There is a gravel-hard run out from the north-west end of the Hospital grounds; at this hard the "Arrogant's" boats can land at all times of tide, except for an hour at low water spring tides, which exceptional case occurs but once or twice in a fortnight. By driving piles at the sides of this hard, and supporting the sides with planking (as is done at Hythe on the opposite side of Southampton Water), the surface of the hard might be kept flat like a carriage road, and, if necessary, broad stone or iron tramways might be laid on each side. Flat boats of corrugated iron might then be constructed, having axles passing through, or over the gunwales, with wheels of such diameter that the lower edges should project but three or four inches below the boats' bottom. The sick being placed in these boats, they would be towed to the hard, whence horses would drag the boats to the Hospital without removing the men.

I beg further to report, that the landing from ordinary boats at the existing hard is quite free from difficulty of any sort, and if there should be no objection to lifting the sick on stretchers from the boat to a carriage, it could be easily done with the assistance of a moveable prow or broad gangboard.

There are but a few hours in the twenty-four during which pinnaces cannot approach the hard.

I have, &c.

(Signed) S. G. HEATH, *Captain.*

Inclosure 2 in No. 15.

Captain Heath to Admiral Sir G. F. Seymour.

Sir, *H.M.S. "Arrogant," Southampton, June 19, 1858.*

IN reply to your memorandum of the 17th instant, I beg to state that I have been more than a year at this anchorage, and that there has been no day, during that period, on which communication by boat between the ship and the shore has been interrupted by gales of wind; and I am of opinion that, under all ordinary circumstances of weather, such boats as I have described could be used for landing sick, but that in gales of wind, from whatever quarter, the ordinary shaped boats will be found more convenient.

I have, &c.

(Signed) S. G. HEATH, *Captain.*

No. 16.

Dr. Babington's Report on the Royal Victoria Hospital, Netley.

The report which I have the honour to offer on the site and structure of the Royal Victoria Hospital, at Netley, as respects their eligibility on sanitary grounds, is founded on statistical and meteorological data, to which I shall refer as I proceed—on personal inspection of the Hospital and its neighbourhood, made on two visits and at different states of the tide—and on inquiries on the spot, as well of inhabitants as of medical authorities.

Climate.

The country in the parish of Hound, in which the Hospital is situated, is open, and highly cultivated, and the ground, which is a light gravelly soil, is so absorbent of moisture, that this, as I am informed, is made a matter of complaint among the farmers. From the Bitterne range of hills on the north and north-east, to the crest of which at Bursledon Mill I ascended, being a distance of two miles from the Hospital, and 180 feet above the level of the sea, the land gradually slopes down to the water's edge, and thus affords protection to the building from the winds which blow from those quarters.

The Registrar-General's statement of the number of deaths, and average annual rate of mortality during the five years 1849 to 1853 in the parish of Hound, shows it to be 17·7 in the 1,000, and in the ten years, from 1841 to 1850, 18 in the 1,000. Now, when from the same authority we learn, that the three healthiest districts in England have a mortality of 15 in the thousand, while such towns as Hull, Chatham, Gosport, and Plymouth, have a mortality of 31, 25, 29, and 29 respectively in the 1,000, and that even Richmond in Surrey has 20 in the 1,000, we cannot but come to the conclusion, that the parish of Hound, as tested by its death-rate, is far above the average in point of salubrity. If we examine more in detail the causes of death, we find that there is not a single fatal case of ague or remittent fever in the parish from the year 1853 to 1857 inclusive, and that there is no fatal disease whatever during the whole of that period which can fairly be attributed to any special defect of climate. Whatever injurious consequences, therefore, might theoretically be supposed likely to arise in this district from the extent of silt and mud exposed by the receding of the tide in the Southampton Waters, certain it is, that there is no evidence whatever derivable from the actually recorded causes of death to prove the existence of malaria as influencing human health in the slightest degree.

The chemical report of Dr. R. D. Thomson demonstrates that there is a small proportion of fresh water in the estuary, varying according to the state of the tide, and the degree of proximity to the mouths of the rivers which flow into it; but as he justly remarks, there are no facts in proof that any injurious action arises from the simple mixture of fresh and salt water. It is true that in hot climates—as in the Tigris, a tidal river—near Canton and within the Torrid Zone—on the southern shores of France, within the Mediterranean—on the shore of Tuscany and the Roman coast, where extensive swamps are covered with a mixture of fresh and salt water, and little or no tide exists—agues and remittent fevers are frequent and fatal: but the exemption of the Southampton Water from such injurious effects, probably depends, partly on the coolness of the climate, where decomposition is not so rapid as in lower latitudes, but chiefly on the fact that the silt or mud is constantly washed by the tide with salt water from the Channel, being covered with it sixteen hours out of the four and twenty, so that gaseous emanations are dissolved by it and carried away, and thus, precisely in the same manner as our drains are purified by flushing, is the shore at Netley purified by the flood-tide. In proof that the locality, even on the silt itself, is not unhealthy, I may mention as the result of my own inquiry, that in the Coast-guard vessel, which is stranded on it nearly opposite the Hospital, there dwell constantly seven men with their wives and children, numbering in all twenty-two persons, who declare that they uniformly enjoy excellent

health. The principal official on board stated to me that he had been thirty-six years in the service, of which he had passed the last twelve in this vessel, and that he had not himself suffered the least illness during that period, or witnessed any illness that could be attributed to locality among those who had come and gone in his time. On being questioned whether at any period, but especially during hot weather, a foul odor arose from the silt, or mud surrounding the vessel at low water, he positively affirmed that no such odor was ever perceived. Major Ravenhill, who has been two years resident on the spot, had previously given me similar testimony, with this reservation however, that when, as sometimes happened, a barge was beached for two or three days on this mud, a disagreeable odor was perceptible on her removal. Such a result, I apprehend, would occur under like circumstances on ony part of the coast where marine vegetation exists; for this being killed by the pressure of the barge, and the deprivation of air and light, will of necessity rot in the course of a few days.

This silt is by no means mere mud, although we call it so; it contains a large portion of sand, and even when kept moist in an open jar for a fortnight gives out no offensive smell. On the shore it is covered in patches with growing marine grass, and this, far from contaminating the salt water, rather contributes to its purification. To suppose that there is any similitude between this silt and the offensive mud of the Thames, would be altogether erroneous; and we have it on Dr. Thomson's authority, that there is no trace whatever of sewage in the water at Netley.

There is no direct meteorological evidence on record from which we can positively determine the nature of the climate at Netley; the nearest approximation that we can make, is to avail ourselves of observations taken at Southampton, and to compare them with similar observations made at other places. With this view, I have drawn out a table of the mean temperature, humidity, number of days of rain, and amount of rainfall at Southampton, as compared with about fifty other places in various parts of the kingdom, given in the Appendices to the Registrar-General's Reports for the years 1850, 1851, 1852, 1853, and 1854.

TABLE of the Mean Temperature, Humidity, Days of Rain, and Rainfall of Southampton, and of the proportion of Excess and Defect at Southampton as compared with about fifty places in Great Britain, taken from the appendices to the Registrar-General's Reports for 1850, 1851, 1852, 1853, 1854.

		At Southampton.	Proportion as compared with the other places given in the Registrar-General's Report.	
			More than at Southampton.	Less than at Southampton.
1850.	Mean temperature of air	49·8	as 22 higher	to 122 lower.
,,	Humidity	·840	as 56 moister	to 40 drier.
,,	Days of rain	128	as 112 more	to 20 less.
,,	Rainfall	32·4	as 23 more	to 114 less.
1851.	Mean temperature of air	49·3	as 39 higher	to 126 lower.
,,	Humidity	·829	as 91 moister	to 66 drier.
,,	Days of rain	141	as 113 more	to 37 less.
,,	Rainfall	24·10	as 81 more	to 78 less.
1852.	Mean temperature of air..	50·3	as 32 higher	to 137 lower.
,,	Humidity	·834	as 78 moister	to 85 drier.
,,	Days of rain	165	as 113 more	to 32 less.
,,	Rainfall	49·7	as 25 more	to 141 less.
1853.	Mean temperature of air..	48·6	as 36 higher	to 145 lower.
,,	Humidity	·841	as 97 moister	to 77 drier.
,,	Days of rain	146	as 131 more	to 33 less.
,,	Rainfall	28·9	as 77 more	to 98 less.
1854.	Mean temperature of air	50·2	as 44 higher	to 138 lower.
,,	Humidity	·820	as 75 moister	to 101 drier.
,,	Days of rain	..	..	..
,,	Rainfall	..	..	..
Mean of Five Years.	Mean temperature of air..	49·6	as 35 more	to 134 less.
,,	Humidity	·833	as 79 moister	to 92 drier.
,,	Days of rain	145	as 117 more	to 122 less.
,,	Rainfall	34·	as 51 more	to 108 less.

The general results then are, taking the mean of the five years, as follow:—The mean temperature of the air at Southampton is 49·6, one-fourth of the other places have a higher and three-fourths a lower temperature; the mean humidity at Southampton is ·833, and the proportion is about eight moister to nine drier, showing a medium degree of humidity; the number of days on which rain fell at Southampton was 145 annually, and in this respect too it holds a medium rank, the proportion being about eleven places where there were more days of rain to twelve where there were fewer; the mean rainfall at Southampton was 34 inches, and the proportion was as one where more rain fell to two where less fell. Of Southampton, therefore, we may say that it is a somewhat, but not very warm place; that it has an average degree of humidity and of rainy days, and that the quantity of rainfall is rather abundant. It is remarkable, however, that in the three following years, namely, 1855, 1856, and 1857, according to the meteorological observations of Colonel James,* taken at the Ordnance Survey Office, at Southampton, the mean temperature was higher, while the humidity and rainfall were lower than in the previous years, being ·53 temperature, 738 humidity, and 29·54 inches rainfall respectively. According to the same observer winds from the north, north-east, east, and south-east prevailed for 163 days; while winds from the south, south-west, west, and north-west prevailed 175 days, the remaining twenty-seven days being calm. Finally, the number of days on which rain fell was 145, being only one less than the average of the previous five years.

We must distinctly bear in recollection, however, that the above observations apply to Southampton and not to Netley, and that, as Southampton is built upon a projecting peninsula, with water on the east, west, and south sides, this position *may* increase its rainfall, and, in all probability, *will* increase its humidity, as compared with Netley, which is situated on a higher level, and with water only on one side. Nor can it be inferred, because it is only three miles distant, that a great difference may not occur between Southampton and Netley, for, on examining the Registrar-General's tables, a considerable difference is often found between the observations taken at places near each other —for instance, at Whitbread's Brewery, Chiswell Street, city of London, during the June quarter for 1851, there fell 1·34 inches of rain, while at St. John's Wood there fell 3·41 inches, and for the December quarter of the same year the humidity at Chiswell Street was ·794, while at St. John's Wood it was ·908.

With Dr. Joseph Bullar, at Southampton, Mr. Francis Cooper, the Officer of Health for that place, and Dr. Orsborn, of Bitterne, I was requested to hold communication; and to each of those gentlemen I therefore wrote to request answers to the following questions:—

Questions.

"1. Is there anything in print obtainable on the subject of the health and prevalent diseases among the population of Southampton and its neighbourhood?

"2. Are there any meteorological observations on record, or is there any notice to be found of the degree of humidity of this district as compared with others?

"3. Is the general health of the population ever sensibly affected by this humidity, as is the case when the sirocco wind blows at Naples, or as is instanced in the relaxing effects of the climate of Torquay?

"4. Are intermittents rare or frequent, and at what seasons and of what type most prevalent?

"5. Is continued fever common in the villages and country farm houses, whether of a bilious, typhus or typhoid type?

* We must not forget that we cannot come at strictly accurate conclusions by comparing the mean results of Colonel James' Tables, founded on observations made daily at 9·30 A.M., and 3·30 P.M., with those of the previous years published by the Registrar-General, respecting which it is not stated how the mean of each day is deduced. If, as is probable, four observations were made—two by night and two by day—or if a mean between the maximum and minimum temperature of each twenty-four hours was taken as the basis of the calculations, it is obvious that the diurnal mean would be lower than that deduced from observations made only in the forenoon and afternoon of each day. The same remarks will apply to the average results in the two cases with respect to humidity.

"6. Does the climate of Netley differ, in your opinion, from that of Southampton?

"7. Is there any evidence of malaria in the neighbourhood of Netley?

"8. Do surgical operations on the whole do well about Southampton, and in the unions and infirmary?

"9. Is acute rheumatism frequent or unfrequent?

"10. Are pneumonia, pleurisy, and inflammations in general frequent or unfrequent?

"11. Is scrofula common?"

To these questions I received the following answers:—

From Dr. Bullar.

"1. Mr. Francis Cooper, Officer of Health, Gloucester Square, Southampton, has published some pamphlets on this subject, and perhaps it would be better for you to communicate directly with Mr. Cooper on this head. If you wished it, when you are here, you could examine the parochial returns of disease kept by one of the parish surgeons for the last seven years.

"Dr. Drew has published a report of the climate of Southampton in the 'Report of the British Association for the Advancement of Science for 1851,' in which are tables of comparison of days of rain, &c., of Southampton, Falmouth, Stone, and York. There is a continuation of this Report in the volume for 1854, an abstract of which will be found at page 29 of the 'Transactions of Sections.' These tables have not been printed, but are, I presume, in the possession of the Society. The comparative degree of humidity is expressly alluded to at page 29, volume for 1854.

"3. No.

"4. I have never known a case of indigenous ague at Southampton, and this is the general medical experience.

"5. Fever is not common here or in the neighbourhood. Mild continued fever, with rose spots (typhoid), is the fever which I have seen, and not requiring or bearing much stimulus.

"6. Netley is, from its situation, more bracing than Southampton. The district is a decidedly healthy one, and rather remarkable for the longevity of its inhabitants.

"7. No.

"8. Yes.

"9. Unfrequent.

"10. Acute inflammations are not common here. The lancet is very rarely indeed used. Amongst the children of the poor there is of course pneumonia and bronchitis which is often fatal. Croup is singularly rare.

"11. Scrofulous complaints are common here as elsewhere."

From Mr. Francis Cooper.

"1. I am not aware of any publication touching the diseases of this neighbourhood. I have published several pamphlets, but they are serial productions of a sanitary nature. I can answer your queries, however, explicitly.

"2. The mean height of the thermometer for the last three years, as observed at the Ordnance Map Office is 51·7; the mean height of the barometer for the same period is 29·979; the temperature, as computed by the dry and wet bulb thermometers, is 44·1; *mean humidity*, 0·768, 1,000 being the point of saturation. Mean annual amount of rainfall, 28½ inches.

"3. The humidity is not more than ordinary, and the health of the population cannot therefore be at all affected by it.

"4. Intermittents are unknown in Southampton.

"5. The prevailing type of fever is simple continued, sometimes, though rarely, aggravated by bilious vomiting; sometimes it runs into a mild typhoid character, but generally our local diseases are mild, and of the asthenic type.

"6. The climate of Netley is very pure, as instanced by the low rate of mortality, being only 1·54 per cent., or 15·40 per 1,000. It is as mild but more bracing than Southampton.

"7. There is *no evidence* of malaria at Netley.

"8. In private practice operations do well. I believe the Infirmary had a few cases of erysipelas after amputation, but since *ventilation* has been carried out, and the wards have had fewer patients in them, nothing of the kind has been seen.

"9. Acute rheumatism is rare, but mild rheumatism is of average occurrence.

"10. Pneumonia and pleuritis are not frequent; they are occasionally seen.

"11. Scrofula is not frequent; I should say very rare. Of course, scrofula is seen, but it appears generally in localities where filth and poverty abound. On the whole, however, it is rare. The geology of Netley is very favourable to health, the soil being porous in a high degree, and therefore dry. The whole strip of land from Bitterne to Netley, a distance of six miles, is *gravel*, *sand*, and light vegetable mould, with an underlying stratum of brick earth, which is composed of clay and sand intermixed in nearly equal proportions. It is the best form of the *tertiary* for building purposes, and from its sloping character, from the highest point of the Bitterne Hills, 180 feet above the level of the sea, to the Hospital site of Netley, it affords the most perfect facilities of natural drainage. I have no doubt in my own mind of the salubrity of the whole district and of its admirable adaptation for a Hospital.

"The *mud*, as it is called, which forms the bed of the estuary, is composed of alluvium, clay, carbonate of lime, and sand—sand forming 90 per cent. *at least* of the whole. There is no trace of animal matter. Marine deposit and fuci are found—the first in abundance; but they are rather a means of health than otherwise.

"The prevailing winds are south-west by south and north, with the easterly monsoons, the wind from the east being more or less of that (monsoon) nature."

From Dr. Orsborn.

"1. Nothing that I am aware of.

"2. Meteorological observations are made, and carefully recorded, at the Ordnance Map Office, Southampton; there are also similar observations, with remarks on the climate of Southampton, by Dr. Drew, in the Reports of the British Association for the years 1851-54. Some useful comparative tables, comprising observations made at seventeen different localities in England, have been published for the years 1856-57, by Mr. Henry Allnutt, 49a, Lincoln's Inn Fields. In Dr. Drew's tables the degree of humidity is clearly placed too high, as it is not borne out at all by the very careful records of the Ordnance Map Office. Mr. Allnutt's tables are very useful compilations, and afford at a glance a comparative view of the barometric, thermometic, and hygrometric conditions of the several localities in which the observations have been made, and Southampton will be found to occupy a very favourable position when contrasted with other places. It must, however, never be lost sight of that in taking Southampton as a standard whereby to judge the climate of Netley, we are accepting conditions far less favourable as regards salubrity than are those of the rural district in which the new Hospital is situated.

"3. The climate of this district is decidedly mild and dry, and has none of the relaxing qualities of that of Torquay and other parts of Devon. Its effects will of course vary on new comers, according to the climatic conditions of the localities in which they may have been previously residing. My experience justifies me in asserting that the general health of the population is never sensibly affected by the degree of humidity appertaining to the atmosphere of this locality; in fact a less degree of this would probably be less salutary.

"4. Intermittents are exceedingly rare, so rare that they are scarcely ever seen amongst the residents of this district. During a practice of nearly twenty years I have seen scarcely any cases of ague amongst the native population, and very few imported cases. The few cases that I have seen have been of the tertian type, with an occasional quotidian; but it would be difficult I imagine to find a district more exempt from malarious diseases. The assertions to the contrary on this point have evidently been hazarded upon crude theoretical opinions, and cannot be substantiated by a single fact.

"5. Continued fever is not common. Cases occasionally occur in spring and autumn amongst the poorer classes; but they can generally be traced to the operation of local causes within, or in close proximity to, their dwellings. It is usually of a mild form, but sometimes it assumes a typhoid character. I have never seen a case of genuine typhus in the neighbourhood. I have carefully examined the registers of deaths in reference to this point, and I find that from the year 1837 to the year 1849 fever, was registered as the cause of death in *eight* cases, in the whole district, including the parishes of St. Mary Extra, Hound (in which is situated the Hospital), Hamble, and Bursledon, whose united population was in 1841 2,716, and in 1851 3,166, the total number of deaths registered during the period above stated having been 500. From the year 1849 to 1857 there were registered 446 deaths, and of these 14 were from fever, so that *during a period of twenty years there have died in a district embracing four parishes twenty-two cases of fever.*

"6. The climate of Netley must certainly be regarded as differing from that of Southampton, the latter place being unquestionably more relaxing than is the more elevated country on the south-east side of the river Itchen. Whether this is due to natural *local* causes only, or to the combined influence of these and the *artificial* characteristics imparted to the climates of thickly populated towns, may admit of question, but still the general fact is placed beyond dispute. Any arguments therefore that may be drawn from meteorological or other observations, in favour of the salubrity of Southampton, would necessarily apply *à fortiori* to Netley.

"7. There is no evidence of the existence of malaria any where in the neighbourhood of Netley, but on the contrary there are incontrovertible proofs of the absence of malarious diseases.

"8. Surgical operations are certainly attended with at least average success, and in those that have been unsuccessful I have never seen or heard that there has been any reason to attribute this to any endemic causes. I have, within a recent period, performed myself four operations in the immediate vicinity of the Hospital, viz., one of lithotomy on a child, complete recovery in a fortnight; two amputations, one arm and one leg (the latter a bad subject); both of the patients did well, and recovered without an untoward symptom in the usual time; the other operation was very severe and protracted, as it was undertaken for the removal of necrosed bone from the popliteal space (femur), a condition which would formerly have been remedied by amputation. This patient is now quite well and pursuing with a stiff knee his avocation as bricklayer. I have never yet lost a patient after an operation in this neighbourhood.

"9. Acute rheumatism is very unfrequent; two or three cases sometimes occur in the course of a year, but not of every year.

"10. Pneumonia, pleurisy, and acute inflammations in general are decidedly rare, unusually so, I should say. It is a common observation of the medical practitioners in this part of the country, that they are very rarely called upon to perform venesection.

"11. Scrofulous diseases are by no means common. We see occasionally struma amongst the children of the poor, as the result of poverty, overcrowding, neglect, and other adverse circumstances; but a walk through any of the villages would be sufficient to convince any one that scrofula is the exception and not the rule.

"In conclusion I would add, as the result of my observation and experience, that, taking into consideration all the requisite conditions appertaining to the site of a Military Hospital, a more eligible locality cannot be found in England, and that so far from there being sufficient grounds for discontinuing the building on the score of the insalubrity of its site, there are endless arguments to prove that it has been wisely selected, and that for beauty of situation, facility of access, capabilities of ventilation, and favourable antecedent medical history, it cannot be surpassed."

The opinion to which I have come, founded on all the above sources of information, is, that the climate of Netley is mild, moderately bracing, and as favourable for the generality of those cases which the Royal Victoria Hospital is intended to receive as any to be met with on the southern coast of England,

being neither so relaxing as that of the coast towns in Devonshire and Cornwall, nor so sharp and cold as that of the Isle of Thanet. To persons from warmer regions, where they have lost their health by tropical diseases, such a happy medium seems well calculated to restore their powers; and it is highly satisfactory to find that, according to Sir John Liddell's report on Haslar Hospital, the locality of which cannot materially differ in climate from that of Netley, its salubrity is perfect. Ague is unknown in its neighbourhood, and hospital gangrene and erysipelas never spread in its wards. When we bear in mind that Haslar Hospital is on a level with, and close to a shore, consisting equally with that of Netley, of mud or silt, while the latter Hospital is forty feet above high water mark, and 200 yards inland, we cannot refuse our belief, even on this ground alone, that it will prove at least equally healthy. In short, I regard Sir John Liddell's report, of what *has* been found from actual experience in point of climate at Haslar, as furnishing the strongest reason which can be adduced for inferring what *will* be found from actual experience at Netley.

Site.

The Hospital is built on the north-eastern shore of the Southampton Water, in the parish of Hound, already described, being about three miles nearer the mouth of the estuary than the town of Southampton. The structure runs parallel with the beach, at a distance of 200 yards inland, on a slope, which rises about one foot in fifteen, so that the ground floor is 40 feet above high-water mark. It rests upon a plateau bounded on the north-west, and distant about 500 yards from the extremity of the right wing, by a low peaty swamp, which, at high tides, is overflowed, but at other times discharges its water by a rivulet coursing down its centre into the estuary. A somewhat similar piece of swampy ground, which, however, the tide does not reach, bounds the plateau on the south-eastern side. Neither of these low lands, consisting as they do of only a few acres each, is likely to influence the climate of the more elevated grounds. But it would be desirable, in order to avoid all risk of such an influence, that they should be either properly drained or filled up; and, I understand, that the accomplishment of either of these objects presents no engineering difficulties, and that one or other of them is, in fact, contemplated.

The surface of the land under the Hospital is, for the most part, a silicious gravel, but towards the south-east end, where the ground was higher, and it therefore became necessary to dig deeper for the foundations, an argillaceous sand or brick earth has been come upon, so that, upon this, the structure in that direction, and especially the back buildings, rests.

This brick earth has been erroneously called clay, but, in conversation with the foreman of the brickmakers on the spot, I found that, for making the bricks employed in the building, many millions of which have been, and continue to be, used, no further preparation of the material, as it comes out of the earth, is needed, than that of mixing it with water and passing it through a pug mill, and those who understand brickmaking know well, that it must, therefore, contain a large proportion of sand. A sample of this brick earth, which I brought from the spot, I found to consist of no less than 85 per cent. of sand, and, being desirous to ascertain its degree of porosity as compared with that of pure clay, I made two exactly similar cups, the one of this brick earth, the other of pure clay, when, filling each with an equal quantity of water, in the former, it filtered through in a quarter of an hour, while, in the latter, it was permanently retained, until, without filtering through at all, it was carried off by evaporation. In further proof of the porous quality of the soil at Netley, I may mention, that my second visit to that place was made the day following one of heavy and continued rain, and yet the ground throughout the neighbourhood showed scarcely any traces of moisture.

The strata under this brick earth are enumerated in Major Ravenhill's report, from which it appears that pure clay is not found, nor any less porous soil than the brick earth, until a depth is attained of 56 feet, which, under any circumstances, would be far too deep to occasion dampness on the surface; but if there were any doubt on this point it would be removed by the fact, stated by Professor Phillips, in his Geological Report, that all the strata have an inclination towards the estuary, and, consequently, granting the impermeability of

the clay at 56 feet, any water which was arrested by it would drain down its surface in that direction.

From these data I am led to the conclusion, that the locality selected for the Hospital is naturally well drained, and that its site is wholly unobjectionable.

Structure.

Before I proceed to offer any remarks on the structure of the Hospital, I would observe that I have been instructed to bear in mind that it is intended for a class of patients of whom only about 15 per cent. will be confined to bed, and who will generally be suffering from chronic diseases, a large portion of which will be either thoracic or rheumatic. This consideration has greater weight in application to the *climate* and *site* of the Hospital than to its structure; for whatever be the class of patients received, they must all be warded and in their beds for eight hours out of the twenty-four, and to provide the three great requisites of due space, ventilation, and temperature during that period implies capability of provision for them at all times. In short, if the Hospital be unfit for acute cases, it is equally unfit for those which are chronic; nay, we may go further, and say that, if it be not adapted for the reception of the sick, it can scarcely be very eligible even for the healthy, for whom, during the hours of rest, it is equally important to supply the three great requisites above-mentioned.

The Hospital consists of a central building and two wings, behind the latter of which are dining rooms and kitchens surrounded by ranges of offices.

On the central portion of the structure, containing accommodation for the officers and servants of the establishment, the dispensing department, store-rooms, committee room, chapel, &c., I have no observations to make.

