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