The wards for patients occupy the three stories in the wings, and with the exception of those at each end, all open upon a corridor. The following table, applicable to one wing, contains an exact detail of the number of wards and of the beds in each; and the two wings are alike, with the exception that in one of them, called the surgical wing, two apartments are appropriated, the one to a library, the other to an operating theatre. These in the so-called medical wing, are wards for 12 and 14 beds respectively; so that there are 26 more beds on that side than the other.

	No. of Beds.	No. of Wards.	Total No. of Beds.
Ground Floor	14	1	14
Ditto	12	2	24
Ditto	9	9	81
First Floor	14	2	28
Ditto	12	2	24
Ditto	9	12	108
Second Floor	14	1	14
Ditto	12	2	24
Ditto	9	12	108
Surgical	2	4	8
Back Buildings	8	4	32
Orderlies' Rooms	8	2	16
18 Small Wards for two Orderlies ..	2	18	36
	..	..	517

The main feature of the Hospital, and that which has given rise to so much difference of opinion regarding the eligibility of its plan, is the lengthened corridor on each floor, with the 9-bed wards which open into it. Each of these wards has a large window nearly down to the floor, and nearly up to the ceiling, opening at the north-eastern end to the external air, and having an area of 106 square feet, out of 360, the area of the whole end of the ward. At the south-west or corridor end of the ward, the area of which is altogether 360 square feet, the central door of entrance with the windows on each side of it, has

an area of 132 square feet. The space per bed in these 9-bed wards is 1,400 cubic feet, as they are 35 feet long, 24 feet wide, and 15 feet high. The beds are placed at the two sides of the wards, and the patients, consequently, face a wall, and are not opposite the light of a window, as is the case where wards have windows on each side. The corridor, into which the wards open, runs the whole length of the wing, and is 12 feet wide. Its south-west wall, which forms the face of the wing itself, consists wholly of windows and their piers of support. Its area, including the window space, is 3,072 square feet, while the area of the window space itself is 2,208 square feet, or nearly two-thirds of the whole, so that, when these windows are open, the corridor may be regarded as a kind of verandah or cloister, nearly in the same condition with respect to temperature and atmosphere as the external air. Objections have been made to a Hospital thus constructed, on the following grounds:—First, that the ventilation through windows at each end cannot be so perfect as the cross ventilation through side windows; secondly, that the air passes over all the beds, and may convey effluvia from one to another; thirdly, that at one end the windows opening into a corridor, the foul air of one ward may, through it, be conveyed to another; and, fourthly, that the light is defective, and that sunlight, which ought to fall on every bed, falls on few, if any.

To the first objection, I would reply, that though it may be easier to supply fresh air by lateral windows in a single block building, provided they can be kept open, it is more difficult to keep up the requisite degree of warmth, a great expanse of single walls and windows, exposed on both sides to the open air, being readily cooled; and, secondly, that there is no practical difficulty in establishing an effective ventilation from end to end in wards which, as at Netley, are but a few feet longer than the breadth of wards on the single block plan. That the current of air should pass over five beds can hardly be considered as practically objectionable, provided the supply be abundant. On the single block system it, strictly speaking, passes over none, for the beds are placed between the windows, and if from the circumstance that the wards are colder, which they certainly are, it becomes necessary more frequently to shut the windows for the sake of warmth, the advantages of the two plans are balanced. The windows of the corridor at Netley are so wide, and so numerous, that the wards may be regarded as communicating with the air, so far as the purity and abundance of its supply is concerned; but the corridor will, in my opinion, be found highly useful, in preventing the direct rays and heat of the afternoon sun from penetrating to the wards, and that the foul air of one ward will affect another, through the medium of the corridor, is a groundless apprehension, for as the air of the wards will always be more rarified than that of the corridor, its current will always set in a direction towards the ward, and never from it. Much stress has been laid on the necessity of having abundant light in the wards of a Hospital, and it cannot be denied that as much as is sufficient to impart a sense of cheerfulness, to enable the nurses and orderlies to do their duty efficiently, and those patients who are well enough to use books and writing materials, is desirable, and even requisite. Light, to at least this extent, will be supplied in the Netley wards; but that the direct rays of the sun should reach all the beds, seems to me quite needless. According to the universal feeling of mankind, repose is sought in obscurity, and we instintively darken our bedrooms when we wish to invite sleep. With the sick, sleep is so especially needful for restoring strength, that patients ought to be placed under conditions which would rather invoke than drive it away. Numerous are the cases in which light not only banishes sleep, but acts as a direct stimulant to the brain, and in the sick chambers of private patients medical men generally enjoin that the bed should be placed in any other position rather than opposite a window.

The ventilation of the nine-bed wards at Netley it is proposed to effect partly by the windows and chimney, and partly by tubes that pierce the outer wall of the corridor, and passing horizontally under its floor, as well as that of the ward, terminate in vertical hollow columns 6 or 7 feet high which rise up in the middle of the floor. At night, when the windows and doors are shut, this will be the only source by which fresh air will be introduced into the wards. Such ventilating hollow columns are a novelty, and may answer their purpose well. Nevertheless it is a new experiment and at all events the columns must be somewhat in the way in the centre of the floor. Would it not be better if the supply of fresh air from without were introduced in the usual way through perforated

zinc apertures in the skirting boards of the wards? The foul air is to be removed by a vertical shaft in each ward, communicating with large horizontal tunnels at the top of the building. This machinery, though somewhat complicated, seems likely to effect the object in view, more especially if some source of heat be employed, as I believe is intended, at the top of the main tunnels, to rarefy the air, and thus compel an upward draft.

On the question of ventilation, however, Mr. Ranger has some propositions to make, of which he has only stated the outline, but which he will no doubt fully explain in his own report. I am decidedly of opinion, that the present means at command for keeping up, by one fireplace alone, the requisite degree of warmth in the wards during the winter are inadequate. Patients with chest affections and rheumatism require a temperature of at least 60° Fahrenheit, and a single fireplace, without additional means of warming a ward of such size, will not produce a temperature within fifteen degrees of that point. Either a second fireplace, or hot water circulating in pipes round the ward, which might be connected with a boiler heated by the single one now intended, will in my belief be required; but this subject has also been made matter of study by Mr. Ranger, and he will best explain his own views and proposals upon it.

The small size of the wards at Netley has by some been thought objectionable. I do not share that opinion; in a Hospital for acute diseases, where a large proportion of the patients are confined to bed, a more numerous staff of attendants might be required in proportion as the wards themselves were more numerous. Each ward would probably need a separate day and night nurse, whether they contained nine patients or twice that number, but where only 15 per cent. of the patients are confined to the ward in the day time, the services of many of the rest are available for hospital work.

If there were any intention of making the Hospital at Netley the seat of a Medical School, it would be absolutely necessary to increase the size of the wards, since a number of students following a medical or surgical officer on his rounds would greatly inconvenience the patients in a small ward, and be unable themselves from want of space to pursue their professional inquiries.

In all other respects small wards are preferable; they admit more easily of a classification of cases; the wants of the patients are more readily made known; there is a sense of greater comfort; and, as in proportion to the size of a ward is the chance that some one patient raving in delirium or groaning with pain will disturb the rest, so a small ward is on the whole more quiet and orderly.

In the larger wards for sixteen beds it will be necessary to have two fireplaces, but their ventilation otherwise seems satisfactory and needs no comment.

The advantages of a corridor, as a place of exercise in bad weather, will be very great in a Hospital, which partakes so much of the character of a sanatorium, and under ordinary circumstances it should be open from end to end; but it would be advisable to have the power of separating it into compartments by placing iron double doors across it at intervals, for otherwise in the event of a fire the flames would run along it as through a tunnel, and spread through the whole wing with great rapidity. As a further precaution against fire the corridor should have a stone floor.

With the position of the lavatories and baths, and their mode of ventilation, in which it appears alterations to meet objections have already been made, as well as with the ventilation of the water-closets, improved as they will be by a suggestion which Mr. Ranger has to propose, I am well satisfied; and I see no great objection to the small rooms with borrowed light, attached to each ward, provided that they be appropriated only as depositories for linen and other stores in daily use, and never as sleeping apartments for orderlies. Mr. Ranger includes these rooms in his proposed alterations, and certainly, inasmuch as they are dark and close, it would be a gain if they were cut off from the ward altogether.

The walls of the wards are, as I understand, to be coated with some hard cement, which, if limewashed, looks unfinished, while paint is unwholesome. I submit, therefore, that it would be preferable to cover them to a height of 7 or 8 feet with glazed tiles, either white, or if this be thought too dazzling to the eyes, of some appropriate hue. These would be neat and durable, and might be cleansed by simple washing with soap and water.

I have no further remarks to offer on the structure of the Hospital, but I wish to call attention to what I consider an important defect in the position of the out-buildings. These, by a reference to the lithographed ground plan of the north-east wing, will be found to close in the wings at the back, forming with those wings, respectively, a parallelogram, in the centre of which are the dining rooms and kitchens. They thus impede the current of air which should pass through the wards on the north-east side, especially those on the ground and first floor. They also form in the rear of the Hospital enclosed spaces, where patients will be tempted to take exercise in air more or less impure and stagnant. To obviate this, by no means unimportant defect in structure, I would suggest that the long side of the parallelogram formed by these back buildings should be divided, and that each half should be removed from its present position and added on as a continuation of the short sides. A reference to the lithographed ground plan of the south-east wing of the Hospital, with which I have been furnished, will render my proposal intelligible, when I state that I would move all that range of buildings, the divisions in which are now marked *dead-house*, *post-mortem room*, *dirty clothes' store*, and *coal store*, and add it on at right angles to its present position as a continuation to the range of buildings, the divisions of which are marked *orderly's room*, *ablution room*, *wash-house*, *latrines* and *urinals*, and *dust*. One-half of the range of back buildings being thus placed on the one side, the other half should be similarly placed on the other, and it will be at once perceived that, instead of an enclosed space, an opening will exist in the rear of the wing, through which a free current of air will reach the north-eastern side of the wards. This alteration would render it necessary to cut away the cliff at the back of the premises to a greater extent, and it would be desirable to remove it altogether by substituting for it a gentle slope from the building to the upper land in the rear. A less extensive alteration, but one which might yet be thought sufficient to answer the purpose, would be merely to pull down the dead-house, post-mortem room, and dirty clothes' store, on the one side, and the two wards corresponding with these buildings on the other.

The Hospital is supplied from a well, 188 feet deep, with pure water, to the extent at least of 50,000 gallons in the 24 hours, which is amply sufficient for the wants of the whole establishment, so that the water in the reservoir is almost superfluous, and may be all employed in flushing the drains.

To sum up in few words, I approve of the climate of Netley as being well adapted to the class of cases for which the Hospital is intended. I approve also of the site, and attach no importance, as affecting its salubrity, to its being on the shore of the Southampton estuary, considering as I do that proof is entirely wanting that this shore exercises any prejudicial influence on human health. With the general plan of the Hospital I am likewise well satisfied, but I believe that some alterations will be needed to ensure a proper degree of warmth in the winter; that some provision must be made to guard against fire; and that the ventilation of the wings on the north-east side is susceptible of improvement by an alteration in the position of the out-buildings.

B. G. BABINGTON, M.D., F.R.S.

No. 17.

Dr. Milroy's Report on the Royal Victoria Hospital, Netley.

Sir, *London, June* 1, 1858.

In compliance with the request in Colonel O'Brien's letter of the 22nd April, that I would favour the Committee, of which he is President, with my opinion of the comparative advantages and disadvantages, in a medical point of view, of the site selected for the erection of the Royal Victoria Hospital, at Netley, I have the honour to communicate the following Report founded on several inspections of the ground and surrounding district, and also of both shores of Southampton Water, on personal inquiries among the resident medical men and other persons competent to give information, and on the careful examination of the various documents sent to me by the Committee.

These documents are as follow:—

"Report to Lord Panmure on, and Details of the Plans of the Victoria Military Hospital, May 15, 1856."

"Returns respecting Netley Hospital, ordered by the House of Commons, July 13, 1857."

"Report to Lord Panmure, marked 'Confidential,' on the Victoria Hospital, Netley, March 12, 1858."

"Report of Sir John Liddell on Haslar Hospital, May 3, 1858."

"Report of Major Ravenhill, R.E., on the site of Netley Hospital, April 23, 1858."

"Letter of Deputy Inspector-General Taylor to Dr. Smith, respecting the proportions of different classes of Diseases amongst Invalids arriving at the Depôt, Fort Pitt, April 14, 1858."

"Report by Professor Phillips on the Geology of the site of the Victoria Hospital, and of the surrounding district, May 11, 1858."

"Ordnance Meteorological Returns for Southampton in the years 1855-6, 1856-7, and 1857-8, by Colonel James, R.E., May 31, 1858."

"Mortality Returns of the Parishes of Hound and Hamble-le-Rice, during the five years 1853 to 1857, communicated by the Registrar-General, May 20, 1858."

"Report by Professor Dundas Thomson on the site of Netley Hospital, May 27, 1858."

I visited Haslar Hospital in order to compare its site, structural arrangements, &c., with those of the Royal Victoria Hospital, and also the Military Hospital at Winchester, reference being made to the latter in one of the above documents.

It will be covenient to consider first, what have been alleged as the *disadvantages* of the site of the Victoria Hospital.

Exception is taken by the authors of the "Confidential Report," to the situation on the shores of the Southampton estuary for the following reasons:—

(*a*). The commixture of the fresh water of the rivers Itchen and Test with the salt water of the estuary.

(*b*). The apprehended pollution of the estuary at Netley by the sewage of the town of Southampton.

(*c*). The extent of muddy shore, on both sides of the estuary, left exposed at each receding tide.

For these reasons it is presumed that the atmosphere of the entire district must be more or less malarial, and must, therefore, prove unfavourable for the

recovery of the sick, and the restoration to health of invalids returning from abroad.

The medical men of Southampton, and of the surrounding districts, declare, as the results of their experience, that such is not the case; that cases of ague are scarcely known among the population; that other forms of intermittent and malarial disease are equally rare, even in the lower parts of the town and along the shores of Southampton Water; and that the higher ground on the opposite side of the Itchen, extending away down to Hamble, &c., is remarkably salubrious and restorative.

At a meeting of the entire medical profession of Southampton and its neighbourhood, held in June of last year, and presided over by Dr. Oke the most experienced physician of the place, a memorial was unanimously agreed on, containing the following passage:--

"That in consequence of the statements that have appeared in the public papers, and which have been repeated in the debates in Parliament, as to the alleged insalubrity of Southampton, and of the district in which the new Military Hospital is in course of erection, we have instituted very careful inquiries into the subject, and we now desire to express our deliberate conviction that the said statements are without foundation, and have originated in a complete misconception of the physical and climatic characteristics of this part of the country; and that not only is our individual experience subversive of the truth of such statements, but it completely establishes the almost entire absence of ague, and the comparatively rare occurrence of fever in these localities, a conclusion which is fully borne out by the general register of deaths, as well as the parochial register of sickness and mortality of the parishes of St. Mary Extra, Bursledon, Hamble, and Hound, in which district the Victoria Hospital is now being erected."

Such testimony, founded on long and multiplied experience, is of course entitled to high consideration, and cannot be lightly set aside. Still it may be useful to examine briefly the several theoretical grounds on which a contrary opinion has been formed, upon a question of so much national interest as that of the fitting site for the great Military Hospital for our sick and invalid soldiers.

The Commixture of Fresh and Salt Water in Southampton Estuary.

It has been often observed in this country, as well as in Holland, France, &c., that low-lying marshy lands near the coast, which are occasionally overflowed by the sea, are apt to become more offensive and to be more unwholesome, especially in hot weather, than similar lands not subject to such inundations. The notorious insalubrity of the Maremma of Tuscany, and other parts of Italy, and of many districts along the shores of Greece, Asia Minor, &c., is partly due to this cause. Bad at all times, they become worse when, in consequence of a violent storm, or from an unusual elevation of the sea—for ordinarily the tides in the Mediterranean are inconsiderable—an eruption of salt water takes place. The land then becomes more swampy than before, the drainage is more interrupted, and, from the larger amount of animal matter and of decomposable salts in sea water, putrefactive decay is more active and offensive.

In tropical countries the same phenomena are observed, only more aggravated and pernicious, along the foul foreshores of nearly *tideless* harbours, and in the lagoons and shallow creeks along the coasts, or near mouths of rivers whose sluggish outflow is often impeded by deposits of silt, &c., brought down by the stream, or washed up by the sea after high winds. In all these cases, where fresh and salt water are mixed together, there is more or less complete stagnancy;—the mixture, abounding with putrescent materials, lies exposed to the air and sun, and presents of course the most favourable conditions for the exhalation of noxious miasmata.

The same thing occurs when town sewage is discharged (as of late years has been done at several of our watering-places on the coast) right upon the beach, or in such a manner that it is immediately washed back upon the shore. The admixture of the sea water may serve to increase a nuisance which of itself, and without this addition, is always bad enough.

It must be obvious that there is no analogy between the different cases

mentioned above, and the case of a running stream flowing into an open estuary, whose waters are in continual movement from the flux and reflux of the tide. The circumstances are different, and the results, as might be expected, are different also. I know of no evidence that makes it even presumable that the simple commixture of fresh and salt water in a *tidal* inlet of the sea like the estuary of Southampton is injurious to health, and certainly none which shows that it is "a common source of malaria," as stated in the "Confidential Report." Our own coast abounds with such estuaries, and evidence therefore may easily be had. Nor do I remember that any observer has ever alleged that ships have specially suffered from malarious influence on approaching the embouchures of great rivers, where the admixture of fresh water may often be recognised at a great distance from the nearest land. At Kertch, and other places on the east coast of the Crimea, the sea water is little more than brackish, in consequence of the immense volume of fresh water poured into the Sea of Azoff; but none of the medical men whom I met there suspected that the malarious character of the country—marshy in parts, and but little cultivated—was due to this circumstance.

The influx of the Sewage of Southampton.

No chemical traces whatever of this cause of pollution are discoverable in the water or in the deposits of the estuary opposite Netley, nor indeed at any part of the shores of the estuary. Still, it seems to be apprehended by the authors of the "Confidential Report" that the continually increased quantity of the refuse from this rapidly-enlarging town may, in course of time, lead to mischief.

The subject of the influx of sewage into rivers has of late engaged the attention of some very able observers, and one or two important facts appear to be clearly made out. All the soluble parts of sewage matter when mixed with running water, and thus freely exposed to the action of the air, rapidly undergo change into various chemical compounds which are nearly or altogether harmless,—just as organic effluvia discharged into the whirling ocean of the atmosphere quickly resolve themselves into new combinations, and disappear. So rapid is the transformation that even in the case of the Thames, with the enormous flood of pollution continually pouring into it, the sewage matter ceases to be discoverable in the stream a very few miles below London Bridge. At Blackwall, it is scarcely, if at all, traceable. The main source of mischief, arising from the influx of the Metropolitan sewage into the river, is believed to be from the suspended less soluble ingredients being deposited along its shores, and there forming the black putrescent mud which accumulates, more especially near the outfalls of the sewers, and also in wet docks and other places where the water is more or less stagnant. It is to these foul mud banks, largely charged with decomposing animal refuse and exposed at every ebb, that the offensive emanations from the Thames and other rivers similarly conditioned may chiefly be attributed. The soluble parts of the refuse matter have quickly ceased to exist.

In the case of the sewage of Southampton, which flows into the Itchen a considerable way above its mouth, not only no traces of the soluble contents, as I am informed, can be found in its waters where they join the estuary, but no portion of the insoluble and suspended organic matter can be recognized along the margin of the river on the Woolston or Netley side. It seems to me therefore most improbable that it will ever reach the shores of the broad estuary three miles lower down. To connect the scarcely appreciable traces of phosphatic salts and the presence of nitrogen in the mud of the shore opposite the Hospital, with the suspected contamination of this mud by the sewage matter from the town of Southampton, is surely very fanciful.

The Muddy Banks along the Shores of the Estuary exposed at low water.

Much stress is laid in the "Confidential Report" on this point as being a most objectionable feature, on the score of health, in the site chosen for the Victoria Hospital; and so, doubtless, it must be considered by every one, if the mud of

these beaches be, as is implied, like the slimy putrescent mud of the bank of the Thames between Westminster and London Bridges. The existence of the soft muddy flats on both shores of Southampton Water, exposed at low tide, had not been overlooked in the original selection of the site. They are not pleasant to the eye; and as it was considered just possible that a disagreeable smell, if not any hurtful effluvia, might be given off from their surface in hot weather, careful inquiries were then made of persons resident on and about the spot, and, among others, of the crew of the Coast-guard brig which had been lying for some years, imbedded in the mud, immediately in front of the Hospital. Every one said that there was never the slightest nuisance from the mud; and the fact that our nobility and gentry have selected the immediate neighbourhood for marine residences seems a pretty strong proof that such is the case.

On my second visit to the ground, on May 19th, I had an opportunity of traversing the wet beach in different directions, and of examining it under favourable circumstances. The tide was at its lowest, and the wind, being about west south-west, blew right across the estuary and the mud to the Netley shore. I could perceive no smell but the usual sea-weed smell when the sea is out. On thrusting my stick a couple of feet down, no smell was perceptible, nor yet on digging up a portion of mud from some depth, and applying it close to the nose.

Several labourers were engaged at the time in clearing out and deepening the channel of one of the "lecks." The mud thrown out on each side was as black as the blackest mud that ever came from a foul ditch or stagnant dock or canal head, and I quite expected to find it anything but inodorous. Yet, although I purposely stood for some time conversing with the men, I could not detect the slighest offensiveness, except at one particular spot, where I perceived a gaslike smell in occasional passing whiffs. Mr. Ranger and I had previously found the same sort of smell on the opposite side of the estuary, when we applied our noses to an oar which had been thrust three or four feet down into the soft mud at the edge of the water, then very low.

The mud obviously consists of the same arenaceous clay or brick earth, which forms part of the general geological formation of the district, covered on the surface with sandy detritus, and at a little way below the surface blackened by the action of a salt of iron, perhaps also by carbonized vegetable matter. The quantity of animal matter in it is shown by miscroscopic and chemical observation to be exceedingly small, not greater, probably, than its impregnation with sea water might lead one to expect.

How different then, in almost every respect, from the sewage mud of the banks of the Thames with which it has been associated!

At Haslar, the extent of mud surface that is exposed on every ebb of the tide is proportionately very much greater than at Netley; and we learn, on the high authority of the Medical Director-General of the Navy, who was for many years at the head of that great Naval Hospital, that he could never recognise the slightest ill effect therefrom upon the thousands of sick who passed under his care through its wards. Inspector-General Dr. Nesbitt, the present Principal Medical Officer of the establishment, expressed to me the very same opinion, adding that in all his experience of hospitals, both in this country and in our Colonies, he knew of no place where wounds heal so favourably as at Haslar—one of the best tests of atmospheric purity.

On the whole, it seems to me that there is little or no more reason to apprehend injury to health from the muddy shores of the Southampton estuary at low tide than from any other wet beach along our coast, where, from the shallowness of the marginal water, the sea goes out to a distance.

Since writing the preceding remarks I have received Dr. Dundas Thomson's Report on the water of the river Itchen, and of the Southampton estuary at different points, and on the composition of the mud from the shore opposite Netley Hospital.

It appears to me to confirm, in all material respects, the views which I have expressed, and thus to give the sanction of scientific accuracy to opinions derived from simple observation and inquiry.

In connection with the physical features of Southampton estuary, which have been noticed above, viz.,—the commixture of fresh and salt water, the influx of sewage matter, and the muddy banks along its shores,—and which are presumed by the authors of the "Confidential Report" to be likely to malarialise

the atmosphere of the district, there is a point of medical doctrine touching the causation of fever which deserves remark, as it is referred to in the argument of these gentlemen against the site of the proposed Hospital. "Similar changes," it is said, "are going on in the estuary to those to which the sea coast malaria of tropical climates has been attributed, though of course of greatly inferior intensity on account of the much lower temperature of our climate."

This alludes to a suggestion, for it cannot be called an hypothesis, thrown out by the late Mr. Daniell, respecting the fever of the African coast. Some bottles of water from the mouth of one of the rivers there had been sent to that eminent chemist for analysis; they had been of course kept for a good many weeks, and were not hermetically secured. Sulphuretted hydrogen was found in the water; and knowing that this gas is most pernicious to life, and supposing for the moment that the specimen he had examined was but a sample of the water off the coast, Mr. Daniell conceived the idea that there might be a connection between the evolution of the noxious gas into the atmosphere, and the generation of the deadly fevers which prevail there. The subject was soon submitted to accurate investigation on the spot by Dr. M'William, when principal medical officer of the ill-fated Niger expedition. His experiments—and they were confirmed by those of several surgeons of our African squadron—showed that not a trace of sulphuretted hydrogen is ever discoverable in the water when first drawn, and that it is only when it has been kept for some time, and with imperfect exposure to the air, that the presence of the gas becomes recognisable. The very same thing is observed with the water of the Thames, and other polluted rivers. Although no sulphuretted hydrogen can be detected in the water when fresh drawn, it becomes generated in casks on board ship. The organic matter in the stagnant water putrifies, and reacting in this state on the sulphates present, the result is their conversion into sulphurets by the abstraction of oxygen; the sulphurets then decompose the water, and uniting with one of its constituents produce sulphuretted hydrogen.

If the atmosphere be completely excluded from the preserved water, these changes will not take place. Dr. M'William sent home some bottles from the African coast, hermetically secured, to Mr. Daniell who, having carefully examined them and found no trace of sulphuretted hydrogen in the water, at once saw the necessity of giving up the idea which he had formerly entertained.*

Independently of the difference in the character of the symptoms of poisoning with this gas from those of a pernicious fever, it is scarcely possible to suppose that any medical man, who was personally acquainted with the climatic and other conditions which breed malarial disease, could ever have accepted this view of its production. As reasonably might the typhus of our foul alleys and crowded lodging-houses be attributed to the gas which lights our streets, as the fell fevers of the coasts of Africa and the West Indies to the action of sulphuretted hydrogen from the decomposition of water and its contained salts. Any apprehension, therefore, of an analogy between those regions and the shores of the Southampton estuary may very safely be discarded.

It would thus appear that the various theoretical objections alleged in the "Confidential Report" against the site, however ingenious, are invalid, and that there is no reason to question the opinion of the resident medical men as to the salubrity of the spot.

And here I will take the opportunity of remarking, as the result of pretty extensive observation in different climates, both in the Old and New World, that the healthiness of a place depends in general far more upon the particular position and the sanitary condition of the place itself, and of its immediate skirts and vicinage, than upon the topographical character of the district in which the place is situated. In the healthiest districts spots will be found of marked insalubrity, arising either from some peculiarities of physical position, or more frequently from the neglect of needful local improvements. And, on the other hand, in regions which are notoriously unhealthy, spots may be rendered safe, and even salutary, by the adoption and the systematic carrying out of simple hygienic measures.

* The whole subject is ably handled in Dr. M'William's most interesting "Medical History of the Expedition to the Niger," 1843.

Over and over again I have seen in the West Indies, and in other countries abroad, the truth of these remarks exemplified. Residences, once favourite abodes, have become from neglect so unwholesome, as to be abandoned altogether; while other places, far less favourably situated, have, by well clearing and draining the ground, opening it up to the free play of the atmosphere, and by unceasing scrupulous attention to the immediate removal of all nuisances, been made pleasant and healthy dwellings, although the surrounding district continued to be anything but unobjectionable.

The medical history of the town of Victoria and its neighbourhood in Hongkong, a few years ago, afforded a strong illustration in point. At first all suffered alike, civilians and soldiers, from the climate; but, subsequently, while the troops were decimated by sickness, the population of the town remained comparatively healthy. There were doubtless several causes for the difference, but one of the chief was certainly the unimproved condition of the ground, and the ill-constructed barracks in the cantonments.

Many similar instances might be quoted. Indeed, all the teachings of medical topography serve to show the infinitely greater importance, in the matter of health, of local than of wide-spread or district influences; and seldom does experience warrant any positive or very confident predictions from the consideration of these latter influences alone. So much depends upon the openness or otherwise of the place itself and its neighbourhood—the character and condition of its soil and surface, as well as of its substratum—the general level of the district, whether flat or undulating—the amount of vegetation, the temperature and rainfall, the prevailing winds, &c., and, more than all, upon the drainage and cultivation of the land, that the prudent physician will never decide without duly pondering all these considerations.

Openness of position to the free play of the atmosphere in every direction, and a moderate elevation above the level of the surrounding country, are always important elements in choosing a healthful site; if the ground slopes down so as to facilitate the natural drainage, and the soil be dry and gravelly, so much the better. Even in the pestiferous climate of Sierra Leone, the fort on the top of the hill, which overlooks the town and bay, is moderately healthy; and most of the attacks of sickness among the residents there are caught when they have to go down to the shipping.

Another consideration, of equal importance, is to ascertain whether the waters in the district are moving or are stagnant. Stagnancy, whether of air or of water, is the condition most to be dreaded in every place. As long as there is free and continual movement in these elements, there is comparative safety. It is when they cease to move, and are still, that danger is apt to arise. There is no exception to this great law of nature. A high authority has declared his belief that "a person may sleep with perfect safety in the centre of the Pontine Marshes if he have his room well heated by a fire during the night."* The stagnancy as well as the humidity of the air is thus counteracted, and no mischief follows. And so it is with water—stagnant, it begins to corrupt; in motion, not only does it not corrupt, but it serves to purify the incumbent atmosphere.

But these remarks are only in the way of parenthesis, and I pass on to notice briefly what appear to me to be the *advantages* of the site chosen for the Royal Victoria Hospital.

The situation is a very beautiful one, a point of no small importance in an abode for the sick and suffering. Placed on the top of a fine gravelly bank, which has a gentle slope to the water's edge, and dips a little on either side, and with an open undulating country behind, the Hospital will possess the prime advantage of airiness and sunniness in every direction. The Bitterne Hills in the rear will serve to break the force of the north and north-east winds, while in front there is nothing to intercept the fresh breezes from the estuary and the mouth of the Solent. Nothing can be more favourable than the general character of the surrounding district, dry and heathy in parts, and carefully cultivated in others. Many beautiful residences are in the immediate neighbourhood.

The ground on which the building stands is shown by Professor Phillips to consist chiefly of a ferruginous gravel, intermixed here and there with beds of

* Sir James Clark on the Sanative Influence of Climate.

brick earth or sandy clay, and everywhere so porous that water never lodges on the surface, and the ground dries very quickly after rain. Its natural drainage is aided by the gradual slope on three sides, so that the actual site is rendered extremely dry. To this cause is probably due its unusual exemption from fogs, mentioned by Major Ravenhill in his report. I heard the same remark made respecting Bitterne by Dr. Orsborn, and respecting Fawley, on the other side of the Southampton Water, by Dr. Churchill. It appears, therefore, to be a feature of the district.

Were there any ground for apprehending occasional unpleasant smells —not to speak of hurtful effluvia, which are out of the question—from the muddy beach at low water, the elevation of the Hospital (the ground floor of the building is about 40 feet above high-water mark), and its distance from the shore, must effectually secure their thorough dissipation before they could reach the inmates.

The only objectionable feature in the site, which I could discover, is the boggy peaty ground in the small valleys on either side of the rising ground on which the Hospital stands. I am informed that there will not be the slightest difficulty in thoroughly draining the land. If this be done, and the surface of the valleys be raised by a good covering of the ballast which has been taken out in such large quantities from the foundation of the buildings, all objection will be removed.

Netley possesses what I consider to be of inestimable advantage for a great Hospital or Sanatorium for sick and invalid soldiers returning from abroad—I mean the animating cheerful prospect which it ever presents to the eye. It is of the utmost importance to the recovery of the one, and the restoration of the other, that their minds be amused and the weariness of in-door confinement be in a measure compensated for by gaiety and enjoyment without. This feature Haslar has in perfection for our sick and wounded sailors; and it is one which the medical officers of that noble establishment rate very highly in the successful treatment of chronic disease. The "*medicina mentis*" has ever been regarded by the best physicians as a most important element of cure; and certainly there is no remedy of the class so pleasurable or more thoroughly useful than a living and ever-changing scene before the eye. This advantage Netley possesses in an eminent degree. The constant moving up and down of vessels along the fine estuary, arriving from or departing to all parts of the world, will be a source of endless amusement, which only those who have lingered on distant shores can fully appreciate. No inland situation, however desirable in other respects, but must lack this much-prized feature.

The ready access, too, from the sea in all states of the weather, its proximity to Portsmouth, and the facility of landing the sick and invalids, as pointed out in Captain Heath's letter, and as had been suggested by Captain Laffan from the very first, also deserve to be noticed. At Haslar, all the patients have to be landed in boats, and without the same direct conveniences that can be had at Netley, especially if the terraced embankment recommended by Major Ravenhill be carried out.

The water from the well that has been sunk in the grounds of the Hospital is very pure, as appears to be generally the case throughout the district, and contains so little saline matter that it is exceedingly apt to act upon lead. It will, therefore, be desirable to avoid pipes and cisterns of this metal. A large amount of illness and injured health among the residents is due, I was told by some of the medical men, to slow lead poisoning from this cause. The supply of fresh water promises, I believe, to be abundant.

The opportunity of having salt water bathing, cold and hot, will be found of great advantage in the treatment of many maladies, and in the recovery of strength by invalids.

The climate of the district in which Netley Hospital stands is regarded by the resident medical men as mild, soft, and singularly refreshing. And this is just about the character that its topographical position on the shores of the Southampton estuary, and the dry, gravelly formation of the fine open country around, would lead one to expect.

Sir John Liddell describes the climate of Haslar to be "mild, temperate, and bracing, not unlike other places on the south coast of England, but much drier than Cornwall and Devonshire." That of Netley cannot be materially different, only it is more sheltered from the north and north-east winds, and

being on higher ground and less encompassed with water, it will be drier and more genial in cold weather, and probably also freer from fogs.

The meteorological characters of the climate of Netley will, doubtless, be found, on observation, to agree with those of Gosport, where the annual mean temperature, height of barometer, rainfall, &c., appear to be nearly the same as at Southampton. From the very accurate returns received from the Ordnance Survey Office, it is seen that the estimates of the late Mr. Drew respecting the rainfall and mean humidity at Southampton, quoted in Professor Phillips' report, are considerably too high. I am unable to institute a comparison with other places on the south coast or inland, until the other meteorological tables are received.

The medical men of Southampton have long been in the habit of sending invalids to the villages of Woolston, Bitterne, and other places in the neighbourhood, for the benefit of the pure and restorative air of the district; and many persons in ailing or broken health from the metropolis, and other inland parts of the country have resorted to it with great advantage.

It is asserted by the authors of the "Confidential Report" that the climate of Netley is soft and relaxing, using the latter word in the sense of enervant and debilitating. But no evidence is given, nor any experience quoted. The term "relaxing" may probably be applied with truth to the atmosphere of Southampton, particularly of the lower parts of the town; but Southampton is not Netley. The site of the Hospital is, I should say, much too open and breezy at all times—for even in still weather the air of the estuary must be continually moving—for its climate to be enfeebling or depressing. It may be soft and soothing, but everything seems to indicate that it is not humid and relaxing.

These gentlemen contend that the climate for a Military Hospital, like that which is erecting at Netley, should be mild, dry, and bracing. This seems to point to an inland situation (unless, perhaps, to such a place as the West Cliff at Brighton), as being, in their opinion, more desirable than at any point upon the south coast, as was originally recommended by the Minister for War, in order to have an easy access from the sea, and to land the sick and wounded soldiers with the least possible amount of land carriage, as well as to be within a moderate distance of either Portsmouth or Plymouth.

Apart, however, from these considerations of policy or public convenience, the question presents itself,—whether the dry and bracing climate of some inland situation is better suited for the recovery and restoration to health of the majority of the sick and invalid soldiers, for whom the Hospital was designed to provide.

Of course, no one climate is best for every constitution, or for every sort of infirmity or sickness. It must be for the bulk of the cases to be treated that we must have regard. Now, what have been hitherto the principal forms or classes of disease among the sick and invalids sent from stations in this country and abroad to the Hospitals at Chatham? From the returns furnished to the recent Sanitary Commission on the Army by Deputy Inspector-General Taylor, it appears that in the twenty-seven years, from 1835 to 1857, the total number admitted was 40,829. Deducting the cases of wounds and injuries, of dislocations, contractions, and of hernia, a total of 34,553 cases of disease are left. Of this number, no fewer than 9,141 are due to pulmonic affections, 6,045 to rheumatic ailments, and 6,855 to that state of infirmity and ill health characteristically termed "worn out." In all, 22,041 out of the 34,552 cases, or nearly two-thirds, belong to the three classes now enumerated,—the remainder being chiefly caused by ulcers and varicose veins, by diseases of the eyes, and by scrofulous cachexy, and visceral affections.

To the great majority of pulmonic cases the climate of Netley will be found admirably suited; there can be no doubt on this head. It will be equally appropriate for a vast proportion of the rheumatic ailments, and of the "worn out" or broken-down-health cases. The warm salt water baths will be of inestimable service to the poor invalids. Dr. Churchill, of Fawley, mentioned to me the cases of several persons, himself among the number, who had derived the greatest benefit from the climate of that district, after years of unrelieved suffering from chronic rheumatism contracted elsewhere.

To persons returning from hot climates with dysenteric and hepatic disease, a mild, soft climate like that of Netley will generally be highly beneficial for some

time after their arrival in this country, and before they are transferred t oa drier and more bracing climate. Any sudden change in the circulation of the skin and internal organs is thus best obviated, and the tendency to pulmonary or hepatic mischief counteracted. Hence it is that old residents of tropical climates generally find it a good plan to spend the first year or so, after their return, in the south of Europe, before they settle down in this country.

Presuming that the district of Netley is malarious, it is intimated in the "Confidential Report" that the site of the Hospital will "be unfavourable for the recovery of cases having the remains of tropical fevers upon them."

Mr. Wiblin, the Quarantine Officer of the port of Southampton, has, from his official position, been much brought in contact, for a good many years past, with this description of cases occurring among the crews and passengers of the West India and South American steamers, and has had large experience in their treatment. He assured me that they very generally recover rapidly in Southampton, under the usual remedies, and that the climate appears to be anything but unfavourable to the cure. He stated also that he had recommended to the Directors of the West India Company to establish at Woolston a sanatorium for the benefit of those men whose health has been seriously damaged in their service abroad, so highly does he think of its salubrity.

In connection with the presumed aguish character of the climate along the shores of Southampton Water, Dr. Churchill of Fawley mentioned what appears to me a very interesting fact, which may not be generally known. Forty years ago, the district of the New Forest was notoriously aguish. Since that time, the larger portion of it has been brought into cultivation, and ague has correspondingly declined or altogether ceased. Still, there are every here and there wet and swampy spots, particularly in the bottoms where the water lodges; and about these spots, cases of ague continue to occur. But he has never met or heard of a single case occurring primarily among the residents along the shore from Hythe away on to Calshot Castle, and thence on to the Beaulieu river, although the whole line of the coast presents the same sort of muddy beach, as on the Netley side of the estuary, on every receding of the tide. The *habitat* of the disease appears to be entirely inland, and it only needs the swampy bottoms to be drained, for ague to disappear altogether from that part of Hampshire.

The Registration Mortuary Returns attest the general salubrity, as far as this can be shown by such tables, of most of the districts on both sides of Southampton Water. In that of St. Mary Extra, which includes the parishes of Hound and Hamble, where the hospital grounds are, the annual death-rate is about 18 per 1000 of the population. This is lower than in the aggregate of the country parishes and small towns throughout the kingdom, and lower still than in the metropolitan suburbs of Richmond or Edmonton. It is on a par with what occurs in the healthy districts of Kingston, Sevenoaks, or Barnet; not but that, in all these districts, the ratio of yearly mortality ought unquestionably to be, and might easily be made, considerably lower than it is. That such is the case with Hound and Hamble is evident from an inspection of the dwellings of the people, as well as from the testimony of the medical men in the neighbourhood, and from an examination of the causes of death during the five years 1853-57 in the tables communicated by the Registrar-General.

Of the total deaths in that period, ninety-seven in number, in the parish of Hound, nearly one-half occurred in children under five years of age; in many cases obviously from neglect. Fifteen persons died between fifteen and forty-five years of age,—including, therefore, the soldier's life. Of these fifteen deaths, six were from phthisis, three from dropsy, three from accidents, and one from apoplexy, one from heart disease, and one from typhus fever.

Phthisis is the offspring of unhealthy homes, and of bad or insufficient food, far more than of climate. Impure air and imperfect nutrition, not the vicissitudes or extremes of weather, are its ordinary producing causes.

As to the death from typhus (there were four others in the parish, all under fifteen years of age), the cases of this disease are almost invariably traced to some self-inflicted nuisance close to dwellings, such as a ditch or hole for the reception of all sorts of filth, or a huge heap of reeking manure in a farm-yard, on one side of which stands the farmer's house; it seldom or never spreads beyond the dwelling where it first appears. Mr. Smith, of Hythe, mentioned to me a recent instance there of five severe cases (three proved fatal) in one family from the former of these causes. No other person suffered.

No death from fever of any sort occurred at Hamble during the five years 1853-57.

The only deaths from diarrhœa during this period, in the two parishes, were in young infants; and it may be added, that in the epidemic cholera of 1849, when the town of Southampton and the village of Itchen suffered severely, the solitary death which occurred in the district of St. Mary Extra was in an old woman, seventy years of age, at Hamble.

The large proportion of deaths at an advanced age, in both parishes, indicates a condition of climate anything but unfavourable to life.

I have thus endeavoured to state and to weigh the comparative advantages and disadvantages, in a medical point of view, of the site chosen for the Royal Victoria Hospital at Netley. The site appears to have been recommended at first by Sir James Clark, from his own knowledge of the district, and from a very favourable report of its geological formation by Professor Ramsay, Director of the Geological Survey of Great Britain. After very careful examination of the ground and neighbourhood, and repeated inquiries among resident medical men and others on and near the spot, Captain Laffan and Dr. Mapleton reported favourably of the situation to Lord Panmure.

The Director-General of the Medical Department of the Army subsequently gave his approval as the result of personal examination of the locality, and of ascertaining the opinions of various medical practitioners in Southampton, and of other well-informed persons in the district.

The medical profession of Southampton and the neighbourhood have recorded their deliberate opinion that "in a sanitary point of view, the site of the Hospital has been wisely selected." In this opinion I concur. The advantages appear to me great, the disadvantages imaginary rather that real.

To speak of the site as being "not probably sufficiently deleterious to injure persons in robust health, although not well calculated to promote recovery from disease," must surely have proceeded from an imperfect acquaintance of facts.

I have, &c.

(Signed) GAVIN MILROY, M.D.

P.S.—By comparing the Meteorological Returns, just received (June 21), from Mr. Glaisher of the Royal Observatory, respecting the annual rainfall, temperature, and humidity of the air for the last four years at various places extending from the south of England to the midland counties, viz., Guernsey, Helston, Ventnor, Worthing, Clifton, Greenwich, Paddington, Oxford, Hartwell, Royston, Cardington, Norwich, Grantham, Derby, Holkham, Nottingham, Liverpool, and Wakefield, with the observations at Southampton by the Officers of the Ordnance Survey Department, it appears that, although the average fall of rain in the course of the twelve months is greater at Southampton than at most of the places enumerated (take for example Ventnor, Worthing, Paddington, or Oxford), the mean humidity of the air throughout the year is less. The climate of the upper part of Southampton—and, we may presume, of Netley—is therefore not to be regarded as a moist one. Now, humidity and stillness of the atmosphere are the two chief elements that go to constitute what is usually meant by the term "relaxing," as applied to climate. Neither of these attributes belongs to that of the Netley district.

Sir, *London, June* 12, 1858.

In my report of the 1st instant, I had the honour to submit to you my opinion as to the site of the Royal Victoria Hospital, at Netley, and the reasons which led me to that opinion.

I have now, in compliance with Colonel O'Brien's letter of the 29th May, to explain my views respecting the plan and structural arrangements of the building, in reference to its suitableness, or otherwise, "to provide for the comfort and promote the recovery of the class of inmates for which the building has been designed, consisting, as shown by the medical returns in your

possession, of invalids of whom only 15 in every 100 will be confined to bed, and who will be generally suffering from chronic diseases." From the report of the original Building Committee to Lord Panmure, in May 1856, it appears that the plan or design of the Hospital was adopted after numerous inquiries among the principal medical authorities, both civil and military, in this country, and a minute inspection of the chief metropolitan hospitals, as well as after carefully examining the plans of some of the most approved hospitals in France and in Holland.

The fine, open, and elevated situation of the ground towards the Southampton Water and the Solent naturally suggested an extensive frontage in that direction, facing nearly south-west; and the idea was, I think, wisely acted on.

In the original plan the wings were detached from the central block, and connected with it only by the corridor on the ground floor. There was thus a free passage to the wind from the front to the rear on each side of the middle building. Subsequently the wings have been joined on to the centre by glazed galleries, so that the Hospital presents a continuous unbroken frontage from end to end. A more easy communication between the wings and the centre on each floor is thus obtained, but at the loss of the free perflation to the rear. I would suggest that the connecting galleries be unglazed, and made very light and open, so as to interfere as little as possible with the circulation of the air in different directions.

It will also contribute much to this desirable object that an open space be left at each end of the rear line of out-buildings in the quadrangle, to give free access to the wind to sweep round from back to front; and, for this purpose too, the gravel bank behind will have to be sloped away at a very small angle.

The main feature of the wings, which contain all the hospital accommodation for the sick and wounded men, is the spacious corridor on each floor running the entire length of the building, and from which is the entrance to the wards.

The corridor plan of construction is common in the continental hospitals, especially in those of Germany, and continues to be adopted in some of the most recently built. The General and Barrack Hospitals at Scutari were upon this plan.

Does the corridor plan necessarily, as it is alleged by some persons, impede the free ventilation of the wards and of the building generally—or does it not? And what are its advantages or disadvantages in other respects?

The answer to the first of these interrogatories appears to me to depend mainly upon a very simple point, namely, whether the corridor itself is thoroughly airy, and is always kept well ventilated, or not. If a corridor, either from original faulty construction, or from mismanagement and neglect, is ever permitted to be a receptacle of impure air—from whatever source the impure air proceeds—it is unquestionably an evil; for then, whenever the door or a window in the intervening wall is opened, the ward must receive a tainted supply.

On the other hand, if the atmosphere of the corridor is maintained uniformly fresh and pure—as doubtless it may always be so maintained—the corridor serves only as an ante-airchamber intermediate between the outer atmosphere and the ward.

The freedom of the air supply to the ward from the corridor will depend on the size of the intervening door and windows, and on these being kept open or not. Open, the ward and corridor are nearly as one chamber,—as much so as two adjoining rooms with spacious folding doors. The insufficiency of the communication between the spacious corridor and the wards was one of the main defects in the Barrack Hospital at Scutari, which, as its name implies, was a Turkish barrack, not a hospital. In the General Hospital there, the communication was much more ample, and the windows on the opposite side of the wards were also much larger. In Turkey as elsewhere, the necessity for free air for the sick soldier is in a measure recognised, but not for men on duty—as if this prime blessing was not as essential for the maintenance of health, as for aiding recovery from disease.

With due attention in keeping the atmosphere of a corridor fresh and pure at all times, both night and day, the corridor may be considered as so much gain or extra space allowed to the inmates of the wards. Instead of 1,500 cubic feet to each patient, 1,800 or 2,000 are thus provided.

At night, and whenever from inclemency of weather the windows of the

wards leading into the open air cannot be kept open, the corridor affords a most convenient means of supplying an abundant and constant stream of fresh air from the staircases, if not immediately and directly from without.

The door of a ward should never be allowed to be quite closed unless indeed—and the plan is a good one—the lower panels are louvred or well perforated. A sheet of perforated zinc may replace the common panel.

In winter, the atmosphere of the corridor and staircases requires to be gently warmed, not heated, so that the stream of entering air may not strike cold, but without losing its freshness. It was from the want of this needful auxiliary that the inconveniences experienced last winter in the Winchester Military Hospital arose, and not from any inherent disadvantage of the corridor, as stated in the "Confidential Report."

There is really no ground, as it seems to me, for apprehending the diffusion of impure or tainted air from one ward into another through the intervention of the corridor, provided always each ward has, as it certainly ought to have, its own independent means of ventilation, more especially as regards the escape of its respired vitiated atmosphere. Any diffusion of what is called a "hospital atmosphere," from one part of a building to another, is evidence in itself of a double evil, neither of which should ever occur in a properly constructed and well-managed hospital. There must be an impure, probably overcrowded, and certainly an ill-ventilated ward somewhere to produce the hospital atmosphere; and the passages or corridor must also have been allowed to be close and badly aërated, or the diffusion would not take place. It will scarcely do to argue against anything merely from the ill effects of its misuse and criminal mismanagement.

A spacious corridor affords the ready means for convalescents and patients not confined to bed—and the proportion of these to bed-ridden sick will be very large at Netley—to have a little change of scene from the wards, and even to take gentle exercise when the state of the weather prevents them going out of doors. Bed-ridden patients, too, may be occasionally wheeled into the corridor —no small boon to a helpless sufferer.

All the Metropolitan Hospital physicians, who were consulted last year by the Building Committee, took the same view of the matter, and expressed their approval of a spacious, airy corridor, "provided," as Dr. Guy justly added, "that the air is subject to continual change."

When it is remembered that the inmates, not bedridden, of the Victoria Hospital are to have, besides the extra space afforded by the corridor, dining rooms distinct from the wards, and indeed in a separate building connected with them by a corridor, and also that the water-closets are of the best description, and so situated that no possible nuisance can arise from them, it will be seen that every attention has been paid in providing for their comfort and welfare.

As to the best size of wards in a hospital, or rather as to the number of patients which it is best, on the score of health, that wards should contain, the general feeling of the medical profession in this country is decidedly in favour of moderate-sized wards—wards that will hold from eight or ten to fourteen or sixteen beds, allowing a space of about 1,500 cubic feet to each. Twenty-patient wards are considered large, and very few physicians or surgeons will be found to approve of wards larger still, in a general hospital.

In Haslar and Melville Hospitals almost all the wards are for fourteen patients, and Sir John Liddell says that he considers this "a very suitable and convenient size," and that he would not recommend any change. Dr. Nesbitt, the present Principal Medical Officer of Haslar, remarked to me that, if any change was desirable, he would prefer wards with fewer and certainly not with more patients in them. Large wards are extremely fatiguing to the Medical Officer, if he carefully examines each patient without a pause or break. The disturbance, too, to a number of sick from one noisy or troublesome patient is also to be considered.

In the new Hospital at Blackburn, which is being constructed in separate blocks, somewhat after the plan of the Lariboisière Hospital at Paris, the wards are, I observe, not to contain more than eight patients.

It is confidently stated in the "Confidential Report" that wards for twenty-five to thirty sick are more healthy than smaller wards, from the greater facility with which they can be ventilated. There is no proof that I know of for this. Dr. Arnott declares distinctly that, "as regards warming and ventilation only, the size of the wards is of little importance;" and certainly most men, who have

had experience in ventilating large chambers and halls, will be found not to concur in the above opinion.

The allegation, too, that "experience has shown that not more than about 100 sick ought to be placed under one roof" is to be taken, I presume, rather as the expression of individual opinion than as the ascertained result of actual trial.

Unfortunately, the subject of Hospital Statistics has not received hitherto the attention which it merits, and our information respecting this and other points of hospital construction is still most scanty and defective. It is much to be desired that the returns of our military and naval Hospitals—and why not of civil Hospitals likewise?—should be annually published, according to one tabulated form of classification to be adopted by all. Then, and then only, shall we be able to determine various questions still *sub judice*.

It has been asserted that Hospitals on the Lariboisière plan of construction are better for the recovery of the sick than Hospitals on the Haslar or Netley plans, or on any other plan that has been tried. I have applied for, but failed to obtain, any information as to the results of the treatment—its success and duration—of surgical and medical cases in the Lariboisière and other Hospitals built on that plan, as compared with similar results from other Hospitals. The three medical gentlemen who went over to the Continent last year, at the instance of the Sanitary Commission of the Army, to inspect the Hospitals in Paris and Brussels, do not appear to have been more fortunate in procuring accurate data for comparison; and the circumstance that the new Military Hospital now erecting at Vincennes is not on the same plan as the Lariboisière, would seem to indicate that the Lariboisière plan is not considered by the French medical authorities to be unobjectionable.

There is much force in the remarks of Dr. Burrows, and the other London Hospital physicians, on the possible disadvantages of the separate block system in a climate like that of England. It is probably better suited for a more mild and genial climate than for ours; and certainly there might be greater difficulty in maintaining an equable warmth in such buildings, during the winter months, than in our ordinary Hospitals. The principle of dispersing, and not of accumulating the sick is, however, a sound one, and the Lariboisière plan, therefore, deserves a trial in the event of other Military Hospitals being built. But whatever be the plan, the great and all-important object to be kept in view is—due regard having been previously given to the site, and to the foundation of the building that it be made and kept thoroughly dry—to secure a free and abundant ventilation in every part, and at all times and seasons.

Lofty doors and windows must of course be the principal means by which this is to be effected. All mechanical contrivances for forcing in fresh air and extracting the foul without recourse to the doors and windows, and by superseding their use, are to be avoided. The atmosphere in such buildings is invariably close and unrefreshing, although chemistry may fail to detect any difference between it and the outward air.

Nevertheless, it is always right that the wards of a Hospital should be provided with some auxiliary and supplemental means of ventilation, besides doors and windows. Transverse or horizontal ventilation will not alone suffice. In fine weather, and during the day, it is easy enough with moderate attention to secure the free circulation of air; it is in winter, and especially at night when windows are shut, that the real difficulty is experienced. The only sure test of thoroughly successful ventilation of a ward is the state of that ward on a winter's evening after the men have gone to bed, or in the early morning before they are up. If the air be pure then, there need be no fear of its purity at other times.

To secure the object in view, the simplest and best plan is to have one or more openings in the ceiling (which should always be slightly arched), for the escape of the impure air, while there is at the same time some arrangement to admit fresh air, near the level of the floor, to supply its place. An under floor flue, having guarded openings in the skirting of the room, will effect this.

In a building like Netley Hospital, where hot water is to be laid on in every floor, the cold air from without in winter might be easily warmed a little before it entered the ward. But probably no special arrangement for this purpose will be necessary, as the walls and floors of the building itself will serve to take off sufficiently the chill of the admitted air.

The escape openings in the ceiling should be immediately over the lamps or the gas burners; the strong upward current of the combustion-products will act powerfully as a suction or extracting force on the impure air of the wards.

Every gas burner throughout the building—in staircases, corridors, and wards—should be provided with a funnel-pipe, leading into a chimney or other flue which opens outside.

It will be convenient that the escape-openings in the ceiling, and the admission-openings near the floor, be so arranged that they may be enlarged and diminished at pleasure, or be altogether shut when required, so as to prevent the irregular and contrary draughts, which are occasionally apt to occur. By overlooking the importance of upward ventilation, and thinking only of transverse ventilation from one side of a chamber to the other, the authors of the "Confidential Report" very unnecessarily, as it seems to me, entertain the fear that the effluvia from one patient must pass on to all the patients along his side of the ward, before they can be discharged.

The views I have expressed above on ventilation will be observed to correspond, very nearly, with those laid down in the First Report of the Building Committee of the Hospital, in May 1856. The structural arrangements which have been advised by Mr. Ranger, C. E., and explained by that gentleman to his colleagues, will be found, I think, effectually to carry out the objects we desire, and to maintain at all times a pure and ever-moving atmosphere throughout the entire building.

With respect to the means for warming the Hospital in winter, it is proposed that Anglo-American stoves be used for this purpose in all the wards and corridors. I would suggest for consideration whether a trial should not be made of Dr. Arnott's smokeless fireplaces in some portion of the building. They appear to me to be exceedingly well suited for the corridors more especially.

To ensure perfect dryness on the ground floor, it would be advisable that a layer of concrete or asphalte be laid under the entire flooring of every ward, &c., on that floor; also that a wide channel or gutter pass along the whole extent of the outside wall to carry off the rainfall at once, and not allow it to sink into the foundation.

The sewage from the Hospital, if discharged directly, and without some corrective process, on or near the beach, would of course infallibly become in course of time a great nuisance, both to the Hospital itself and to the neighbourhood. It is a point which will doubtless receive Mr. Ranger's attention, and need therefore occasion no alarm.

Dustholes also are apt to become nuisances, if anything but dry ashes are allowed to accumulate. All vegetable and animal refuse or rubbish of any sort should be *daily* removed to a distance, or be burned at once. In a Hospital or barrack yard, an ordinary dusthole should never be allowed to exist; it is usually a receptacle of all sorts of filth. The back of a kitchen fire affords the ready means of getting rid *instanter*, and without the slightest inconvenience, of all organic and decomposable matters.

Due attention being uniformly paid to the various points indicated above, I feel every confidence that the Royal Victoria Hospital will be a first-rate Hospital in respect of healthiness, and be found altogether well suited for the purposes for which it was designed.

I have, &c.

(Signed) GAVIN MILROY, M.D

No. 18.

Report by J. Mouat, Esq., C.B., V.C., Deputy-Inspector General of Hospitals.

Sir,

In compliance with the instructions contained in your letter, dated War Office, May 4, 1858, informing me of the objects of the Report, the names of the gentlemen associated with us in that object, and the subjects to which our special attention was to be directed in framing the Report—

I have the honour herewith to submit, for the consideration of the Secretary of State for War the following observations, which are, to a certain extent, necessarily a commentary on previous Reports, printed copies of which we have been provided with.

In the performance of this duty, I have endeavoured to limit myself, as nearly as possible, to the specific instructions contained in the communication above referred to; and have abstained from advancing speculative or theoretical opinions, confining myself to a fair practical statement of the case, meeting opinions with facts, and adopting the views of the able scientific gentlemen who have been selected to specially report on the subjects of their particular province.

Having arrived at conclusions different to those of the Barrack Commission, but believing their views to be founded on insufficient evidence, and in some respects on incorrect data, I trust it may not be deemed either presumptuous or disrespectful, having placed the opinions I have arrived at, on careful consideration of all the circumstances involved, in somewhat emphatic language. It is but just to those gentlemen to state the advantage derived from the perusal of their valuable reports, many of the statements in which, particularly regarding the principles of barrack construction, I concur in. The chief fallacy in their report appears to be in regarding Netley as a Hospital intended exclusively for the treatment of acute and infectious disease, whereas it is in reality a species of Hotel des Invalides and Fort Pitt combined: hence the form of building adopted. It is likewise due to these gentlemen to admit the very great advantage experienced, in a better acquaintance with, and a more thorough investigation or ventilation of, the subject, from the additional evidence of the scientific and able men, who have favoured us with the views, facts, and opinions on which our judgment has to a great extent been founded.

I have the honour to be,

Sir,

Your most obedient servant,

J. MOUAT,

Deputy Inspector-General of Hospitals.

Colonel O'Brien, Assistant Quartermaster-General,

President of Committee on Royal Victoria Hospital.

Locality, Site, Climate, and Sanitary Considerations.

Having carefully perused and studied all the printed and other documents placed at our disposal by Colonel O'Brien, President of the Committee, together with the maps, plans, drawings, &c., and having satisfied ourselves, by a personal visit to the locality, an inspection of the grounds, buildings, &c., now in progress under the superintendence of Major Ravenhill, of the Royal Engineers, from whom we have derived much valuable information, we must confess at starting feeling somewhat perplexed—

1. By the contradictory nature of the opinions advanced by men of such acknowledged ability and standing as have subscribed their names to the Confidential Report on the Victoria Hospital.

2. By the comprehensive and important nature of the considerations involved.

3. By the difficulty of meeting and answering theoretical objections, by purely practical refutations, based on general and local experience; and here, it is submitted, we are bound to attach more weight and consideration to the opinions and statements, of the resident medical gentlemen of Southampton than appears to have been conceded to them, borne out as they are by the returns of the Registrar-General.

Nature of the Climate, Site, &c.

The natural beauties and apparent salubrity of the site selected for the erection of the Royal Victoria Hospital, at Netley, cannot fail to strike even the most indifferent observer: situated on a gradual slope or rise on the eastern bank of the Southampton Water, an arm of the sea, which it faces, protected on the north-east by high lands, affording a cheerful panoramic view of ships passing and repassing, a finely wooded coast opposite, grounds proposed to be handsomely and tastefully laid out in ornamental gardens and walks; a covered colonnade of great length and sufficient width, forming at all times and seasons a promenade from which both the sick and convalescent can command a cheerful view of the prospect, appears to us to form as desirable a position for such an establishment as could be wished for, or chosen. But to come to the more practical and serious considerations involved in the objections which have been urged against it on sanitary grounds, namely—

"That the climate of the whole locality is soft and relaxing, and that the site of the Hospital itself, opposite to a large mud bank, is one ineligible for the purpose."

1. With regard to the climate.

This would be generally thought, as a matter of ascertained fact, to be exceedingly simple; but, it appears, to ascertain any modern fact or transaction with truth and exactness, is attended with considerable difficulty. We should not wonder that some obscurity prevails, where there is diversity of opinion; here it is but one of degree. The climate of Southampton, which is an approximation to that of Netley, is described, by its detractors, as "*soft and relaxing*" this is, we believe, the worst charge brought against it. It is likewise described, as damp and moist by some; by others as simply relaxing; and by its advocates or admirers as *mild and genial*, or *mild and temperate*. These are only relative terms, and apply strictly to the *town of Southampton*, which may be less bracing than places higher inland; but the site of the Hospital at Netley being higher than Southampton, on a rising ground, facing the water, with a clear open front, and on all sides, an ever moving or changing atmosphere, partly the result of the tides, fanned by a constant sea breeze, with a mean average temperature of 50°, we are quite at a loss to understand how it can be considered as injuriously relaxing; indeed we feel disposed to question if such a climate as any part of the coast of England possesses can be deemed relaxing to the great bulk of patients likely to inhabit this Hospital for a brief period, namely, "tropical invalids." Possessing some experience of the complaints of this class, having held an appointment in India for some time, where the whole of the invalids of the Madras Presidency passed through our hands, and having returned from that country an invalid, and disembarked in this very locality, where we had previously resided, we may perhaps be permitted to offer an opinion on the

nature of the climate, as adapted to this class of cases. Supported as these views are by all the resident medical men of the locality, we can come to no other conclusion than one favourable to it; indeed, judging by our own feelings and the experience of old Indians, both from the East and West, what is termed a "bracing or keen atmosphere" would prove injurious to both rheumatic and pulmonic affections, by far the largest classes of disease likely to come under observation; * and in winter anything but agreeable to their feelings—for who can doubt or question the susceptibility of old Indians to extremes of temperature; it is proverbial.

A reference to the Table just alluded to from the Principal Medical Officer at Chatham, showing the number of invalids treated at Fort Pitt during the last 16 years, and the nature of the diseases for which they were invalided, gives the great bulk of cases, both for home and foreign invalids, to rheumatic and pulmonic affections, just the very class for which the climate we are discussing is favourable adapted. With regard to wounds, forming the next largest item in the Return, bearing in mind they are all secondary cases, we can see nothing objectionable in the climate which is mild enough for pectoral affections, and quite bracing enough for convalescents from wounds. A climate exactly suited to all and every kind of disease, it is hardly necessary to observe, is not to be found any where; but for the majority of cases arriving from abroad, including those having the remains of tropical fevers, particularly of an intermittent or remittent type, as such cases are unknown in the district, it is fair to assume they would recover as well there as in any other part of England, of course excepting the ague districts of Lincolnshire and Cambridgeshire (*vide* Registrar-General's Return).

The question of malarious exhalation will no doubt be satisfactorily dealt with by Mr. Simon, Dr. Thomson, and Mr. Ranger; but, as before observed, disease of an intermittent or remittent type being, according to the reports of medical practitioners, nearly unknown, it is no unfair inference to adopt the conclusion that either the elements, or the conditions, or both, are wanting. We feel assured, from the facts before us, that the chemical theory of the evolution of gases from the mud, in a natural state injurious to health, cannot be supported, and that their influence on the hygienic condition of the locality has been much mistaken, or greatly exaggerated, and has led to the unfounded apprehensions on this head.†

To continue the objections advanced against the site, namely—

"That the site of the Hospital itself, opposite to a large mud bank, is one ineligible for the purpose."

The Barrack Commission, who now take the latter objection, have fallen into error; 1st, as to the extent of the mud bank opposite the Hospital, and the implied insalubrity of the site from this source; 2nd, as to the constituents of the mud itself, which, however it may offend the eye for the short period during which it is exposed in the twenty-four hours, does not appear to possess any of the deleterious qualities attributed to it by the Commission, who have gone so far as to compare it to the mud of the Thames at Westminster—an opinion contradicted by the chemical analysis and microscopic inspection, the result of both showing the organic matter to be harmlessly minute, and the mud itself more than three parts sand proverbially innocuous (*vide* Chemist's Report). Admitting the most valid objection—that it is an eye-sore, and may offend the senses—we are informed both by the civil and military engineers, that no practical difficulties exist to covering in the whole of the exposed mud in front of the building. This can be effected with convict labour at a trifling cost, will add materially to the frontage, and form an esplanade of considerable extent.

It is perhaps necessary to enter somewhat into detail on the subject of the exposed mud at low water, and its effluvium, as it appears *primâ facie* to be the most objectionable feature of the locality; but this, on analysis, in a great measure disappears, and may be safely left to be dealt with by the Chemist's Report, in which, so far as we are able to compare results, we agree.

Dr. Granville, in a work on the "Spas of England," published in 1841, states,

* *Vide* Director-General's Table of "Classes of Diseases to be provided for in Royal Victoria Hospital, as well as Sanitary Commission Report, page 482.

† The remarks of Mr. Witt regarding the prevalence of cholera in tidal inlets appears to us purely negative, and is not even borne out by the Cholera Map of 1849, published by the Registrar-General; nor are we in a position to prove that cholera obeys any fixed laws.

"Those who object to the smell arising from the mud at low water, or dread its supposed effluvium, entertain, in the case of the Southampton Water, an estuary ten miles in length and more than two broad, unfounded apprehensions." He further states, whatever debris of vegetable or animal substances the retreating wave may leave behind, neither the length of time they can possibly remain exposed before they are again re-covered by the returning tide, or the solar heat of an English climate, can induce decomposition, still less putrifaction, so as to render them a source of mischief." In fact there is nothing to putrify, the organic matter being utterly insignificant in quantity (*vide* Chemist's Analysis); this is further borne out by the unanimous testimony of the medical men and residents, whose evidence on this point is important; indeed, too much stress cannot be attached to the healthy condition of the inhabitants generally, their total exemption from disease of an intermittent character, and more especially the statement of the crew and families of the brig "Partridge," dwelling on the very spot, some of them for years, not only with immunity from disease, but in robust health. It is the strongest practical refutation of a theoretical objection, and if it does not carry conviction, *no amount of reasoning will.*

Dr. Bullar, a resident physician of eminence, writing on the climate and diseases of Southampton in 1831, says:—"The town is quite free from ague; the mud lands do not produce it, as the water upon them is never stagnant. Intermittent neuralgias are not met with; fever is not common." And we may safely add, the elements of malaria, as far as the locality of Netley is concerned, do not exist. Professor Phillips reports—"The country is open and dry, without stagnant pools of water." Both the nature of the subsoil and the natural contour of the land tend to facilitate drainage. There is no evidence that the purity of the air is affected in any degree by emanations from the exposed tract of mud in the vicinity. On the contrary, the evidence of Dr. Thomson (p. 4 of his report), goes to prove the reverse. He states:—"It would thus appear that there is supplied in nature a counteracting agency to fix the sulphuretted hydrogen (the result of the decomposition of the sulphates in the sea water by the agency of vegetable matter in the mud) as it is formed, and to prevent at least the greater portion generated from being elevated into the air. In further examining the air over the mud, I have not succeeded in discovering any evolutions which can be considered injurious to health." The analysis with regard to the peat under the surface of the mud bed, is equally conclusive. "I find the bog to be a common description of peat. I have subjected it for some weeks to the action of saline water taken from the estuary at Netley, and have not been able to detect any odour originating from the reaction, or of deleterious gas emanating from the mixture of fresh and salt water." We have seen specimens of the mud kept in open flower-pots in a sitting room, with a fire in it for days and weeks, without emitting any perceptible odour, and scarcely soiling linen; and we have had some in our own possession during the recent hot weather, with similar results. The fact is at once accounted for, on placing it under a miscroscope; it is apparently, and turns out to be, on analysis, chiefly sand, with some vegetable cells, from a species of grass growing largely at the bottom, all along the shore of the estuary, and when dried, not unlike some kinds of green hay. The calcareous and saline matters are small, being chiefly held in solution by the water, which is generally perfectly clear, and the marine vegetation distinctly visible. The live animalculæ are chiefly infusoria, harmless and useful scavengers, tending to clear it of organic animal refuse. It is scarcely necessary to allude to the effects of the sewage of the Southampton Water, as it is admitted even by Mr. Witt, "to be too small to occasion mischief;" and its existence in the water opposite to Netley, denied *in toto* by Dr. Thomson, who states that he has not been able to detect "even a trace of sewage in front of Netley," while it could be satisfactorily demonstrated that it is next to impossible it can get there. In fact, it appears to us, that nearly all the objections urged against the site and locality are more apparent than real, even the alleged injurious admixture of salt and fresh water, upon which so much stress has been laid as a source of malaria, is questionable, if not a fallacy—the analysis opposite to Netley and Cowes giving somewhat similar results; and there is no evidence on record to show that such admixture is productive of any injurious reaction. On the contrary, it is stated on the authority of Dr. Thomson, that the mixture of the salt and fresh water in the

Black Sea and Baltic, have not produced any results injurious to health, that could be attributed to chemical action. This, therefore, can have little or no practical bearing on the subject.

With regard to the next objection put forward in the Report of the Barrack Commission, namely, "that the building itself stands upon clay, of which the contractor is making excellent bricks," this is not strictly correct nor fair, as it would lead to the supposition that the whole of the foundation of the building was based upon clay, which is not the case. Pure clay is not to be found anywhere at the surface, nor nearer than fifty-five feet, while the brick earth, which has evidently been mistaken for clay, only contains 14 or 16 per cent. of alumina, which cannot interfere with the percolation of water, or render the surface damp.

The excellent and valuable report of Professor Phillips on this point is decisive, and ought to settle the question of soil and site. He says:—"Thirty-five feet above the high water mark, the floor-line of the Hospital extends for about a quarter of a mile parallel to the cliff, which is capped by a layer of flint pebbles, resting on coherent sand, in some places slightly argillaceous. The flint gravel here referred to spreads from the cliff edge over a large tract of country round the new Hospital, and gives to it, for the most part, a dry healthy character. Beneath it, the substrata vary; sands, and clays much mixed with sands, of different kinds, appearing at different places under the same gravelly covering. The alternating strata yield water to many shallow wells. The foundations of the Hospital are partly laid in the gravel, and the well which is near the centre is begun in that deposit; but in the wings of the building the gravel was thin and partial, and pale *sandy* clay was met with at or near the surface, and has been found useful in brickmaking. It is not at all like the strong clays in the vicinity of London, but is more arenaceous and appeared to be free from the bisulphuret of iron, which is so common in blue clays, and is subject to decomposition by atmospheric agencies. Considering how small is the total surface of clay, how completely it may be covered up with gravel, laid over it in all the intervals between the walls of the wards, and in the spaces around the building, and how little retentive of moisture it is when compared with other clays, I conclude no injurious effects can really arise from it. Even if the precautions alluded to were not attended to, it appears to me very unlikely that, with walls guarded, as these are, by a layer of asphalte, and surrounded by grassy lawns or gravel walks, all drained by sewers which discharge under the sea water, a well-ventilated Hospital, in a country so dry and open as this can really be damaged by a few acres of argillaceous land."

Setting aside any theoretical objections founded on the chemical effects of the deoxodising power of the sun and air, on the aluminous base, which in the present state of chemical knowledge of the subject, is uncertain; the real practical objection lies in the power of the subsoil to retain water, and thereby engender a damp atmosphere in and around the Hospital. This is fairly disposed of, if not completely refuted, by both Professor Phillips, in the remarks above quoted from his report, and in the replies to queries Nos. 2 and 3 of Major Ravenhill's report appended, in which he states:—"Both the nature of the subsoil and the contour of the Government land tend to facilitate drainage. I have never known a district where less water is retained on the surface, than the land in the vicinity of the Hospital, nor one in which the atmosphere was dryer;" and as this is completely borne out by the geological description of the strata, this objection appears to be opposed to evidence, and therefore cannot be maintained. We have already alluded to the question of the admixtures of salt and fresh water in the estuary, which appears to be so small, as not to be appreciable to the taste, and only to be discerned on careful analysis. It cannot be proved to exist opposite to Netley to any extent that may prove injurious; nay, it is a question whether it really is ever so at all, and appears to have been adopted as an assumed fact; nor is there any reliable evidence to establish the nice distinctions attempted to be drawn as to the kind, or form, or intensity of malaria produced by a salt water or fresh water marsh, or by an admixture of the two, and is, in all probability, a popular fallacy that may be safely dismissed from our minds, where there is no marshy ground.

Having thus disposed of the most important objections as to site and locality on the grounds of fitness and salubrity, likewise the extent to which the

exposed mud may be considered injurious; we shall conclude this part of the subject by stating, that a reference to the returns of the Registrar-General for the district, and a return appended showing the mortality of the most healthy as well as the most unhealthy districts in England, goes to prove, that the district or locality in which the great Military Hospital at Netley is being erected, so far from being unfavourably influenced by the alleged suppositious causes of disease, as advanced against it, is amongst some of the most favoured spots in the United Kingdom; and, while agreeing with the Commission in estimating at its true value the importance of pure air (which we contend Netley possesses) in all medical treatment, and endorsing the opinion, that "pure air, pure water and wholesome food, are in a vast number of cases more efficacious than any drugs," we must record our dissent to the style of reasoning adopted in the following paragraph of the Report, (page 23), that a "climate which is not deleterious to healthy people, pursuing healthy avocations, is not necessarily the climate best fitted for a Hospital." It is not putting the case in a fair light,—it is damning by implication and hypothetical reasoning. A good genial climate—not only where no undue rate of mortality exists, but where the reverse is the case, a climate in which the inhabitants are generally speaking long-lived, in which no endemic exists, and epidemics unknown, is as fit for the sick as the healthy; and if not fit for the one, is necessarily unfit for the other. But after all, experience is our best and safest guide in all disputed questions, and if the opinions of the local practitioners are entitled to any respect, and that of officers in the public service of any value, the testimony of Sir J. Liddell, Director-General of the Naval Medical Department, on the climate, site, and locality of Haslar (*vide* Appendix), in many respects very analogous but far inferior to Netley, is a practical refutation of every serious objection that has been brought forward, and strengthens the inference there is really nothing that can be fairly considered of sufficient importance in a sanitary point of view to justify the unqualified condemnation of the locality. The hypothetical reasoning and qualified statements contained in Mr. Witt's Report can scarcely be deemed valid objections, since they are disputed, and assume that which is not proved, viz., the existence of deleterious emanations from the soil or mud requiring the presence of an amount of organic matter that does not exist, and a temperature for their evolution unknown in the climate, as well as a concentration of the materials or elements for their production; for, supposing the chemical action of the sulphuric acid in the sea water to be exerting its influence as in a flask, we are disposed to doubt its action in so dilute a form, and at such a temperature as the water and air possesses in this climate. Without questioning the great changes that are going on in nature, or the progress of decomposition under certain circumstances, these phenomena are so imperceptible and gradual that the speculations on this part of the subject appear almost a tax upon our credulity, and cannot justify the imputation cast upon the healthiness of the site chosen for this Hospital.

We are entirely at a loss to understand upon what scientific grounds the following conclusions have been arrived at:—"The site is not probably sufficiently deleterious to injure persons in robust health, although not well adapted to promote recovery from disease." What is the nature of the deleterious influence, or where the experience that justifies such an opinion? It is not to be found in the returns of the Registrar-General, which place this locality amongst the most favoured districts of the United Kingdom, making the mortality rate as low as 18 per 1,000, while Mr. Cooper, the Health Officer at Southampton, reduces it to 15½, or nearly equal to the three healthiest districts. If these returns are correct what becomes of the "noxious gases," "deleterious and offensive effluvias," "large mud banks," "clay subsoil," "relaxing climate," "mixture of salt and fresh water," that appear to have been taken for granted as "injuriously influencing the purity of the air over the entire district." The existence of some of these causes is a fact, but their injurious tendency doubtful, others are questionable, and some of the elements are wanting *in toto*. But we look in vain for the results which it has been sought to attach these several causes as a natural sequence of cause and effect, and as they are not to be found, the inference is clear and almost may be deemed irresistible—

1. That the general character of the district is healthy, and the water pure and abundant.

2. That there are not sufficient grounds for imputing unhealthiness to the site chosen for the Hospital.

3. That the locality is free from any malarious or other injurious endemic influence, and, in a sanitary point of view, is or can be rendered as fit for the purpose as any we are acquainted with.

Plan, Construction, Ventilation, Drainage, &c.

The questions we have hitherto been discussing refer entirely to the site, locality, and climate, as affecting the selection of the spot chosen for a large Military Hospital in a hygienic point of view.

We have not now to consider the great and important question of hospital accommodation generally, involving the principles of construction, ventilation, &c., to which public attention is only beginning to be directed; but whether the form of building and construction adopted in the Netley plans is well adapted to the purpose to which it is intended to be applied, namely: "for the reception of convalescents and sick of the army serving in England, invalids from foreign stations, and wounded returning from a foreign war, or in the words of instruction conveyed to us:" "Whether seeing the class of inmates for which the building has been designed, consisting, as shown by the medical returns in your possession, of invalids, of whom only 15 in 100 will be confined to bed, and who will generally be suffering from chronic diseases, the great majority of which will be thoracic, you think the general design and arrangements shown upon the plans well calculated to provide for their comfort and promote their recovery, or whether, on the contrary, you think that design and those arrangements inappropriate to the object in view?"

Having recently visited all the large London Hospitals, and being well acquainted with the Civil and Military establishments of France and Belgium, as well as our own at home and abroad, we are surprised to find set forth as new, principles that have been acknowledged as established for years. We are still further surprised to find, condemned as injudicious, the enclosed corridor or verandah, the very *sine qua non* of military hospitals, and all public buildings in our colonies, where they afford shelter and protection from the rays of a tropical sun, and in this country, from the variable nature of our moist climate, they offer the sick and convalescent a protected promenade, accessible in all states of the weather. The advantages of a corridor are its own; the disadvantage, in a sanitary point, entirely one of mal-construction. We are at a loss to discover how a corridor of the nature and extent of the one proposed at Netley, can "tend to disseminate the foul air of the wards," bearing in mind that the corridor has, or ought to have, to a great extent, an external atmosphere, and that the wards, each are separately and specially ventilated, and not directly communicating with one another. The natural tendency of the air currents, more particularly at night, and when the windows are closed, will be into rather than out of it; that foul air, being generally warmer and specifically lighter than the outer air, will have a tendency to ascend, and escape by the chimneys, &c., and the cooler and fresher current from the corridor will rush in to replace it; the corridor, from its nature and extent, being in reality a large reservoir of fresh air for the supply of the wards, which may be either admitted at the natural temperature or slightly warmed in winter, as circumstances may require.

Impressed with the great importance of true principles in the construction of all buildings intended for the occupation of large bodies of human beings, viz., constant renewal of the contained air and escape of the contaminated," too much stress appears to be laid on cubic space, as if it alone could remedy every other defect. If this were true, every ship ought to be a floating pest house, whereas vessels have been known to make a voyage round the world, and be absent for years, without the loss of a man. Cubic air space, though highly important, is a secondary consideration to getting rid of foul emanations and a constant renewal of the atmosphere

The principles of construction, as laid down by Mr. J. Robertson, published in the "Transactions of the Manchester Statistical Society," which are true, but not new, are separate pavilions, undoubtedly the best adapted for hospitals intended exclusively for wounds and surgical injuries, acute or infectious disease,

but not necessarily the most suitable for a building intended for the purpose to which Netley is to be appropriated. The block plan is only an experiment in this country, to which it is not so well adapted as to the Continent, enjoying a dryer, warmer climate. It is too cold in winter and too hot in summer, and has not been adopted in the Model Hospital at Rotterdam, for the following reasons, which we quote as they apply in an especial matter to Netley:—

1. That the cost of such buildings for a large number of men is enormous.
2. That it involves the necessity of large wards, to which the general opinion of the profession, both civil, naval, and military, is opposed.
3. That it likewise involves the necessity of opposite windows, which, however favourable to ventilation in a warm climate and fine weather, is not so at all times.

That this construction involves a draught to which sick are extremely sensitive and much opposed, and it has been found to occasion considerable inconvenience and annoyance, even to the production of ophthalmia, from the light falling directly on the patients' eyes; obliging the adoption of bed-curtains, to which medical men in this country, and in the army particularly, strongly object.

Without entering in detail into the objections of the Middlesex Memoralists, which do not apply to a Hospital not specially intended for the treatment of acute or infectious diseases, or comparing a building situated in a clear open space with a perpetual sea breeze, to one placed in a large, densely populated district, where many of the patients are in bed, or noticing the strange inaccuracies contained in their report, we must consider as the real question referred to us for opinion, whether, the end in view—viz., to provide invalids returning from foreign service, suffering from chronic diseases, and sick and wounded sent from the seat of foreign war, or awaiting their discharge from the service, or return to duty—would be obtained by the plan of building proposed.

As our report is limited to the building already in progress, and to its adaptation to the end in view as shown on the designs, and explained to us by Captain Laffan, we shall proceed at once to discuss its construction, without trenching on the province of the engineer, to whom all the matters of architectural detail must necessarily be confided. The first and most important question that suggests itself is the form of building selected; and we think that Captain Laffan has shown good reason and sound judgment in the adoption of this form of building for the purpose; and, although disposed in favour of separate blocks, for the treatment of surgical injuries, and acute or infectious disease, such a system was neither adapted to the ground nor the end in view. We likewise approve of, and consider the reasons assigned for the adoption of the corridor as a means of communication not only the best, but the most useful; it will be comfortable to the inmates, affording them a pleasant retreat from the sick ward, irrespective of the weather, so proverbially treacherous in this country; and, if properly ventilated, will form a reservoir for fresh air, that can be admitted into the wards at all times and all states of the atmosphere.

We cannot therefore agree with the Middlesex Memoralists, either in their premises or conclusions; if the first are wrong, the conclusions must be erroneous, and if right, the conclusions are not necessarily right also; for they involve both matters of fact and opinion; the facts are denied, the opinions disputed. The wards do not communicate with one another, or directly with sculleries and latrines, and the contaminated air cannot escape into the corridor, and thence from one ward to another, or the laws of diffusion must be strangely perverted, and the ventilation of the wards themselves entirely lost sight of. That a corridor, constructed on the principles of the one proposed, which does not destroy the benefit of transverse currents of air, but only moderates and modifies it—that with such large windows, directly facing those of the wards, there can be any serious obstruction to the admission of light or sun, may be disputed. The sun gains admission to the wards at 1 P.M., but we are not disposed to attach great importance to the admission of a *constant* or *large* amount of sun-light into wards; the glare is exceedingly inconvenient, and the moment it gains admission, it is obliged to be excluded by means of blinds. For the same reason we prefer not to have the light directly in our eyes in an apartment designed for sleeping. In the opinion of the engineer, in which we coincide,

the proportion of windows to cubic space is ample to ensure a sufficiency of light for all purposes—light introduced from the end of an apartment being more effective than at the sides.

With regard to the size of the wards (which are constructed to contain 9, 12, and 14 patients respectively, with an average cubic space of 1400 feet), the general, we may say almost unanimous, opinions of both naval and military officers, as well as most civilians is in favour of small wards; such strong concurrent testimony ought not to be set aside, in the absence of evidence, that such arrangement is not equally efficacious in promoting recovery; and there can be no question that small wards are more comfortable and quiet than large ones; nevertheless, we are not indisposed to consider 20 too many in a well-proportioned roomy apartment, provided they are not acute cases.

With regard to the question of night nursing, which appears to be one of the main objections to the adoption of small wards, Miss Nightingale's opinions on this subject are entitled to great weight; but on due consideration of the subject, and a reference to the manner in which night work is done at Haslar, the difficulties on this head appear to have been overrated. It has been assumed that nearly all the patients are so ill as to be confined to bed, whereas the proportion of such cases is really very small, only 15 in every 100; therefore, the practical objection on this head, as regards Netley, is removed, for even if the whole of the 15 per cent. of patients confined to bed required night nursing, the cost of administration would not be great, indeed might be managed without female nursing at all: although we are disposed to admit, to the full extent, the incalculable advantage of female nursing in a *certain class* of cases, and the great moral effect of this admirable class of women, when well selected and of a suitable age, the difficulties will be found greater than its advocates anticipate; for, notwithstanding the romantic ideas attached to this subject, fostered and engendered by the late war, we hold that women, as a rule, can only make good and useful nurses when led to the adoption of this most trying and disagreeable of occupations, from strong moral feelings, in fact, feelings of devotion or affection; when adopted from sheer necessity or for mere mercenary considerations, as will in all probability be the case in a great majority of candidates, the risk of failure will be great and success the exception. A great moral change must come over this class, and Protestant Sisters must form an integral portion of the community, for the express purpose of supplying the necessary assistance on this head; and any one who succeeds in effecting so great an object will deserve well of their country, and confer a lasting benefit on the nation.

The subject of light, air, and ventilation, although strictly the province of the engineer, who is bound to provide an ample supply of all those indispensable requisites in a Hospital, cannot be passed over in silence. Mr. Ranger, the talented civil engineer, who will deal with this part of the subject, assures us that all these objects can be effectually provided for without materially interfering with the plans, or altering the building, which has been designed with strict reference to the class of cases which will generally form the great bulk of the inmates, yet we should not feel satisfied unless we were convinced that the structure, in all its details, hygienic and administrative, was such as to be adapted to a Hospital fit for any purpose and any class of cases. With this view, certain improvements have been suggested in the plans, which appear well calculated to effect that object, and render this establishment perfect of its kind. The ventilation, under consideration is of three kinds; first, for extracting foul air; second, for admitting fresh; third, for the escape of the products of combustion. We do not feel satisfied that any artificial system of ventilation would act with certainty and efficiency, and suggestions of a material kind, have been made by Mr. Ranger, that appear to be calculated to render this desirable aim more certain; as all this will be found fully detailed in the engineer's Report, we refrain from entering more fully into it. The means of warmth by one open fireplace in each ward, in the opinion of Mr. Ranger, will not afford sufficient warmth in severe weather; he, therefore, advocates a modification in the stoves, the chimneys of which are to be so constructed as to form the most perfect ventilating shafts, while air can be introduced at the skirting at will to flood any particular part of the chamber or bed with fresh air when necessary; the gas burners are each likewise to be constructed to form extracting shafts for foul air and the products of combustion.

It is to be hoped that, with doors and windows directly facing each other, of such ample dimensions, the windows to open in four pieces in such a manner than any given amount of air can be admitted, that in obedience to the well-known laws of diffusion, none of the ill effects from the supposed escape of effluvia from the sick need be apprehended, even at night, when the wards are full and the windows closed.

The duplicate arrangement of the kitchen, which has been objected to, and which must remain, does not necessarily *double* the expense, as would be inferred from the remarks on this subject, or even materially increase it, and is fully counterbalanced by the meals being served up hot, with punctuality and dispatch, which could not be the case if one large central kitchen was adopted.

The construction and position of the water-closets is good and convenient; they are sufficiently ventilated to cut off the escape of impure air into the wards; the pipes are large; the water supply for flushing abundant; but an extracting foul air flue between the valve and the trap has been suggested by Mr. Ranger as tending to completely prevent the escape of any noxious effluvia into the chamber itself; the floors, walls, and ceiling, are of Parian cement; the main sewer, which has a fall of 100 feet, is egg-shaped, 6 feet in diameter and 3 feet wide; it runs parallel to, and 8 feet in rear of the building, and escapes 250 feet beyond high water mark. All the pipes are twice trapped.

A very complete system of ablution and baths has been provided, which we apprehend the most fastidious fault-finder will not object to, and we trust the very elaborate investigations which have been entered into, and a better acquaintance with all the facts and details of the case, will produce a change in the opinions and sentiments, and modify the conclusions arrived at by the eminent and able men who have so zealously and faithfully devoted their time and attention to this interesting inquiry.

There are other matters of detail, such as the nurses and orderlies apartments, the arrangement of the yard and outhouses, store-rooms, pack-stores, &c., and the other necessary concomitants of a large Military Hospital, all of which appear to have received the most careful attention on the part of the authorities, and which may be safely left in the hands of the able officers to whom the task has been confided.

It has been suggested to pave the corridor with stone, or some other material, and to place iron doors at certain intervals, either to isolate any part of the building, or to prevent the spread of fire in case of accident. We feel no doubt that these, and all the suggestions that have been made, will receive due attention, and that all engaged in this inquiry can be actuated but by one motive—the desire of administering to the comfort and happiness of our fellow creatures, and the saving of human life.

J. MOUAT,
Deputy Inspector-General of Hospitals.

NOTE.—We have left the question of disembarkation of sick to the decision of the Naval authorities, but do not apprehend any difficulties on the subject of facility of access from the sea.

No. 19.

Report of Robert Cooper, Esq., Surgeon, 4th Dragoon Guards, on the Royal Victoria Hospital, Netley.

INTRODUCTORY REMARKS.

It is not my intention to enter at any length into the consideration of the subjects embraced in this report. I shall content myself with a few passing comments upon the leading topics under discussion, in order to justify the views I entertain relative to certain questions about which differences of opinion exist.

To facilitate the inquiry it will be necessary to enter into the following subjects and their sub-divisions:—

I. The Site.

II. The Climate.

III. The Influence of the Local Atmosphere upon Convalescents and Sick, arriving from the Army serving in England, or from Foreign Stations.

IV. Whether the Victoria Hospital is suited to the intention for which it was designed.

In furtherance of the object in view, it will be necessary for me to avail myself of the valuable statements, from time to time submitted to my notice, during the prosecution of researches. It will be my aim to form sound conclusions, by drawing them solely from facts, under the conviction that inferences based upon positive knowledge must possess a value far in advance of that which belongs to deductions founded upon questionable and speculative data.

I. SITE.

Under this head it will be convenient to treat upon the following important subjects:—

1. *The* Geological Formation *of the District.*

2. *The presence or absence of* Swamp *near the Victoria Hospital.*

3. *The extent of* "Mud" *in the vicinity of the Building, and its effect upon the local atmosphere.*

4. *The existence of* Peat *below the surface of the shore, and its alleged power of emitting deleterious gases.*

5. *Whether* Surface and Subsoil Drainage *can take place in a degree sufficient to affect the district beneficially.*

6. Composition of the Water in the Southampton Estuary, *and the means employed by nature to prevent the generation of a malarious atmosphere, where fresh and salt water are intermixed as a daily occurrence.*

7. *To what extent the* Sewage Matter *of Southampton, and of remote districts, can affect the air at Netley.*

8. Water Supply.

9. Approach.

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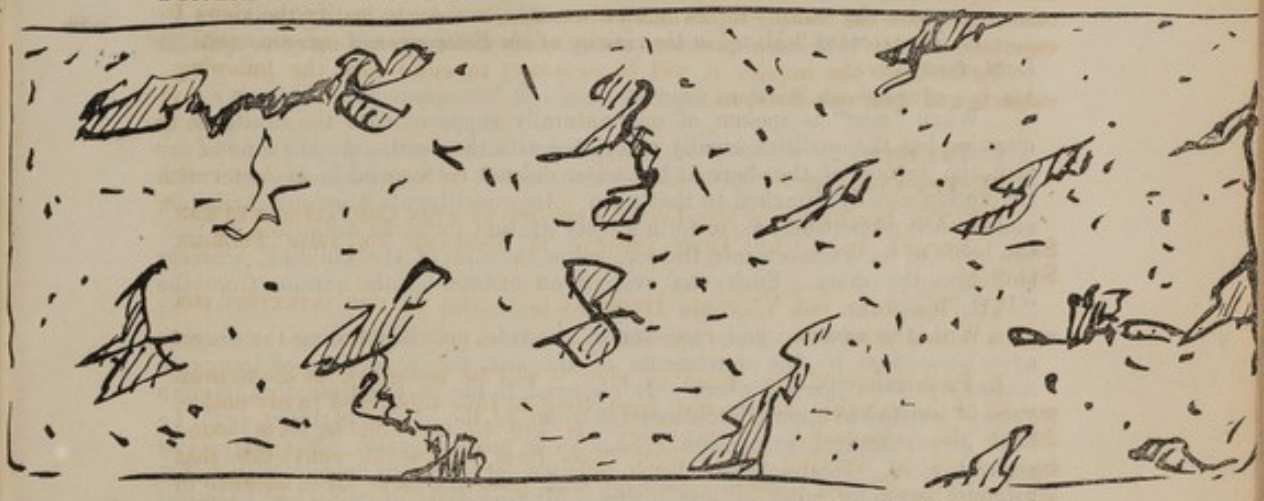
1. The Geological Formation *of the District.*

It is quite needless to recapitulate the remarks of Professor Phillips and Major Ravenhill on this topic. I have merely introduced the subject that I may refer to a passage in the "Report on the Victoria Hospital, Netley," at

page 23, par. 7, viz., "*The building itself stands upon clay, of which the contractor is making excellent bricks for the construction of the Hospital. This clay subsoil has also been made another ground of objection to the site.*"

When visiting Netley I took some trouble to ascertain whether this quotation could be established. Upon inquiry I was given to understand that the whole of the front part of the building rests upon gravel, with the exception of the right wing, beneath which there is a soil consisting of gravel and clayey matter intermixed, the former being greatly in excess of the latter, so that the whole is readily permeable by water. I next inquired into the composition of the brick earth found upon the spot. On being conducted to an undisturbed bed of the formation, I immediately noticed its very peculiar structure, which seems to have been hitherto overlooked. The accompanying sketch represents a section of the "*brick earth*."



The shaded portions consisted of pure sand, and were more or less connected with each other in various directions. The intermediate structure was composed of fine clay and sand, combined in such proportions as allowed of percolation of water through their mass.

Having thus given the physical characteristics of the "*brick earth*," or "*clay*," continuous with that which has been stated to exist beneath the building, as part of the superficial strata, I need not enter into the consideration of the beds of pure sand which lie deeper, since they have not been called into question as hurtful to the site.

With reference to the geology of the entire district, it only remains for me to observe that, in consequence of the porous nature of the ground, water rapidly disappears from its surface. Indeed, the country for miles around Netley is known to be absorbent of rain in a high degree.

2. *The presence or absence of* Swamp *near the Victoria Hospital.*

On the north-west by west side of the Government land there is a valley, through which a rivulet flows into the Southampton Waters. The bed of the valley has an area of 10 acres 340 roods, and is at spring tides liable to inundation, especially during the prevalence of southerly winds. A very disagreeable smell is at times encountered at the bridge which spans the rivulet, as it flows on to the beach. This is occasioned by the proximity of a sewer, which at this point discharges its contents into the fresh water stream. As the sewer merely drains an adjacent house, there can be no great difficulty in deviating the course of the refuse.

The Southampton Waters do not flow into the valley on the south-east by south boundary of the site, a sluice gate having been placed to cut off the communication. After heavy rain a good deal of water lodges in the valley, the level ground of which occupies an area of about 4 acres 838 roods, disposing it to emit deleterious gases.

Estimates have been forwarded to the Government to cut off all communication between the valleys and the Southampton Estuary. Proposals have

likewise been made for the complete drainage of the land. Should these objects be effected, no apprehension need be entertained of unfavourable emanations from wet soil close upon the buildings.

Soon after leaving the Itchen Ferry, as you proceed in the direction of Netley Abbey, there may be seen, on the left hand side of the road, some wet ill-conditioned land, of a swampy character. Its distance from the Victoria Hospital is too great to permit its emanations to reach that building, should any be at times evolved. The records in the Registrar-General's office seem to disprove the existence for miles around of the causes of endemic disease. We are therefore to infer that lands of a marshy character are scarcely to be met with elsewhere in the district.*

3. *The extent of* "MUD" *in the vicinity of the Building, and its effect upon the local atmosphere.*

When "*mud*" is spoken of one naturally supposes that the substance in question has the qualities usually associated with the word. At the time of my visit the surface of the shore at low water did not correspond in character with the notion usually attached to that term. Its constituents were so distributed, and in such proportions, as to form a solid stratum for some distance. In fact, the hoofs of horses taken into the sea, below the site of the building, scarcely sink into the shore. Such was evident on examining the surface from the "Partridge" brig.

With the advance and recession of the tide, notwithstanding the disturbance occasioned by the movements of the sea, not a particle of inorganic matter was seen floating about. It occurred to me at the time, that if mere "mud" existed to a considerable extent, some of the lighter particles would be held in mechanical suspension. Such was not the case. *The water was perfectly clear.* I cannot consider it possible for waves to move over "mud" without becoming more or less turbid. Microscopical examination, chemical research, and the unaided senses, testify to the shore being composed principally of sand, with here and there a predominance of matter subjecting it to the designation of "*mud*," which matter, however, extends at spring tides over a space of nearly 300 yards, and not over an area of 600 to 800, as stated elsewhere.

The odour which at times is perceived on the shore is in all likelihood identical with that distinguishable at other sea side places. Peculiar conditions of the atmosphere seem to favour its production. Many hold that it depends upon the evolution of bromine and iodine, which are beneficial in certain diseases. Be that as it may, I can scarcely believe that it originates in decomposition of an injurious character, inasmuch as, *the probable effects from such a cause cannot be traced in the district.*

Whilst reflecting over the subject, it occurred to me, that injurious emanations could not be evolved so long as the organic components of the soil were separated from each other, by the simultaneous presence of excessive moisture, and a large proportion of inorganic ingredients, since, such a condition must prevent the free access of air to the particles susceptible of decomposition, and hence, retard, or, altogether stop, purtrescency, with its consequent escape of gaseous compounds.

We are not to be unmindful of the summer growth of luxuriant marine plants, which spread over the entire expanse of the shore. The covering they afford protects the "mud" from the sun's heat, and contributes, moreover, to the absorption of any gases which perchance may escape from the soil.

It has been said that if the "mud" is disturbed, it emits a disagreeable smell. No apprehension need be entertained on that score, inasmuch as, the navigation of the estuary by steamers is too limited to give rise to any displacement on the banks.

Allowing for the sake of argument that gases do now and then find their way into the atmosphere, it follows, by a law of nature, that being rapidly and extensively diffused through space, they are rendered harmless by infinitesimal dilution.

* Vide Tables called for by the Committee.

4. *The existence of* PEAT *below the surface of the shore and its alleged power of emitting deleterious gases.*

I have always been given to understand that peat possesses properties capable of preserving animal and vegetable substances. The formation occurs elsewhere along the coast of England, but I have not heard that it has ever occasioned emanations injurious to the public health. The deposits have remained for centuries unaltered in composition, so far as we know, and they are likely to continue innocuous through time. The presence of peat far below the surface of the shore requires no further comment, beyond, its depth attests to its harmlessness.

5. *Whether* SURFACE OR SUBSOIL DRAINAGE *can take place in a degree sufficient to affect the district beneficially.*

The gradual inclination of the land seaward in itself provides for surface drainage.

As bearing upon the subsoil drainage we must remember the characteristic features of the brick earth. The various strata from the surface, to a depth of 56 feet, facilitate the rapid escape of excessive fluid from the superficial beds. The natural level of the water in the well is more than 16 feet below the surface. This fact is a satisfactory proof of the dry nature of the general superficies of the land. I therefore cannot understand *how the foundation of the Hospital should ever prove damp.* The conditions are too favourable to permit it. Even should any doubt be entertained on the subject, it would be an easy matter to provide against the escape of moisture from the soil, within the walls of the building, by a layer of concrete being spread beneath the ground floor.

The geological formation of the neighbourhood for miles around is such as to occasion the disappearance of rain soon after it has fallen. The local distribution of the soil appears, therefore, to be highly advantageous in contributing to a drier atmosphere than might otherwise exist. Evidence on the subject might be accumulated from many sources were it necessary.

6. COMPOSITION OF THE WATER IN THE SOUTHAMPTON ESTUARY, *and the means employed by nature to prevent the generation of a malarious atmosphere, where fresh and salt water are intermixed, as a daily occurrence.*

The specific gravity of the water opposite Netley shows that salt and fresh are combined, and it must of course vary with the amount of rainfall upon 700 square miles of country, which are drained into the estuary. During floods water will of necessity be of less specific gravity than in dry weather, and this circumstance in a great measure may account for the discrepant statements made in relation to this particular.

In connection with this topic, it is highly interesting to observe the coincident results of chemical research and microscopical investigation. The former announces the predominance of saline ingredients over fresh-water constituents; the latter, the prevalence of organic forms adapted mainly to oceanic existence,* in the proportion of thirty-six marine and brackish water species, to six suited only to fresh-water life.

The supposition that injurious emanations, in the latitude of England, arise in tidal estuaries, simply from the admixture of fresh with salt water, is at variance with my limited experience. The naturalist, in treating of animal and vegetable life in such localities, testifies that they are so mutually dependent on each other, and so in affinity with the circumstances around them, as to be admirably supported under daily varying, but essentially the same conditions. Further, it would appear that the balance of existence between the two kingdoms is so wonderfully adjusted, that the one can never be created out of proportion

* Vide Mr. Warington's Remarks in Appendix C. The fresh-water species may have been carried by a flood to the shore at Netley. It is not affirmed whether they were living when examined under the microscope.

to the other, without disturbing the general harmony, and giving rise to injurious results; so that, if this beneficent equipoise were withdrawn, the vicinity of all indentations of the coast, which receive fresh water, would become more or less uninhabitable, in consequence of the evolution into the air of noxious agents derived from animal and vegetable matter in decay.

7. *To what extent the sewage matter of Southampton, and of remote districts, can affect the air of Netley.*

Chemical analysis has demonstrated that the amount of organic matter in the Southampton Water, opposite the Victoria Hospital, is inconsiderable, and not deserving of a minute's consideration. (*Vide* Mr. Witt's Report).

It is the intention of the authorities at Southampton to dispose of the sewage matter for manuring purposes, and not to allow it to pass into the estuary.

With reference to the surface drainage of 700 square miles of country, the population must enormously increase to render the daily discharge from the district appreciable in front of Netley, the oxidation and dilution which follow upon the flow of organic refuse into moving waters being an effectual preventive of mischief.

8. Water Supply.

The water for the use of the Hospital will be derived from two sources—

1. A well within the building.
2. A reservoir at some distance behind it.

The well water is reported upon most favourably by Mr. Witt. It is expected that the supply from the reservoir will be equally useful for domestic and culinary purposes.

9. Approach.

This subject requires to be viewed in different ways. I shall, therefore, divide it into the following heads:—

1. *Means of approach over a public road.*
2. *Whether it will be necessary, or not, for rails to be laid in connection with main trunks.*
3. *Facility or difficulty of landing invalids and wounded men from vessels during all states of the tide and weather.*

1. *Means of approach over a public road.*

Invalids arriving at Southampton by railway from all parts of England will subsequently have to be conveyed four miles in ambulances before they reach the Hospital. Delay in their transport must occur at the ferry which crosses the Itchen river. The shore having been regained, a nearly level road leads to Netley. No provision has yet been made for its repair, so far as I could learn. It will require to be macadamised before it is fit to receive any considerable increase of traffic. The question then occurs, who will be expected to put into, and keep in order this highway—whether the Government, the local residents, the parish, or the turnpike trust?

2. *Whether it will be necessary, or not, for rails to be laid in connection with main trunks.*

The line of railroad between Basingstoke and Fareham passes within five miles of the site. It would be out of place in me to do more than to suggest

the expediency of avoiding delay and fatigue to invalids, by conveying them direct to their destination, instead of taking them by the interrupted route of Southampton and the ferry.

3. *Facility or difficulty of landing invalids and wounded men from vessels during all states of the tide and weather.*

Before invalids from the colonial possessions, and wounded men from the seat of hostilities, could be landed *direct from shipboard*, it would be necessary to construct a pier of considerable length in the Southampton Water. Indeed, I am told it must be run out to a distance of 2,400 feet, to enable ships of large tonnage to lie alongside. Such being the case, it is for the authorities to decide whether navigation ought to be interfered with to that extent.

Unless an efficient pier be constructed, it is evident that invalids and wounded men will have to be landed in boats built expressly for the purpose. On a lee shore such a mode of disembarkation is very objectionable. The following tables will give an idea of the prevailing winds at Southampton during the years 1848, 1849, 1850. They have been arranged from records kept by John Drew, Esq., F.R.A.S., and Ph. D. University of Bâle. Under the head of winds from the land I have introduced the north-west, notwithstanding the material influence it must exert upon the Southampton Water, in occasioning general commotion whenever blowing hard. It is almost unnecessary to state the grounds on which I have included the south-east wind under a different classification, for a glance at the Ordnance chart will satisfy any one that great disturbance must be caused in the estuary during the prevalence of a high wind from that quarter, caused by the sea rolling in from the English Channel.

1. Table of Winds at Southampton during three years, which would blow from the land at Netley.

Years.	E.	N.E.	N.	N.W.	Totals.	Mean.
1848.. ..	25	78	73	42	218	..
1849.. ..	34	125	95	61	315	..
1850.. ..	34	77	141	61	313	..
	93	280	309	164	846	282

2. Table of Winds at Southampton during three years, which would blow either directly upon the shore at Netley, along the cliff, or upon the whole body of the water in the Estuary.

Years.	S.E.	S.	S.W.	W.	Totals.	Mean.
1848.. ..	39	117	89	185	430	..
1849.. ..	62	73	124	124	383	..
1850.. ..	38	86	168	108	400	..
	139	276	381	417	1213	404

From the above tables it is apparent that the prevailing winds for the three years were those which are most likely to interfere with disembarkations; and it is fair to assume that the tabulated records will, with slight variations, hold good in future years.*

* Vide Appendix A for further information.

But before any special value can be attached to the mean prevalence of certain winds, liable to interfere with the landing of men from vessels moored in mid-channel, it will be necessary to obtain data with reference to the following particulars, irrespective of wounded soldiers, who are liable to arrive at any season of the year, consequent upon hostilities abroad.

1. The months in which invalids arrive from foreign stations.
2. The direction and force of the different winds in those months.

With reference to the second query, the information can be obtained from the table, at page 63, in the Report of the British Association for 1851; but with regard to the months in which invalids arrive from the Colonies, the intelligence can only proceed from the military authorities.

Before quitting the subject, I must remark, that it is very evident the wind sometimes blows furiously over the estuary, making Netley a lee shore. The fact, indeed, needs no meteorological corroboration, since the trees on the cliff bear testimony to it, being permanently bent towards the Hospital.

The argument, that the sick from the various ships at Portsmouth are landed in all states of the weather and tide, to reach Haslar Hospital, does not apply in the case under consideration, for this reason:—the disembarkation at Haslar is carried on in a narrow sheltered creek, which is out of range of disturbance, whereas, at Netley, it will have to be accomplished in an estuary, upwards of a mile and three-quarters wide, and open to gales from the English Channel, and other quarters. In the former instance, the water of the creek must, under any circumstances, be moderately still; but in the latter, the mass of water is always liable to be urged into commotion, which might delay for days together the disembarkation of the sick.

If the port of Southampton was connected with Netley by a branch railway, the necessity of a pier opposite the Hospital would be removed.

II.—CLIMATE.

The question of climate has to be considered from several points of view. Some of the topics already adverted to, bear upon its specialities, and, therefore, it is unnecessary for me to occupy much space in treating upon the following subjects:—

1. *Local geological features in relation to the air of the entire district around Netley.*

2. *Whether the ten square miles of "mud" exposed at low water are, or are not, productive of evil consequences.*

3. *The sources whence the atmosphere of Netley are derived, and the effect of the air upon residents, so far as can be gathered from the records of sickness and mortality.*

4. *Wherein the climate of Netley varies from that of Southampton.*

5. *As to whether the climate is suited to invalids and wounded men arriving from all parts of the United Kingdom, as well as from different regions of the World.*

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1. *Local geological features in relation to the air of the entire district around Netley.*

It has already been stated, that in the vicinity of Netley, and for miles around, the arrangement of strata is such as to favour the disappearance of surface water soon after the fall of rain. Such being the case, there will be a comparative absence of atmospheric moisture; and in truth, so far as geological formation can contribute to the healthiness of a site, the position of the Victoria Hospital may be regarded as highly favourable. It would, however, be taking but a narrow view, to consider local circumstances only as influencing the atmosphere, whether beneficially or otherwise, inasmuch as ærial currents from a

distance are not without their effect, as is to some degree noticed under the third subdivision.

2. *Whether the ten square miles of "mud" exposed at low water are, or are not, productive of evil consequences?*

A good deal of doubt is thrown upon the existence of so much "mud," even at spring tides. The surveyors must have failed to inquire into the component parts of the shore. It is a simple matter to assign a common designation to a tidal beach, but the question arises, whether the report on which the statement is founded corresponds with the facts of the case.

To my mind, the soil exposed at low water is harmless, for reasons already given. I do not believe in the disengagement of elements capable of affecting the atmosphere injuriously, since *it is contrary to all local evidence.*

3. *The sources whence the atmosphere of Netley are derived, and the effect of the air upon residents, so far as can be gathered from the records of sickness and mortality.*

From the proximity of the site to the English Channel; from its connection with one of the healthiest parts of the kingdom; from its openness to the prevailing air currents of the Atlantic; and from its freedom from the local production of noxious emanations, I cannot but think that the air of Netley must be as pure as it well can be, and in confirmation of this opinion is the united testimony of resident practitioners, and of statistical documents.*

I cannot dismiss this subject without referring to a highly important fact bearing on the question of healthiness of locality. It appears that an average of 600 men have been employed at all seasons of the year on the works at Netley, without any sickness arising among them, attributable to endemic influences. Had there been malaria in the neighbourhood, it would doubtless have manifested itself, since the men were collected from all parts of England, and, therefore, were not acclimated. During two years it has been necessary to send only three medical cases from the works to the Public Hospital in Southampton, one for pleurisy, a second for spitting of blood, and the third for simple continued fever. The first was attributed to exposure, the second to over-exertion, and the third was traced to drunkenness, and laying out in the sun.†

It appears from the table in the Appendix, that the mean age at death (over a period of 44 years in the adjacent parish), was 43·4, which is very favourable. The village of Hamble was selected for the death-rate inquiry, for two reasons:—

1. On account of its proximity to the Hospital.

2. Its position at the bifurcation of the Hamble river with the Southampton estuary being favourable to the presence of any injurious emanations, should such arise from extensive mud banks at low tide.

In vain I searched through the village for children and adults in whom the characteristic traces of malarious influence could be detected. Mr. Bates declares he has never been called upon "*to attend a single case of intermittent fever*" in the parish, or, "*any disease of a malarious character in the district.*"‡

4. *Wherein the climate of Netley varies from that of Southampton.*

In Appendix D it will be seen that Mr. Bates affirms that the climate of Netley is "*mild and bracing,*" whilst that of Southampton is "*relaxing.*" It is quite impossible for a perfect stranger to venture an opinion either one way or the other. I attach weight to Mr. Bates's assertion since it is based on 25 years' experience.

* Vide statistics furnished by the Registrar-General, and the Table of Longevity in the parish of Hamble, attached to this Report, Appendix E.

† Vide Appendix B for further information on the healthiness of the site.

‡ Vide Appendix D.

5. As to whether the climate is suited to invalids and wounded men, arriving from all parts of the United Kingdom, as well as from different regions of the world.

The considerations involved in this question are answered in a great measure by the medical authors who have written on the climate of Southampton. The united testimony of the profession in the neighbourhood has since confirmed those views. From all I can learn, Netley appears peculiarly well adapted for "*thoracic diseases*," which prevail to so considerable an extent among the men for whom the accommodation is required. I have no experience to guide me to an opinion, as to whether, or not, the locality is adapted for patients arriving from the Tropics. At present, I see no reason why the climate should be unsuited to invalids suffering from the general run of trifling ailments. It cannot be expected to meet the requirements of every case. It would be unreasonable to anticipate such a result.

With reference to secondary operations being undertaken in the building, there can be no objection, provided *the ward ventilation be managed satisfactorily*, so as to maintain uniformity between the internal and the external atmosphere.

IV.—WHETHER THE VICTORIA HOSPITAL IS SUITED TO THE INTENTION FOR WHICH IT WAS DESIGNED.

After a very careful examination of the plans, I have to express my belief, that the *lighting*, *ventilation*, and *heating* of the wards intended for nine men, will be found insufficient. The end wards will have the advantage of more sunlight, and will moreover, offer greater facilities for admitting the external air by means of lateral windows, and, in consequence, will be better suited for bed-ridden cases. All the wards will require, at times, more warmth than can be given off by a single fireplace.

The building after it has undergone certain improvements, in all likelihood, will become a suitable residence for the majority of cases requiring temporary accommodation in an invalid depôt. Mr. Ranger will submit his ideas on the subject in a separate report. It is, therefore, quite unnecessary for me to enter upon the alterations suggested by him.

GENERAL DEDUCTIONS.

It may not be deemed out of place if I attempt to draw a few inferences from the preceding statements and observations, as well as from the documents submitted from time to time to my consideration.

1. The geological formation of the entire district, for miles in extent, is such as to ensure a drier state of the local atmosphere than would exist if the general strata of the neighbourhood were less absorbent.

2. The gradual inclination of the land in a south-westerly direction from an elevation of 65 feet in rear of the building, to one of 15 feet at the cliff, must be very conducive to surface and subsoil drainage of an artificial character.

3. The apprehension arising out of the exposure at low water of what is alleged to be "mud," ought, even if it were well founded, to be in a great measure relieved by a knowledge of the fact, that there is after each tidal flow of this estuary a second full flood, which has the effect of retarding the ebb of the Southampton Water, and therefore of shortening the period during which the "mud" is exposed to atmospheric and solar influence.

4. As the hour of low water is continually varying, it follows that the "mud" bank is not daily exposed to the sun's greatest heat.

5. Nature through the hot months of the year provides a natural protection to the soil against the injurious operations of heat, by extending over the whole expanse of the "mud" bank, luxuriant marine plants, whose office partly consists in purifying the water by well understood functions, and whose presence, moreover, shelters from injury, millions of organised structures, actively engaged in consuming whatever otherwise might be hurtful to the higher forms of existence, and ultimately to man himself.

6. Should any noxious gases escape from the shore, they would, according to the law of their diffusion, be dispersed in all directions into space, and thus be rendered harmless by reason of their infinitesimal dilution.

7. Even if dry peat could be fairly considered as having injurious qualities, the possibility of mischief from it would in this instance be precluded by the depth at which it lies from the surface.

8. The adaptation of organic life to the composition of the water in tidal estuaries in this country, discountenances notions adverse to the unhealthiness of such localities, and since the continual intermixture of fresh with salt water is compatible with the existence of organic life in other estuaries, there is no reason for supposing that evils arising from the death and decay of similar forms, will occur in the Southampton Water.

9. The ready oxidation of sewage matter, its extensive dilution after discharge into a vast bulk of moving water, and its appropriation as a means of existence by the myriads of organised forms with which it is brought into contact, concurrently justify the belief, that no injury could be caused to the inmates of the Hospital by any conceivable quantity of refuse from the 700 square miles of country which are said to drain themselves into the estuary, even if large towns should in the course of time be scattered over that area.

10. The supply of water for general purposes of the establishment appears to be unexceptionable.

11. With reference to facility of approach, and of disembarkation in all weathers, of invalids and wounded men, the site in my opinion is unfavourable.

12. Local geological formation, together with favourable atmospherical influences from the adjacent districts, and from sources far removed, combine to render the air of Netley free from malarious taint.

13. It is impossible to have in a variable climate like that of England, an atmosphere suitable to every case.

14. The climate of Netley appears to be peculiarly well adapted to the bulk of the cases requiring only a short residence in a general Hospital prior to being invalided from the service; as well as for "thoracic diseases," which prevail to so large an extent among soldiers.

15. The site of the Victoria Hospital might be deemed very favourable for cases of constant occurrence in regiments at home, in which removal from the polluted atmosphere of towns greatly promotes convalescence and restoration to perfect health.

16. The building, after it has undergone certain modifications and improvements, doubtless will afford accommodation sufficiently suited for the majority of the complaints occurring among Army invalids.

ROBERT COOPER,
Surgeon, 4th Dragoon Guards.

May 30, 1858.

Concluding Remarks.

Since writing the preceding observations, I have received a copy of Dr. Thomson's statements. After a careful perusal of the document I do not feel myself called upon to alter a single sentence in my report. It would be occupying time unnecessarily were I to attempt any confirmation of his views. I am happy to find my opinions corroborated by the valuable chemical evidence now before me.

June 7, 1858.

APPENDIX A.

Since the tables at page 159 were arranged, I have been furnished with a copy of the Meteorological Records kept at the Ordnance Office, at Southampton, for the past three years, from which the following tables have been compiled, to correspond with those previously given.

3. Table of Winds at Southampton, for Three Years.

Hour of Record.	E.	N.E.	N.	N.W.	Total.	Years.
9·30 A.M.	32	80	41	51	204	1855 to 1856.
3·30 P.M.	34	66	34	41	175	
9·30 A.M.	34	54	47	59	194	1856 to 1857.
3·30 P.M.	29	46	45	63	183	
9·30 A.M.	37	43	26	21	137	1857 to 1858.
3·30 P.M.	30	31	22	30	113	
Total	196	320	215	375	1,006	Mean .. 335

4. Table of Winds at Southampton for Three Years.

Hour of Record.	S.E.	S.	S.W.	W.	Total.	Years.
9·30 A.M.	35	48	63	31	177	1855 to 1856.
3·30 P.M.	26	46	51	24	147	
9·30 A.M.	24	50	63	35	172	1856 to 1857.
3·30 P.M.	24	29	53	46	152	
9·30 A.M.	51	42	77	41	211	1857 to 1858.
3·30 P.M.	46	32	57	43	178	
Total	206	247	364	220	1,037	Mean .. 346

By comparing the tables it will be seen that the Ordnance records differ considerably from Mr. Drew's, the latter causing Netley side of the estuary to appear more frequently a lee shore.

Notwithstanding the close approximation in the frequency of the two classes of winds shown in the Ordnance Tables, it has to be borne in mind, that disembarkations must of necessity be interrupted during high winds, from whatever quarter they may be derived, provided they take place from vessels moored in mid-channel, in contradistinction to being "abreast" of a pier.

From the subjoined table of *calms*, copied from the Ordnance records, it will be seen, that few prevail in the district. The fact is interesting, for a variety of reasons, which need not be enlarged upon in this appendix.

5. Table of Calms at Southampton.

1855 to 1856.	1856 to 1857.	1857 to 1858.	Mean.
13	11	41	22

APPENDIX B.

Information obtained on board the "Partridge" brig, stationed on the shore close to the Victoria Hospital.

Mr. Parsons, the Chief Boatman in charge of the Preventive Station at Netley, states, he has been in command of the "Partridge" brig for nine years. Several men have joined the Coast Guard Station during his term of office. He has known many come on board in a very delicate state of health after being dismissed from hospital. The convalescents sent to him had contracted their complaints at other stations. In all instances they have regained their strength in a wonderfully short space of time. The men, women, and children, twenty-four in number, constituting the vessel's complement, invariably enjoy the best health.

APPENDIX C.

Questions submitted by Surgeon Cooper, 4th Dragoon Guards, to Robert Warington, Esq., of the Apothecaries' Hall, London, May 16, 1858.

Questions.	*Answers.*
1. What is your opinion with reference to the admixture of fresh and salt water in tidal estuaries upon animal and vegetable life? Does it occasion their death, subsequent putrefaction, and give rise to the diffusion of deleterious emanations?	1. I do not consider any ill effects to arise from the admixture of fresh and salt waters in tidal streams upon animal or vegetable life, inasmuch as, in both kingdoms, certain species are found, and abound in such localities, in a perfectly healthy state, and, therefore, death, putrefaction, &c., should not be more prevalent there than elsewhere.
2. Do you consider that banks of fresh and marine mud give out injurious emanations when exposed to the air during the period of low tide? If not, in what manner is it obviated?	2. I do not consider the banks of fresh and salt water mud, *if undisturbed*, should give out injurious emanations when exposed to the air during the period of low tide, inasmuch as the surface of such mud has already been oxidised and cleansed, and the soluble organic material contained in it removed by the water and its inhabitants; and any organic matter that may be exposed during the short period of the recess of the tide must become rapidly oxidised by the ozonised air passing over the surface, and, as the salt water with which it is saturated evaporates, the saline ingredients must increase greatly in their proportion, and thus impede any fermentation.
3. How do you consider banks of mud exposed at low water in fresh and marine inlets become cleared of their organic matter on the return of each tide?	3. I consider the multitudes of natural scavengers and purifiers, such as mollusca, jelly-fish, star-fish, shrimps, prawns, eels, soles, &c., which frequent such localities, together with the myriads of microscopic diatoms, would perfectly cleanse away all superficial decaying matter. The returning tide would also dissolve all that has been rendered soluble during its recess, and thus cover and seal up the lower and black stratum from producing any injurious action. That this is the case is evidenced by the examination of the banks of rivers, sandy sea shores, and the like.
4. What do you consider the smell to originate in at London bridge when the mud is exposed at low water, in the summer, if such exists?	4. I consider the smell which is perceived in the Thames at low water to arise from the continued churning, disturbance, and agitation to which the mud banks are subjected

Questions.

Answers.

by the numerous small steam boats which ply up and down the river, between London and Westminster bridges; by this means the decaying animal and vegetable matters in the mud are constantly stirred up, charging the waters with offensive gases. These steamers ply every fifteen minutes each way, and there are three sets of them, besides those to Greenwich, Gravesend, and rail steamers, &c.

5. What is your opinion as to the action of the sulphates of lime and magnesia present in sea water upon organic matter?

5. There is no doubt that if water, rich in sulphates, and containing also dissolved organic matter, is confined in tightly closed vessels, and exposed in warm situations, sulphides would be generated, but under ordinary circumstances, where there is free exposure to the air and tidal influence, I am convinced no such action can take place.

6. If submerged mud is black from the presence of sulphide of iron, what would be the effect of strong acid upon it, and should it yield any perceptible quantities of sulphuretted hydrogen?

6. If sulphide of iron should exist in mud, causing it to assume a black colour, *abundance* of sulphuretted hydrogen should be evolved by the action of a strong acid upon it.

7. Does ozone exist in larger quantities on the sea coast than in inland districts, and does it exert a beneficial action on the local atmosphere?

7. That ozone exists in large quantities at the sea side is generally admitted, and the experiments of Faraday, made on the air at the sea shore of Brighton, and on the downs at the back of the town, prove incontestably that it destroys or oxidises the organic emanations arising from populated districts and other sources, and is itself thereby removed from the atmosphere.

8. Will you be so kind as to examine with the microscope the specimens of mud I have transmitted, and let me know what forms of diatomacea exist in it?

8. I have made a rough microscopic examination of the specimens of mud you forwarded me, and find it very rich in diatomacea. There are twenty-nine marine, seven brackish water, and six fresh water species. The most abundant are those I have indicated in *italics*, and this I should say to a twenty-fold extent.

MARINE SPECIES, No. 29.

1. *Navicula didyma.*
2. „ elliptica.
3. „ liber.
4. *Stauroneis pulchella.*
5. *Cocconeis scutellum.*
6. „ grevellii.
7. Nitschia sigma.
8. „ angularis.
9. Synedra superba.
10. Pleurosigma littorale.
11. „ alpina.
12. „ formosa.
13. „ Baltica.
14. Actinocyclus undulatus.
15. Gomphonema marinum.
16. Campelodiscus parbulus.
17. „ Hodgsonii.
18. Grammatofera marina.
19. „ serpentaria.
20. Melosoia nummuloides.
21. Ahabdomena arcuatum.
22. Biddulphia aurita.
23. „ pulchella.
24. „ rhombus.

Questions. *Answers.*

25. Eupodiscus sculptus.
26. Amphipleura sigmoidea.
27. Achnanthes longipes.
28. „ brevipes.
29. Coscinodiscus eccentricus.

BRACKISH WATER SPECIES, No. 7.

30. *Epithemia musculus.*
31. *Tryblionella marginata.*
32. Pinnularia peregrina.
33. Pleurosigma hippocampus.
34. Homœocladia filiformis.
35. „ sigmoidea.
36. Mastologia Smithii.

FRESH WATER SPECIES, No. 6.

37. Epithemia Hyndmanii.
38. Nitschia sigmoidea.
39. Coscinodiscus minor.
40. Pinnularia major.
41. „ cardinalis.
42. Navicula patula.

Observations.—In submitting the accompanying remarks, it is necessary for me to state, that I applied to Mr. Warington for his views on certain subjects connected with Chemistry and Natural History, on account of his well-known capacity to afford me the required information. His replies to my questions being so appropriate to the subject under consideration, that I have ventured to give them in full, although they were written for my own guidance.—R. C.

APPENDIX D.

Copies of Questions submitted by Surgeon R. Cooper, 4th Dragoon Guards, to Robert Bates, Esq., Surgeon, in practice at Botley, near Southampton, Hampshire. Replies dated May 15, 1858.

Questions.	*Answers.*
1. How long have you practised in the neighbourhood of Netley Abbey, and its immediate district?	1. I have been practising in the neighbourhood of Netley for upwards of twenty-five years, and have been many years medical officer to the No. 1 District of South Stoneham Union, of which Netley forms a part.
2. Are you aware of any emanations from the banks of Southampton Water?	2. No.
3. If cognizant of emanations, do they act prejudicially upon the health of the people, so as to occasion disease of any description, and especially of a malarious character?	3. I do not remember ever being called on to attend a single case of intermittent fever, or any disease of a malarious character in the district.
4. What is the nature of the climate in the neighbourhood of Netley Abbey, and does it vary in any respect from the climate of Southampton?	4. I consider the climate of Netley mild and bracing, that of Southampton, relaxing.
5. Is convalescence unusually long after serious illness in the district of Netley, or is it otherwise?	5. Cases of serious illness are comparatively rare; in those few that have come under my notice I have not observed that convalescence has been more than usually protracted.
6. If you have had experience in chronic cases from remote parts of England, have they been restored to health within a reasonable time, or has it been to the contrary?	6. I have had no experience in the cases to which the question refers.
7. Would you consider the climate of Netley suited to invalids arriving from tropical countries, suffering from diseases incidental to such latitudes?	7. The climate of Netley being mild and bracing, and otherwise exceedingly pure, is in my opinion well suited for invalids arriving from tropical countries.
8. Does the mean age at death vary in any respect from the most healthy districts in England?	8. No. The average duration of life in Netley, and the immediate district, I should think high, and would bear comparison with the most favoured locality in England.

APPENDIX E.

TABLE of Deaths in the Parish of HAMBLE-LE-RICE, Hampshire, during a period of 44 Years.

Years.	1 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100	Total Deaths in Parish.	Of which Accidental.	Total of the Ages at Death.
1814 ..	1	1	1	..	1	..	1	..	1	..	6	..	228
1815 ..	2	1	1	..	..	3	..	..	..	..	7	..	216
1816 ..	..	..	..	2	..	1	2	1	..	..	6	..	316
1817 ..	1	..	..	..	..	1	2	..	..	..	4	..	196
1818 ..	2	..	..	1	..	..	1	..	..	..	4	..	98
1819 ..	..	..	..	..	..	..	..	2	..	..	2	..	151
1820 ..	..	..	..	1	1	1	1	2	..	..	6	..	350
1821 ..	2	..	1	1	..	3	1	..	2	..	10	..	448
1822 ..	2	..	1	..	..	..	1	1	..	..	5	..	155
1823 ..	2	..	1	..	..	..	1	2	3	..	9	..	498
1824 ..	2†	1	..	1	..	1	1	1	1	..	8	1†	322
1825 ..	..	1	1	..	..	..	..	..	..	..	2	..	38
1826 ..	2	..	1	1†	..	1†	2	..	3	..	10	2†	486
1827 ..	1	..	1	..	..	1	1	1	1	1	7	..	400
1828 ..	2	1†	..	..	1	..	..	1	..	..	5	1†	145
1829 ..	2	..	1	..	2	..	..	1	..	..	6	..	194
1830 ..	..	1	1	..	..	..	..	..	1	..	3	..	130
1831 ..	3†	1	..	1	2‡	1†	1	4	1	..	14	4†	643
1832 ..	3	..	..	..	1	2	1	4	..	..	11	..	566
1833 ..	..	3‡	1	..	2	2†	2	..	..	..	10	3†	319
1834 ..	2	..	1	..	1	..	2	2	1	..	9	..	440
1835 ..	2	..	1	..	..	1	..	..	..	..	4	..	61
1836 ..	2	1	..	1	..	..	2	2	..	..	8	..	334
1837 ..	1	..	..	..	..	..	2	4	..	..	7	..	427
1838 ..	1	1	1	..	2	2	..	..	1	..	8	..	312
1839 ..	..	..	1	..	..	..	1	2	..	..	4	..	241
1840 ..	..	..	1	..	..	..	..	..	1	..	2	..	109
1841 ..	2	1†	..	1	..	..	..	1†	1	..	6	2†	304
1842 ..	2	..	3	..	1	..	..	..	..	1	7	..	218
1843 ..	1	1	..	..	..	..	3	..	1	..	6	..	288
1844 ..	..	1	..	..	1	1	..	2	2	..	7	..	435
1845 ..	1	..	..	..	1	..	..	2	1	..	5	..	283
1846 ..	4	..	..	1	..	..	..	1	1	..	7	..	197
1847 ..	3	..	..	..	1	1	..	1	..	..	6	..	176
1848 ..	2	1	..	2	1	..	..	1	..	..	7	..	202
1849 ..	1	1	1	..	2	..	..	1	1	1	8	..	361
1850 ..	1	..	..	..	1	..	..	1	1	..	4	..	213
1851 ..	1	1	..	..	..	..	..	2	..	..	4	..	162
1852 ..	4	1	..	1	..	1	3	1	1	1	13	..	540
1853 ..	2	1	..	2	1	..	4	3	1	..	14	..	640
1854 ..	3	1	..	..	1	..	..	1	1	..	7	..	221
1855 ..	2	1	..	..	..	..	1	1	1	..	6	..	253
1856 ..	2	..	..	..	..	..	2	..	..	..	4	..	128
1857 ..	..	..	1	2	1†	2	1	..	..	..	7	1†	294
	66	22	21	18	24	25	39	48	28	4	295	14	12,738

MEAN AGE AT DEATH CALCULATED ON A PERIOD OF 44 YEARS, 43·4.

Remarks.—† This symbol against a number directs attention to the decennial period in which the accidental death occurred.

‡ This symbol denotes that two deaths happened within the decennial period.

The population of Hamble in 1835 was 318
" " 1851 " 443

Among the casualties in the Parish of Hamble, 11 were drowned, 2 accidentally killed, and one burnt to death.

ANALYSIS of the Deaths among Children under 10 Years of Age within a period of 44 Years in the Parish of HMBLE-LE-RICE, Hampshire.

Birth to 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	Total Deaths within 44 years.
31	10	6	6	3	3	..	1	3	3	66

APPENDIX F.

List of Burials in the Churchyard at Hamble-le-Rice, of Extra-Parochial Residents, during 44 years.

	Name.	Place whence the body was received.	Age at Death.	Year of Burial.	Remarks.
1	Ann Humphrys	Manchester ..	55	1814	
2	Richard Coombes	Titchfield ..	68	1816	
3	John Buckland	Hound	62	1816	
4	Elizabeth How	Botley	43	1817	
5	Edmund Hanstretch ..	Died at Sea ..	30	1818	Parish not known
6	Francis S. Pottinger ..	Southampton ..	15	1819	
7	Ann Gordon	Do.	39	1819	
8	George H. Allies	Do.	6 months	1819	
9	Edward Taylor	Bath	84	1820	
10	Edith Sutton	Southampton ..	52	1821	
11	Mary Benham	Botley	54	1821	
12	Elizabeth Clark	Bursledon ..	80	1823	
13	Caroline Sivary	Southampton ..	3	1823	
14	Charles Sivary	Do.	4 months	1823	
15	John Woolridge	Alverstoke ..	83	1824	
16	George Coles	Portsmouth ..	11	1824	
17	Harriett T. Harford ..	Southampton ..	12	1825	
18	Maria Turble	Titchfield ..	31	1825	
19	James Gamman	Do.	5 months	1825	
20	Harriett Wightman ..	Southampton ..	51	1825	
21	Samuel Ridett	Do.	24	1825	
22	Phœbe Scovell	Do.	6 months	1829	
23	John Miller	Do.	43	1829	
24	Clara Ayling	Do.	3	1830	
25	Harriett Berry	Hound	2 months	1830	
26	Mary Wheeler	Barsledon ..	84	1830	
27	Frances E. Harford ..	Southampton ..	26	1830	
28	James Sutton	Do.	58	1830	
29	Elizabeth Scoury	Do.	5	1830	
30	Joseph Newman	Titchfield ..	36	1831	Drowned
31	George Huxman	Hound	88	1832	
32	James Draper	London	46	1833	
33	Isabella Munday	Titchfield ..	40	1833	
34	Ann Porch	Southampton ..	71	1835	
35	Eliza Scovell	Do.	37	1836	
36	Eliza T. Ridett	Lyndhurst ..	3 months	1839	
37	Emma F. Needle	St. Mary Extra ..	1	1839	
38	James Walsh	Southampton ..	32	1840	Drowned
39	Eliza Scoury	Do.	23	1841	
40	Eliza Scoury	Do.	2	1841	
41	William Scoury	Do.	3 weeks	1841	
42	Lucy Miles	Do.	53	1841	
43	Elizabeth Parsons	Do.	75	1841	
44	Caroline E. Price	Do.	3	1842	
45	Edward H. Knight	Do.	2	1842	
46	Sophia Walsh	Do.	34	1842	
47	Margaret Buckland	Hound	51	1842	
48	Edward Brown	Southampton ..	27	1843	Drowned
49	John Philip Oke	Do.	46	1844	
50	Mary A. B. Barney ..	Charlton, Somerset	28	1844	
51	Laura Ridett	Lyndhurst ..	4	1845	
52	Mary Smith	Southampton ..	86	1846	
53	William Linney	Do.	49	1846	
54	Ann Hawkins	Do.	81	1847	
55	Charles Scovell	Do.	24	1849	
56	William T. Wren	Do.	42	1850	
57	Richard T. Daneford ..	Do.	3	1850	
58	Edwin Bath	Do.	26	1850	
59	Richard Whitewell ..	Hound	49	1851	
60	Charles Sutton	Southampton ..	49	1851	
61	Ellen M. Tauverine ..	Southsea	15	1851	
62	Giles Strugnell	Southampton ..	83	1851	
63	John Scoury	Do.	25	1851	
64	William H. Batchelor ..	Do.	1 month	1852	
65	Sarah Coles	Portsmouth ..	72	1855	
66	Catherine Scoury	Southampton ..	67	1855	
67	William Wren	Shirley	20	1855	
68	Grace E. Webber	Brighton ..	44	1858	

Of the five burials in Hamble churchyard, from the neighbouring parish of Hound, the mean age at death will be found to be 50.

No. 20.

Report of Dr. Bullar on the Site of Netley Hospital.

Questions.	*Answers.*
1. What is the geological formation of the ground at the spot chosen for the erection of the Hospital? What is the character of the principal strata, in what order do they occur, what is their depth, and in what direction do they slope or dip?	The geological formation on which the Hospital stands is that which geologists recognise as the "Brocklesham sand" division of the tertiary formation. The series of beds in this formation consists of alternations of sands and clays or arenaceous clays, forming in their aggregate a depth of 700 feet, and they overlay the London clay, the plastic clay, and the chalk formations. At Netley the strata are nearly in a horizontal position.
2. Is the general character of the formation such as would facilitate the draining off of surface or rain water, or is it such as would arrest that natural drainage and retain the water, so as to form a wet soil, or engender a moist atmosphere?	The whole district of country round Netley is covered with the "drift" of flint pebbles and sands, and the soil is consequently naturally well drained and dry.
3. Are there any beds of clay under the building, and if so, at what depth do they occur, and how may they be expected to affect the dryness of the building?	The foundation of half the left wing is on gravel, and the rest on a mixture of gravel and of sandy clay, which layer extends at the well to a depth of 16 feet 6 inches. This forms an excellent foundation for the structure, as the building is on a slope, with such a fall towards the sea as to give every facility for perfect drainage. The foundations are laid on a bed of concrete, 2 feet 6 inches deep, and 5 or 6 feet broad, and the walls have been carried up with brick in cement, with a layer of asphalte 1 foot 6 inches above the surface, and no fears need be apprehended of any dampness from the sandy clay.
4. What is the extent of mud left exposed at low water, at the spot where the Hospital is being erected, at ordinary and at spring tides, and how often do the latter occur?	At spring tides the mud along the shore in front of the Hospital is uncovered to the extent of 300 yards, and to a somewhat less extent at ordinary tides. During neap tides the mud is uncovered only to the extent of 100 yards. The spring tides occur once a fortnight.
5. How many times in the twenty-four hours is that mud covered, and left uncovered by the water?	The mud is uncovered twice in the twenty-four hours, but it remains uncovered to its full extent about a quarter of an hour only in each tide, or whilst the tide is at "a stand." The tides in Southampton Water are very peculiar; they run up seven hours, remain at full tide two hours, and then run out in three hours. During the two hours of high water there is a slight fall and a second rise, the second high tide generally exceeding the first.

Questions.	*Answers.*
6. What is the character of the mud, what proportion of vegetable organic matter, and what proportion of animal matter does it contain, and what effect has the sea water or the mixture of sea and fresh water, such as it exists at Netley, in decomposing these various substances?	The mud is of the usual blueish brown colour of estuary deposits, and is more or less mixed with sand in various parts. There is a thin covering of sea weed in some parts, principally consisting of the long thin filaments of the "Zostera Marina," which when dried was formerly and to some extent is still used instead of hair or feathers for stuffing beds with. There is of course also a certain amount of animal matter in the worms which here, as everywhere else, live in the mud; and winkles are numerous on its surface. Examined by the microscope the mud consists mostly of silicious and calcareous matter, with some minute and living infusoriæ and confervæ, and these low forms of living growths are the reverse of noxious, as they convert dead matter into living matter, and so prevent it from becoming noxious. The water of the estuary has no particular effect in decomposing these various substances, but on the contrary these forms of animal and vegetable life are sustained in health by the water.
7. Do you anticipate that any gases, or odours prejudicial to health, are likely to be engendered by the action above referred to?	As a practical answer to this question, it may be stated that there is a hulk for the Coast Guard (called the "Partridge," Coast Guard watch vessel), drawn up on the shore below the new Hospital, where at the present time 24 persons are living. Mr. Parsons, warrant officer of the Royal Navy, in charge, has lived on board the whole time for the last eight or nine years, with seven men, their wives and families. He has never had a day's illness; all on board during the whole time have been particularly healthy; there has not been a case of fever, ague, or severe illness, and during this time from seven to twelve invalids have been sent from other stations, all of whom have soon recovered their health. As the hulk lies on the beach, half in the shingles and half in the mud, so that those on board must be fully exposed to any gases or odours from the shore, this evidence of the wholesomeness of the air is highly satisfactory.
8. What is the character of the stratum of peat which lies under the mud opposite to the site of the Hospital, and do you think that the salt water, or the mixture of salt and fresh water, such as it exists at Netley, is likely to exercise any action upon the peat such	The peat, which lies 6 or 7 feet under the mud, forms part of the great submerged forest formation which extends all round the coast of the United Kingdom, and to a great extent along the shores of the Continent. It is composed of ordinary peat, with a great

Questions.

as would cause the evolution of gases prejudicial to health?

Answers.

quantity of timber in a high state of preservation in it. The antiseptic power of peat is well known, and if it has any influence, it must be a beneficial one, inasmuch as it prevents the decomposition of animal and vegetable substances.

9. What do you estimate to be the proportion of fresh to salt water in the estuary opposite to the site of the Hospital at high, and at low water, and what effect do you think that such admixture may have in influencing the character of the atmosphere?

The volume of salt water which enters the estuary is so large in comparison to the amount of fresh water delivered into it by the Test and Itchen rivers and some smaller streams, that the dilution at Netley is not appreciable. I have examined the specific gravity of the salt water in the estuary, opposite to the site of the Hospital, at high and low water, and also in the Solent, between Calshot Castle and Cowes, repeatedly, and I could detect no differences. This admixture of fresh with salt water has no effect, *per se*, in influencing the character of the atmosphere.

10. Do you consider that any appreciable effect is produced upon the water of the estuary opposite Netley by the discharge of the sewage of the town of Southampton; and do you consider the amount of sewage sufficient to influence the purity of the atmosphere?

The sewage of Southampton is delivered into the estuary at a point which is three miles above the Hospital, and the volume of water in the estuary is so great that it can have no effect upon the purity of the atmosphere at Netley.

11. What is the general character of the climate at Netley? What is the comparative purity of the air, as contrasted with that of other places within your knowledge? Do you consider the air to be mild or otherwise, dry or moist, bracing or relaxing; and what effect do you anticipate that the climate would exercise upon different classes of patients?

The climate at Netley is similar to that which prevails along the south coast of England, and is more equable than the climate of the central or more northern portions of the country. The air is pure, and though mild it is bracing, and in general it is free from the extremes of dryness or moisture, and is well suited for the recovery of such patients as have had their constitutions enfeebled in tropical or hot climates.

In order to ascertain the influence of the air on those in health, I made a personal examination of those men who had been employed on the works the whole time. They were twenty-six in number—a small number, owing to the change of contractors and the changes in the kind of work. But all these men had been working on the ground for two years, and several of them had wive and children in the immediate neighbourhood. Their evidence, confirmed by their appearance, was unanimous as to the extreme healthiness of the spot. Not one of these men had had any attack of illness, and only two had been slightly indisposed, whilst they generally affirmed that their wives and children, as well as themselves, had never

Questions.	*Answers.*
	had better or such good health elsewhere. Had there been any malaria this could not have been the case.
12. What is the comparative longevity of the inhabitants of the Netley district as compared with other places?	The mean value of life in the Hamble district in which Netley is situated, is thirty years.
13. What will be the means of access by water? Can patients be landed direct from vessels, or must boats be used? To what distance must a pier be carried to enable patients to be landed at all times of tide?	The invalids brought by the largest steamships may be landed at the proposed pier without difficulty, and with no more delay than occurs at the Southampton Docks.

As one of the Physicians to the Royal South Hants Infirmary and to the Southampton Dispensary, to which institutions I have been attached for more than twenty years, I have had ample opportunities of ascertaining the diseases of the town and neighbourhood, and I have always considered the whole district in which Netley is situated as a particularly healthy one, and as furnishing comparatively few patients to either institution; nor do I recollect any case indicating a malarious influence.

The same range of experience enables me to state decidedly that no malarious diseases have been traceable in Southampton to the influence of the mud, and in making this statement I am only adding my testimony to the general experience of the whole medical body. I have not known a case of ague contracted in Southampton. Those cases which I have met with were in individuals who have been first affected in other places. If therefore the large tracts of mud, on which some parts of Southampton abut, give rise to no malarious diseases, there can be no danger to the inmates of the Netley Hospital where there is only a narrow strip of mud over which the large flood of salt water from the Solent flows in, twice in the twenty-four hours for seven hours, remains at high tide for two hours, runs out in three, and only exposes at low water 100 yards at neap tides, and 300 yards at spring tides; and this mud consists almost wholly of siliceous and calcareous particles, and upon it the water never stagnates. It is hardly necessary to say that this question as to the effect of salt water mud on the health is a practical one, only to be decided by the actual experience of disease, and not by hypotheses framed by chemists on the analysis of the soil, or on possible chemical combinations.

In a sanitary point of view the site appears to me to be well chosen for a Hospital for soldiers invalided from hot countries. It is open to the south, 33 feet above, and 400 feet distant from high-water mark, on land sloping to the sea, and thus admitting perfect drainage; and the foundations are on a stratum partly of gravel, partly of sandy clay or brick earth, mixed more or less with gravel, which stratum is porous, rapidly absorbing moisture, and resting on beds of sand. The land behind it gradually rises to the north-east for two miles, protecting it from the winds from that quarter, whilst in the south-east it is fully exposed to the sea breezes from the Solent. The situation is cheerful and very beautiful, and invalids can be landed at the spot. The climate is free from extremes, mild, and yet sufficiently bracing for those who cannot bear too great a demand on their weakened powers.

(Signed) JOSEPH BULLAR, M.D.,
Physician to the Royal South Hants Infirmary.

Southampton, May 16, 1858.

No. 21.

Report of Dr. Orsborn relative to the Site of Netley Hospital.

Questions.	*Answers.*
1. What is the geological formation of the ground at the spot chosen for the erection of the Hospital? What is the character of the principal strata, in what order do they occur, what is their depth, and in what direction do they slope or dip.	It is a gravelly soil, overlying at a variable depth sand and clay, the latter resting at a depth of 200 feet, more or less, upon the London or blue clay; but for precise particulars relative to depth, order, &c., of strata, I must refer to Major Ravenhill's Report.
2 Is the general character of the formation such as would facilitate the draining off of surface or rain water, or is it such as would arrest that natural drainage, and retain the water, so as to form a wet soil or engender a moist atmosphere?	The formation is such as to facilitate to an unusual extent the draining away of rain or surface water. In exemplification of which facility I would refer to the state of the public roads in the neighbourhood, which are some of the finest in England, and from which the water drains off so rapidly, that even a few hours after the heaviest fall of rain it is practicable to walk without the slightest inconvenience. I can state from many years' personal experience that the soil does not retain the water sufficiently long to impart any degree of prejudicial moisture to the atmosphere.
3. Are there any beds of clay under the building, and if so, at what depth do they occur, and how may they be expected to effect the dryness of the building?	Clay is found beneath the gravel at a depth varying from 5 to 10 feet, but from the facilities which the strata afford for natural drainage, and which the site of the building possesses for artificial drainage, it appears to me to be impossible that the dryness of the building can in any way be unfavourably affected. In levelling the surface for the site, the gravel has been entirely removed under the east wing, so that this rests upon the clay; but for the reasons above assigned the dryness of the building *need* not be affected by this.
4. What is the extent of mud left exposed at low water at the spot where the Hospital is being erected at ordinary and at spring tides, and how often do the latter occur?	*See* Major Ravenhill's Report.
5. How many times in the twenty-four hours is that mud covered and left uncovered by the water?	It is left uncovered twice in the twenty-four hours, but as there is a second flood tide two hours after the first, this necessarily abbreviates the period during which the mud is exposed, and lengthens that of its complete submergence, so that the period of the exposure of its whole expanse is very brief; and it should be borne in mind, that this exposure takes place at a different hour on each successive day, so that it will be at distant intervals.

Questions.	*Answers.*
	that its occurrence will happen under a mid-day sun—a point of some importance when estimating the effects of that body.
6. What is the character of the mud? What proportion of vegetable organic matter, and what proportion of animal matter does it contain, and what effect has the sea water, or the mixture of sea and fresh water, such as it exists at Netley, in decomposing these various substances?	This question can be *satisfactorily* answered by, chemical analysis only, and by microscopical investigation.
7. Do you anticipate that any gases or odours prejudicial to health are likely to be engendered by the action above refered to?	I do not; and in confirmation of this opinion I would refer to the state of health of the inhabitants of the three villages situated on the margin of the Southampton Water, viz. Itchen, Weston and Hamble, the first and last of these being scarcely above the mean level of the sea, and situated moreover, the one at the mouth of the Itchen, and the other at the mouth of the Hamble river, and thus far being far more unfavourably circumstanced than is the site of the new Hospital; yet, in neither of these villages have I, during a practice of nearly twenty years, seen any disease or type of disease that could be attributed to the influence of the abovenamed causes, and I am satisfied that they exercise no prejudicial influence on health.
8. What is the character of the stratum of peat which lies under the mud opposite the site of the Hospital, and do you think that the salt water, or the mixture of salt and fresh water, such as it exists at Netley, is likely to exercise any action upon the peat, such as would cause the evolution of gases prejudicial to health?	The stratum of peat, lying at a depth of about 10 feet below the surface of the mud, is evidently composed of the remains of a vegetation very similar to that still existing; and after a submergence of now probably several centuries it is not difficult to detect amongst it fragments so effectually preserved as to enable one to decide the species of tree to which they belonged. I have seen such fragments which I have had no difficulty in recognising as portions of beech, birch, and probably elm; and as it has thus resisted decomposition to a great extent for such a lengthened period, there is no probability of any more active changes going on now, and if there were, it can scarcely be supposed that the disengaged gases could make their escape through a super-stratum of even 10 feet in thickness, and still retain their noxious properties, besides which, by far the larger portion has been reduced by decomposition to an inert condition.

Questions.	*Answers.*
9. What do you estimate to be the proportion of fresh to salt water in the estuary opposite the site of the Hospital at high and at low water, and what effect do you think that such admixture may have in influencing the character of the atmosphere?	I can only form an approximative estimate of the proportion of fresh to salt water—the former must necessarily be in small amount, as the tributary streams are few and insignificant, and I should imagine that the water of the estuary may be regarded for all practical purposes as "salt." Its specific gravity is somewhat less than that of the ocean, but as we have no recognized standard by which to measure, it is difficult to estimate the exact amount of its deficiency in saline matter. At all events its "freshness" is so small in degree that it can scarcely be supposed to modify in any measure the character of the atmosphere.
10. Do you consider that any appreciable effect is produced upon the water of the estuary opposite Netley by the discharge of the sewage of the town of Southampton, and do you consider the amount of sewage sufficient to influence the purity of the atmosphere?	None whatever. The discharge of the sewage does without doubt contaminate the purity of the air in the immediate neighbourhood, but this only to a limited extent, and certainly not so far as the site of the Hospital, a distance of three miles. In estimating the salubrity of the site, its influence may certainly be ignored.
11. What is the general character of the climate at Netley? What is the comparative purity of the air, as contrasted with that of other places within your knowledge? Do you consider the air to be mild or otherwise, dry or moist, bracing or relaxing, and what effect do you consider that the climate would exercise upon different classes of patients, either on new comers or old residents?	Mild and dry; hot in the summer, but less intensely cold in the winter than many other parts. The air of the locality cannot be surpassed for purity by that of any district in England, I firmly believe. In short there is little possibility of its being otherwise, as a south or south-east wind must traverse the open sea, whilst an easterly, north-easterly, or north wind must travel across a fine open expanse of country, scarcely surpassed in beauty by any part of England. The air is mild and dry, and must be regarded as being neither bracing nor relaxing generally; and with regard to the effects of the climate upon different classes of patients, this is a question too extensive to be entered upon within the limits now imposed. I would however observe that, as it possesses a medium character, and as the Hospital must of necessity become a receptacle for a far larger proportion of chronic and convalescent cases than of acute diseases, and considering, moreover, that its inmates may arrive from all quarters of the globe, there is a greater probability that the climate will be found to agree with a larger proportion of these than would a locality verging on either extreme of being too relaxing or too bracing; and in estimating the eligibility of the site this is a point not to be lost sight of. That it agrees

Questions.	*Answers.*
	generally with new comers and old residents may be inferred from the fact that one scarcely ever hears its salubrity called in question. Residences in the neighbourhood are eagerly sought after, and there is at the present moment but one house of large size vacant. In short, until the present agitation respecting the site of the Hospital, this neighbourhood has always been regarded as remarkably healthy, and I have opportunities of knowing that it has been so regarded almost universally. (*See* Appendix)
12. What is the comparative longevity of the inhabitants of the Netley district, as compared with other places?	*See* Appendix annexed.
13. What will be the means of access by water? Can patients be landed direct from vessels, or must boats be used? To what distance must a pier be carried to enable patients to be landed at all times of the tide?	I should imagine there will be no difficulty in landing patients, but this question can be more satisfactorily answered by those having better opportunities, and who may be more competent to form an opinion.

(Signed) JOHN ORSBORN, M.D., F.R.C.S.

Bitterne, near Southampton, May 20, 1858.

P.S.—In conclusion I would add, as my deliberate and unbiassed opinion, that taking into consideration all the requisite conditions for the site of a Military Hospital, a more eligible locality could be scarcely found in England than that selected at Netley; and that for facilities of access, capabilities of ventilation, favourable antecedent medical history, cheerfulness and beauty of situation, the locality in question cannot be surpassed; and that so far from yielding to the objections that have been raised to the site on purely vague and theoretical grounds, the military authorities will find that its salubrity can be established by evidence such as reason cannot reject, nor prejudice subvert.

Appendix to Report of Dr. Orsborn of Bitterne, near Netley, Southampton.

11. In reference to the humidity of Southampton I would observe, that in a "Meteorological Summary for the United Kingdom, for the years 1856 and 1857," compiled and published by Mr. Allnutt, comprising observations made at the following stations in England, viz.:—

Truro,	Greenwich,
Newport (Isle of Wight),	Oxford,
Exeter,	Leeds,
Worthing,	Lampeter,
Nottingham,	Bedford,
Hawarden,	Worcester,
Canterbury,	Norwich,
Bristol,	Durham.

It will be seen that the mean degree of humidity for each month of the above years has been registered at most of the above stations, and, on comparison, it will be found that in the majority of instances this is lower at Southampton than at any other place; and when not actually the lowest, it will be seen that there are seldom more than two of these localities (and these not always the same), where the mean degree of humidity has been less than at Southampton, and there cannot be a doubt that if observations were taken at the site of the Hospital the humidity of the atmosphere would be found to be still less than is shown in the above tables. The mean degree of humidity at Southampton is found to be about ·75, which is, probably, a close approximation to the most salutary degree of moisture.

12. Having carefully examined the registers of deaths for the sub-district, embracing the parishes of St. Mary Extra, Hound (parish of Hospital), Hamble, and Bursledon, containing a population of 2,716 in the year 1841, and 3,166 in the year 1851, I am enabled to give the following particulars relative to the number of deaths at different ages.

There were 500 deaths registered from the 5th July, 1837, to the 20th August, 1849, which gives an average of about 41·5 per year. Of these 500—

171	were under	10	years of age.
39	were over	10	,,
42	,,	20	,,
29	,,	30	,,
27	,,	40	,,
43	,,	50	,,
44	,,	60	,,
53	,,	70	,,
43	,,	80	,,
8	,,	90	,,

Now, if we deduct the number of those who died under ten years of age, a period of life to which many serious and fatal diseases are incidental, we shall have 329 deaths ranging through the several decades from ten to 100, and of these it will be seen that 148, or nearly half, occurred after the age of sixty, and fifty-one having lived to beyond eighty. During this same period of twelve years, fever is registered as the cause of death in eight cases only, two of these deaths having occurred in Hound (parish of Hospital),

Of the next 466 deaths registered, from the 31st August, 1849, to 7th June, 1857—

200	were under	10	years of age.
25	were over	10	"
19	"	20	"
23	"	30	"
33	"	40	"
32	"	50	"
39	"	60	"
51	"	70	"
22	"	80	"
2	"	90	"

Of the 246 deaths over ten years of age 114 occurred after the age of sixty, and twenty-four after that of eighty. During this period of eight years, fever (including gastric fever), is registered as the cause of death in fourteen cases, seven of which occurred in Hound, giving an average of less than one case per year for this parish for the above period. I doubt very much if any district in England can offer more favourable records than these.

(Signed) JOHN ORSBORN, M.D.

Bitterne, near Southampton, May 20, 1858.

No. 22.

Colonel O'Brien to F. Cooper, Esq., Officer of Health, Southampton.

Sir, *War Office, Whitehall, London, April* 17, 1858.

The Committee appointed by the Secretary of State for War to report upon the nature of the site selected for the new Royal Victoria Hospital at Netley, near Southampton, and upon the plans of that building, being desirous of obtaining the opinions of those gentlemen who, from their general professional experience or local knowledge, can best speak as to the salubrity or otherwise of the site in question, and the effect which the climate may be expected to exercise on various classes of patients, I am instructed by the Committee to solicit the favour of your opinions as to the advantages or disadvantages of the site selected for the new Hospital, and I have the honour to enclose herewith a list of questions relative to that site, and to request that you will favour the Committee with a reply to such of those questions as your professional knowledge and experience may enable you to answer.

I am instructed to inform you that the Committee is authorized by the Secretary of State for War to incur any necessary expense connected with the professional remuneration of those gentlemen who may be good enough to afford them their assistance, or with any visit made by them to the neighbourhood of Netley which may be necessary to enable them to form their opinions.

I have, &c.

(Signed) T. O'BRIEN, *Colonel and President.*

P.S.—The enclosed list of questions embraces the points upon which the Committee desire particularly to have the advantage of your opinion, but the Committee will feel obliged if you will be good enough to add any remarks or observations which may appear to you calculated to throw light upon the advantages or disadvantages of the site or the healthiness of the locality.

Major Ravenhill, R.E., who is now in charge of the works at Netley, will be requested to afford you every information and assistance in his power in the prosecution of your inquiries.

Inclosure in No. 22.

Report of F. Cooper, Esq., Officer of Health, Southampton.

Questions.	*Answers.*
1. What is the geological formation of the ground at the spot chosen for the erection of the Hospital? What is the character of the principal strata, in what order do they occur, what is their depth, and in what direction do they slope or dip?	1. The order of stratification is, first, vegetable mould, varying in depth from 3 to 9 inches; second, large rubbly gravel, varying from 2 to 3 feet; third, brick earth, composed of clay and sand, closely intermixed to the depth of 9 feet, the sand forming a large proportion. The various strata dip from north-east to south-west. The vegetable mould, gravel and brick earth forming a depth of 16 feet.
2. Is the general character of the formation such as would facilitate the draining off of surface or rain water, or is it such as would arrest that natural drainage and retain the water, so as to form a wet soil or engender a moist atmosphere?	2. No water can possibly remain on this bed; it is the best form of the Tertiary for building purposes. The drainage is perfect, because so porous as to admit of free percolation in every part and direction. It cannot create or cause a damp atmosphere; on the contrary, it is an absorbent of moisture from the atmosphere, and from its porous nature immediately filters off all such moisture, without retaining any.

Questions.	*Answers.*
3. Are there any beds of clay under the building, and if so, at what depth do they occur, and how may they be expected to effect the dryness of the building?	3. The yellow sand underlies the brick earth, and is 27 feet in depth, a hard brown clay, 1 foot in thickness, lies at a depth of 54 feet from the surface. A greenish sand, 27 feet in thickness, is found next, under which a hard dark clay 16 feet in density is found; but none of these can possibly effect the dryness of the air.
4. What is the extent of mud left exposed at low water, at the spot where the Hospital is being erected, at ordinary and at spring tides, and how often do the latter occur?	4. The greatest extent of uncovered mud is 900 feet at low water spring tides, 350 at neap tides. The whole of the mud is covered ten hours out of the twenty-four. Spring tides occur twice a month.
5. How many times in the twenty-four hours is that mud covered and left uncovered by the water?	5. The *whole* of the mud is covered five hours during each tide, and left uncovered seven hours out of the twenty-four.
6. What is the character of the mud? What proportion of vegetable organic matter, and what proportion of animal matter does it contain, and what effect has the sea water, or the mixture of sea and fresh water such as it exists at Netley, in decomposing these various substances?	6. The mud is composed of alluvial matter, chiefly clay, carbonate of lime, and siliceous debris, in a very fine state of pulverization, coloured by the disintegration or subdivision of long fimbriated algæ or marine grass, broken up by the tidal waters, and intimately blended with the superlying stratum, and which, becoming carbonized as it were, imparts the dark-brown or blackish colour to the bed of the estuary. These grasses become infinitely multiplied by their disintegration, and are diffused throughout the overlying bed of the river. There is *no* animal matter in any of these strata. The proportion of vegetable is very small compared with the vast amount of alluvium on which it lies. The mixture of sea and river water produces no injurious effect, because in point of fact the fresh water, as compared with the estuary, is infinitesimal, and absolutely inappreciable.
7. Do you anticipate that any gases or odours prejudicial to health are likely to be engendered by the action above referred to?	7. No.
8. What is the character of the stratum of peat which lies under the mud opposite to the site of the Hospital, and do you think that the salt water, or the mixture of salt and fresh water, such as it exists at Netley, is likely to exercise any action upon the peat, such as would cause the evolution of gases prejudicial to health?	8. The peat lies at a depth varying from 6 to 10 feet from the surface; in some places it is dark, fibrous, and dense; in others ligneous, with large, and tolerably well preserved portions of wood, which pulverize readily on pressure, and from which, as a matter of course, no odour can arise, nor from its depth can any escape of gas be looked for. As already stated, the fresh water is so small in amount when mixed with the estuary as to be incapable of any influence whatever. The bed of peat varies in depth from 8 to 12 feet.

Questions.

9. What do you estimate to be the proportion of fresh to salt water in the estuary opposite to the site of the Hospital at high and at low water, and what effect do you think that such admixture may have in influencing the character of the atmosphere?

Answers.

9. The water at Netley at half tide as tested by Dr. Joseph Bullar and myself gave 1·022; at the Floating Bridge of the river Itchen at full tide 1·022; at Calshot Castle 1·022; in the Solent 1·022; and midway from the Southampton pier to Calshot, 1·022: thus showing beyond all doubt that the fresh water had lost all trace, and that the character of the sea water was completely preserved. Salt pans exist at Fawley on the shore opposite to Netley. The influence of the sea water on the local atmosphere is beneficial.

10. Do you consider that any appreciable effect is produced upon the water of the estuary opposite Netley by the discharge of the sewage of the town of Southampton, and do you consider the amount of sewage sufficient to influence the purity of the atmosphere?

10. The sewerage of Southampton does not go within a considerable distance of Netley; it is pumped into the Itchen an hour after the tide ebbs, and is continued until within an hour or two of the next full flood. It is carried by the current to the main channel of the estuary, where the Itchen, the Test, and the sea water converge, and which is at least two miles from the Victoria Hospital. The channel of the Itchen runs due south to the channel of the estuary, whilst Netley lies due east from Southampton. The volume of water at the above point of convergence must counteract all deposit and effluvia, and from its qualities as a deodorant tend to neutralize or destroy its sewage character *in toto*.

The purity of the atmosphere at Netley is very great, and quite beyond the influence of any such matter whatever.

11. What is the general character of the climate at Netley? What is the comparative purity of the air as contrasted with that of other places within your knowledge? Do you consider the air to be mild or otherwise, dry or moist, bracing or relaxing, and what effect do you anticipate that the climate would exercise upon different classes of patients?

11. The climate of Netley is good. It is one of great purity, and will bear comparison with any place I am acquainted with. The climate is more bracing than Southampton, though mild, and is admirably calculated for patients labouring under chest and bronchial affections. Fever cases do remarkably well in such situations, the pure sea breezes exercising a marked effect on their convalescence.

The mean annual height of the barometer, at the Ordnance Office, Southampton, is 29·979, and the mean daily range 0·024. The mean annual temperature is 51·7; the mean daily range is 2·7. The mean temperature of the evaporation for three years is 48, and the mean daily range 1·2; the mean humidity for the same period is 0·768. The mean maximum temperature for three years is 57·6; the mean minimum is 43·4; approximate mean

Questions.	*Answers.*
	temperature 50·5; the mean temperature of the dew-point, computed from the wet and dry bulb, 44·1. Netley being distant but three miles from Southampton, may be assumed as yielding precisely the same meteorological results.
12. What is the comparative longevity of the inhabitants of the Netley district as compared with other places?	12. The mean value of life in the district of Hamble, in which Netley stands, is decidedly high, being 30 years for each person. The approximate rate of mortality is 1·54 per cent. The population of Hamble at the last census was 394 persons. There are now living in the village 12 persons whose ages vary from 75 to 83 years, and 34 whose ages vary from 65 to 75 years.
13. What will be the means of access by water? Can patients be landed direct from vessels, or must boats be used? To what distance must a pier be carried to enable patients to be landed at all times of tide?	13. If the present jetty were carried out 300 feet farther, it would enable patients to land 18 out of the 24 hours, by a boat constructed for that purpose.

Observations.

From the statistics of Netley and the district of Hamble it appears that the Tables of Mortality and mean value of life are very favourable. The geology is such as experienced sanitarians would prefer for location. The sea water has nearly the same mean specific gravity at the Hospital at half and flood tide as is found in the ocean. It is true there are differences in the amount of saline matter in different seas, but the deep ocean water may be taken at 1·026 or 1·028, whilst at half tide, or even less, it is 1·022 at Netley. The well water for supplying the Hospital, procured by boring 160 feet, is exceedingly soft and pure; tested by Clarke's soap test it is not more than 4·3 degrees of hardness. It is limpid and agreeable to the taste, yielding 50,000 gallons per day, without being affected in quantity.

All the persons resident on the works at Netley testify to uninterrupted health since the building of the Hospital commenced; those of the Coast Guard resident close to the site for many years give the same testimony. It is worthy of remark that throughout the district the same proof of health was afforded by all of whom inquiries have been made. The aspect of the Hospital is fine, and its proportions noble. The estuary, a source of health and mental enjoyment, such as cannot fail to conduce to the benefit of convalescents, and to the amelioration or recovery of those, more especially, who have suffered from attacks of a bronchial or pulmonary character. Ague and intermittents are unknown in this locality, instances of longevity are frequent, and as a rural population few places surpass it for vigorous and rude health. When laid out and planted, and its walks are gravelled, no place will present greater attractions, nor will the invalid soldier find in any part of the world greater chances of recovery, nor more certain means of health than are presented here. It is admirably placed for invalids from tropical climates. From the highest point of the Bitterne Hills, 180 feet above the level of high water, the air has an unimpeded sweep to Netley.

The area of land comprised in this slope is about 20 miles. The soil in every part porous and dry, and the atmosphere, tested by hygrometrical and other meteorological measurements, is found to be one of the purest and best description.

The Hospital stands back 600 feet from high-water mark, and at a level of 40 feet above high tide; the site has a natural drainage from its sloping and geological character, and presents the best possible means of health.

(Signed) FRANCIS COOPER, *Officer of Health.*

No. 23

Colonel O'Brien to Under-Secretary of State, War Office.

War Office, Whitehall Gardens,
May 27, 1858.

Sir,

The Committee appointed to consider certain objections which have been raised against the site and plan of the Royal Victoria Hospital at Netley, having been hitherto unable to report on the points adverted to in their instructions of the 10th ultimo, on account of their not having yet been furnished with the reports of the medical gentlemen and others whose advice and assistance they were empowered to call for, nevertheless deem it to be their duty to state briefly, for the information of the Secretary of State for War, the steps they have already taken to carry out their instructions.

Having received the necessary authority from the Secretary of State for War, the Committee, on the 17th April, the day they received this authority, forwarded certain questions to the medical men at Southampton relative to the site of Netley Hospital. On the 21st of April the Committee issued letters of instruction to Professor Thomson, Professor Phillips, Dr. Babington, Dr. Milroy, Mr. Simon, and Mr. Ranger, of the Board of Health.

On the 22nd April application was made to the Director-General, Army Medical Department, for permission to obtain the opinions of Dr. Mouat, C.B., Deputy Inspector-General of Hospitals, and Mr. Cooper, Surgeon, 4th Dragoon Guards, to whom similar letters to those above referred to were addressed.

Each of these gentlemen having examined the site of the Hospital, previous to forwarding their reports, are now only awaiting the results of the requisite chemical analyses, and which have not yet been completed, although the Committee have repeated to Professor Thomson their desire to receive his report at the earliest moment consistent with the object in view. Professor Thomson has given the Committee satisfactory reasons for this unavoidable delay, arising no doubt from the very important nature of the chemical inquiry.

Immediately on receiving Professor Thomson's report the Committee propose to place it in the hands of each of the other gentlemen engaged in this investigation, a course absolutely necessary to enable them to arrive at a correct judgment on the subject.

The Committee have received the geological report from Professor Phillips, of Oxford, copies of which they have already placed in the hands of those gentlemen. So far as the geology of the district is concerned, this report is favourable to the site.

The Committee have likewise received replies to their queries from the medical men of Southampton, which replies are also favourable to the site.

The Registrar-General has been applied to, and has furnished the Committee with the mortality statistics of the district in which Netley is situated, showing that the mortality in the parish of Hound in which is the site of the Royal Victoria Hospital, is 17·7 per 1,000 living annually, and in the three healthiest districts of England the mortality is 15 per 1,000 of living per annum, and while in Liverpool, the most unhealthy town in England, the mortality is 36· per 1,000 living per annum.

With reference to a special part of our instructions, regarding the facilities or otherwise for landing, the Committee applied to the Lords Commissioners of the Admiralty requesting that their Lordships would be pleased to cause a competent naval officer to examine and report on this important subject.

The results of which will be duly communicated; and the Committee beg leave to assure the Secretary of State for War that no time will be lost in completing the Report and bring their proceedings to a close.

I have, &c.,
(Signed) T. O'BRIEN.
Colonel and President.

No. 24.

Dr. Mouat to Colonel O'Brien.

Sir, *War Department, May* 28, 1858.

In anticipation of the separate reports in course of preparation, I have the honour herewith to forward for transmission to the Minister for War the following resolution agreed to at a meeting of the referees held this day, Dr. Babington in the chair.

I have, &c.
(Signed) J. MOUAT, *Secretary.*

Inclosure in No. 24.

Resolution.

War Department, May 28, 1858.

The referees appointed to report upon Netley Hospital, having met by appointment at the War Department, Dr. Babington in the chair, and having consulted together, have come to the following resolutions :—

That the detailed reports of the referees will be furnished in the course of next week.

That, meanwhile, the referees agree that no evidence which is before them warrants a belief that the district selected as the site of the Hospital suffers from any malaria or other hurtful endemic influence.

And that those of the referees who have completed their personal inspection and inquiries in the district are satisfied that the site of the Hospital is well chosen in reference to sanitary considerations.

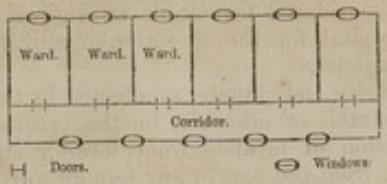
(Signed) B. G. BABINGTON, M.D.
ROBERT COOPER, *Surgeon, 4th Dragoon Guards.*
GAVIN MILROY, M.D.
J. MOUAT, *Deputy Inspector-General.*
Wm. RANGER, C.E.
JOHN SIMON.
R. D. THOMSON, M.D.

No. 25.

Memorandum relative to the Suggestions in the Confidential Report which differ considerably from the views which guided the construction of the Hospital at Rotterdam, which I was directed to inspect, in May 1856, at the suggestion of Dr. Andrew Smith.

In the principle of construction, as well as in most of its details, the Victoria Hospital resembles closely to the one at Rotterdam.

Both consist of a long range of building, three stories high, having wards adjoining each other, with windows on one side, and doors on the opposite side, opening into a corridor which extends along the whole length of the building.



The wards in the Victoria Hospital are rather larger, but accommodate no greater number of patients, viz., 10.

The amount of light admitted into the wards is the same in both, and is found to be ample at Rotterdam for performing any surgical or other operation.

At Rotterdam, the corridors and wards have each their own distinct foul, fresh, and hot-air flues; the ventilation and heating of each ward is, therefore, perfectly independent of that of any other, and each ward is, therefore, to all intents and purposes, as perfectly isolated as if it were in a separate building, there being no communications between the wards, excepting through the corridor, from which they are separated by a double door.

The same system of heating and ventilating has been adopted, I believe or the new Victoria Hospital.

The system of having the wards in detached blocks of buildings, as in the "Hôpital de Lariboisière" in Paris, was not adopted in building the Hospital at Rotterdam, and not approved of, for the following reasons:—

1st. The enormous cost.

2nd. The objection to having large wards, which such a system requires. In "Lariboisière," there are as many as 30 patients, I believe, in the same ward.

3rd. The plan of having windows on opposite sides was strongly objected to—

First. On account of the tendency to create a draught.

Second. That by this arrangement the light *must* fall directly on the patients' eyes, whilst in bed, and that this was found to cause them considerable inconvenience, and resulting actually in disease in more than one instance. The doctors in charge of "Lariboisière," considered this cross light as one of the greatest defects of their Hospital.

H. ELPHINSTONE, *Captain,*
Royal Engineers.

21*st January*, 1857.

No. 26.

Colonel O'Brien to Medical and Scientific Gentlemen.

Sir, *War Office, Whitehall, May* 4, 1858.

I am directed by the Committee to acquaint you, that the gentlemen whose names are noted in the margin,* have acceded to the wishes of the Secretary of State for War, and are prepared to lend their assistance in investigating the circumstances connected with the inquiry on the site and plans, &c., of the Royal Victoria Hospital at Netley.

* Dr. Babington, F.R.S.; Dr. Milroy; John Simon, Esq., F.R.S.; Wm. Ranger, Esq., C.E.; Professor Thomson, F.R.S.; Professor Phillips, L.L.D.; Dr. Mouat, C.B., Deputy Inspector-General of Hospitals; R. Cooper, Esq., Surgeon, 4th Dragoon Guards.

The general subjects upon which the Committee desire, in the first instance, to be favoured with your opinions are—

The comparative advantages and disadvantages, in a medical point of view, of the site selected for the erection of the Royal Victoria Hospital at Netley.

The general character of the climate, the purity or impurity of the air, and its chief characteristics, as being bracing or relaxing, dry or moist, mild or the reverse, the effect which may be anticipated to be produced upon the climate by the nature of the soil, the admixture of salt and fresh water in the estuary, and the extent of mud banks left exposed at low water.

To what extent the site and the climate, as affected by all the preceding considerations, may be considered favourable or unfavourable for the erection of a great Military Hospital for the reception of convalescents and sick from the Army serving in England.

To what extent the site and climate, as affected by the same considerations, may be considered favourable or otherwise for the erection of a great Military Hospital for the reception of invalids from foreign stations, and sick and wounded men returning from the seat of any foreign wars.

I am instructed, however, to say, that the Committee by no means desire to confine your attention to the subjects here indicated, but that they will esteem it a favour if you will be so good as to report upon any other subjects which may suggest themselves to you during the course of your inquiry, and which may seem to you calculated to affect the healthiness of the site or the nature of the climate.

I have, &c.
(Signed) T. O'BRIEN.

P.S.—Major Ravenhill, R. E., who is now in charge of the works at Netley, will be requested to afford every information and assistance in his power in the prosecution of your inquiries.

No. 27.

Colonel O'Brien to Medical and Scientific Gentlemen.

War Office, Whitehall Gardens,
29th May, 1858.

Sir,

I AM instructed by the Committee to thank you, in their name, for the General Report which you have been good enough to send them, on the site selected for the Royal Victoria Hospital, at Netley; and I am to state that the Committee will have much pleasure in receiving the detailed reports whenever you feel yourself in a position to supply them. As you appear now to have nearly completed your inquiries as regards the site, and as it appears from your General Report, that thus far, the result of your inquiries on that point have led to a favourable conclusion, the Committee think that the time has arrived for asking you to direct your attention to the plans of the new building.

The Committee will have the whole of the plans, elevations, and sections prepared for your inspection, and will afford to you, either individually or collectively, any explanation which you may think necessary. The Committee would be glad to be favoured with your opinion, whether, seeing the class of inmates for which the buildings have been designed—consisting, as shown by the medical returns in your possession, of invalids, of whom only 15 in every 100 will be confined to bed, and who will be generally suffering from chronic diseases, the great majority of which will be thoracic—you think the general design and arrangements shown upon the plans well calculated to provide for their comfort, and promote their recovery; or whether, on the contrary, you think that design, and those arrangements, inappropriate to the object in view.

If the result of your inquiries should lead you to the first of these conclusions, but it should still appear to you that improvements might be made in the details, the Committee would receive with pleasure, and would examine with careful attention, any suggestions you might think fit to make.

I have, &c.
(Signed) T. O'BRIEN,
Colonel and President.

No. 28.

Extracts from Dr Granville's "Spas of England," 1841, pp. 555-557.

In point of residence for people of delicate health, Southampton, if public report is to be credited, will soon exhibit a novel feature, by the execution of a projected plan whereby the whole, or at least the largest portion of that well wooded and cheerful bank of the Southampton estuary, or water, extending between the Itchen and the Hamble, including the venerable remains of Netley Abbey, will be converted into an assemblage of villas, and rows of dwellings with gardens. The situation is admirable, and the general aspect one of the most favourable description. A proper and judicious choice of spots for the erection of particular houses, or the formation of crescents and terraces (for in that everything consists), will render this locality the most to be preferred by invalids of the class first mentioned, who are anxious to benefit by the Southampton air.

* * * * * * *

I cannot believe another report made to me respecting the future destiny of the well wooded ridge on the left bank of the Itchen just alluded to. The Dock Company may perchance require, in the immediate vicinity of their basons, close to the margin of the water, room for the erection of warehouses, and for that purpose a large portion of the ridge is said to have already been levelled and cleared. But they surely can never have seriously contemplated the notion of letting or selling the remainder of the ground to the south of the mouth of the river, and all along as far as Netley Abbey, to a publican, for the purpose of building ordinary houses to accommodate the people employed in the docks, for whose Sunday amusement and edification the venerable ruins of the abbey are to be desecrated, and its site converted into a tea garden! Every chance of securing the best and a safe retreat at Southampton to people of delicate lungs, in the first degree of that disease, mentioned in this chapter, will have been thrown away quite, should such a barbarian scheme be carried into execution.

Those who object to the smell arising from the mud at low water, or dread its supposed effluvia, entertain, in the case of the Southampton Water, an estuary ten miles in length, and more than two miles broad, unfounded apprehensions. Indeed, as far as the class of invalids is concerned, for whose sake I should rejoice to see a judicious conversion of the Chamberlayne lands into mansions and villas, the circumstance of emanations from sea deposits being in their immediate neighbourhood is favourable rather than not. It is for this reason that I do not lay so much stress as others have done, when writing about Torquay, on the inconvenience of having a small inner harbour, which at low water sends forth its mud effluvia; although I admit that it is anything but agreeable. Nor can I be accused of inconsistency in maintaining, in the case of Southampton, a different notion from that expressed respecting Teignmouth. The whole difference in the latter case consists in the sheet of water at that port being a large river, bringing down and depositing before the town its own peculiar vegetable and animal impurities along with the mud left by the receding tide; whereas the sheet of water at Southampton is an open arm of the sea, in a direct line with Spithead, and the east part of the English Channel, as well as with the Solent in communication with the west channel. And as for the three river streams which pour their freshwater tribute into the bay, their contributions are too insignificant to cause any impression different from that which I am disposed to attribute to the emanations of the Southampton Water at low tides.

No. 20.

Extracts from Report of the 21st Meeting of the British Association for the Advancement of Science, 1851, pp. 57, 58, 59.

The degree of humidity as compared with Greenwich, situated inland, and on a considerable elevation, approaches, as might be expected, nearer the point of saturation.

	1848 (11 months).	1849.	1850.
Greenwich	·820	·802	·805
Southampton.. ..	·878	·844	·861

In the year 1848, the south, south-west, and westerly winds were largely in the ascendant, and the consequence was an exceedingly wet season, as these winds were usually accompanied with rain; they are, for the most part, warmer than those from the northward and eastward, and hence we find the mean temperature of that year higher by 2 degrees than 1849, and by 3 than 1850.

In 1849, the northerly and north-easterly winds were frequent; the proportion between those winds from the quarters north to east inclusive, and those between south and west, being as 254 to 321. The difference in the fall of rain during this year and the preceding, amounted to upwards of 10 inches: the loss of the January observations prevents my stating the exact amount.

In 1850, the south-west winds predominated over the north-east in the proportion of 372 to 252; the amount of rain collected was as nearly as possible the same as in 1849. The mean temperature was low, especially in the months of January, March, and October, when the wind sets frequently from the north and north-east, as the tables will show. During the month of March especially, the low degree of humidity shows the dry nature of the air on the prevalence of the northerly wind. In the month of March, generally the north and north-east winds prevail, while winds from the south and south-west are about equally distributed throughout the other months of the year.

* * * * * * *

1. During the course of the year, the number of days on which the freezing point is reached at Falmouth is about $\frac{1}{3}$ of that at Southampton, at Stone $1\frac{1}{2}$, at York $1\frac{2}{3}$.

2. With regard to the number of falls of rain beyond $\frac{1}{2}$ an inch in 24 hours Southampton and Falmouth are about equal; at Stone and York the number of such days is $\frac{1}{3}$ of those at the former places.

3. The entire quantity of rain at Falmouth during the three years is somewhat more than $\frac{1}{10}$ beyond that at Southampton; at Stone and York somewhat more than half the quantity at Falmouth; York having received 77·6 in., and Stone 68·3.

4. The number of days on which rain is stated to have fallen is less at Southampton than any other place; being 474 to 577 at Falmouth, 502 at Stone, and 519 at York. This result is consistent with that just mentioned, and with the table that follows, and leads us to the conclusion that the rain falls in larger quantities at Southampton than at any of those places with which I am comparing it.

* * * *

It would appear, then, in conclusion, that the climate of Southampton is mild, differing but little from that of the most southern town in England; that the air is more generally laden with moisture than that of inland towns, arising from its proximity to the sea and freshwater, and from the prevalence of winds from the points between south and west and those inclusive, which are laden with aqueous vapour from the sea; that this moisture falls in copious showers on a fewer number of days than the less quantity in the inland towns with which it has been compared; occasionally in large quantities at a time, as on June 27,* 1850, when nearly two inches of rain, accompanied with thunder and lightning, fell in 12 hours; that severe cold is less prevalent than at places inland, but the quantity of rain is greater; while the average amount of cloud appears, from comparison with about forty other places, to be a mean between the more and less cloudy skies. Though the air may be less bracing than places

higher and more inland, we have the advantage comparatively in mild winters, and the absence of that severity which is so trying to the invalid.

I avail myself of a high medical authority to subjoin the following enumeration of the prevalent diseases, and of those which are unusual in the neighbourhood; which, being written entirely independently of my observations, will, I apprehend, be yet found to harmonize with the opinions which I have founded on the meteorological observations.

Inflammatory diseases of an active kind are not at all common, nor do they require or bear active depletion when they occur. The town is quite free from ague: the mud lands do not produce it, as the water upon them is never stagnant. Intermittent neuralgias are not met with. Fever is not common. Twenty years ago it was very rare, but since the town has increased greatly in numbers it is more prevalent, though not of a malignant type. There is a considerable amount of complaint from uneasiness, discomfort, indisposition, and local pains produced by indigestion of an atonic kind, or the result of want of general power. The system is not so vigorous as in a more bracing climate, and, therefore, not so able to digest the same quantity of food; and unless much greater attention is paid to quantity especially, and also quality, as well as to habits, headache, distension, constipation. and general debility are not uncommon. Young and vigorous persons who come here from a colder and drier air, usually complain at first of sleepiness, and an inability to perform the same amount of muscular or mental exertion. On the other hand, rather delicate and susceptible people (especially women), who are never well in colder parts of England, enjoy much more bodily comfort here. For the same reason it suits children and elderly people, especially if they have been subject to inflammatory diseases of the air passages in colder or drier places. Gouty and rheumatic diseases are not common here, as might be expected, from the inability to digest a large quantity of food; in short, there is a greater amount of indisposition from indigestion, and a less than an average amount of active secondary diseases, such as fever and violent inflammation."—Dr. J. Bullar.

* * * *

* This was the heaviest fall of rain recorded.

Major Ravenhill, R.E., to the Inspector-General of Fortifications.

Sir, *Royal Victoria Hospital, Netley, April* 14, 1858.

I HAVE the honour to report that the surface soil of the Government land at Netley is of a gravelly nature.

A vein of gravel, varying from 3 feet to 7 feet in thickness, extends over the entire property, excepting in the meadows forming the north and south boundaries of the Government land. Beneath this vein of gravel is an irregular and variable deposit, consisting of sands more or less argillaceous.

From the fossils, consisting, amongst others, of the venericardia planicosta, turritella, sulcifera voluta bulbula, already found in excavating for the main sewer, and in sinking the well 180 feet in depth in the right wing of the Hospital, there is no doubt that the substrata of the Government land is synonymous with, and belongs to, the middle Bagshot sands, or, in other words, to the Bracklesham Bay series, the strata dipping from north-east to south-west.

In levelling the site for the foundations of the left wing of the Hospital, the vein of gravel above alluded to was passed through, and the foundations of this portion of the building are in a sandy loam.

In carrying out the excavations for the main sewer, which runs 8 feet in rear of the main building, at a depth of 6 feet on the extreme right, dropping to a depth of 20 feet on the extreme left, the same green sandy loam was passed through.

The only point immediately within the walls of the building at which clay has been arrived at is at the well in the right wing, where, at a depth of 55 feet 5 inches below the surface, a layer of clay, one foot in thickness, has been passed through; and again, at a depth of 27 feet 6 inches below it, three other beds of clay, 22 feet in thickness, were also bored through.

After the foundations of the entire main building were completed, and the excavations were being carried on in rear of it, a large quantity of brick earth was discovered immediately beneath the vein of gravel above referred to, which has been worked with considerable advantage to the War Department.

This variation of structure from the ground immediately beneath the Hospital is probably of a local character, but without further trial no decided opinion can be given on this point.

I have, &c.

(Signed) P. RAVENHILL, *Major,*
Commanding Royal Engineers.

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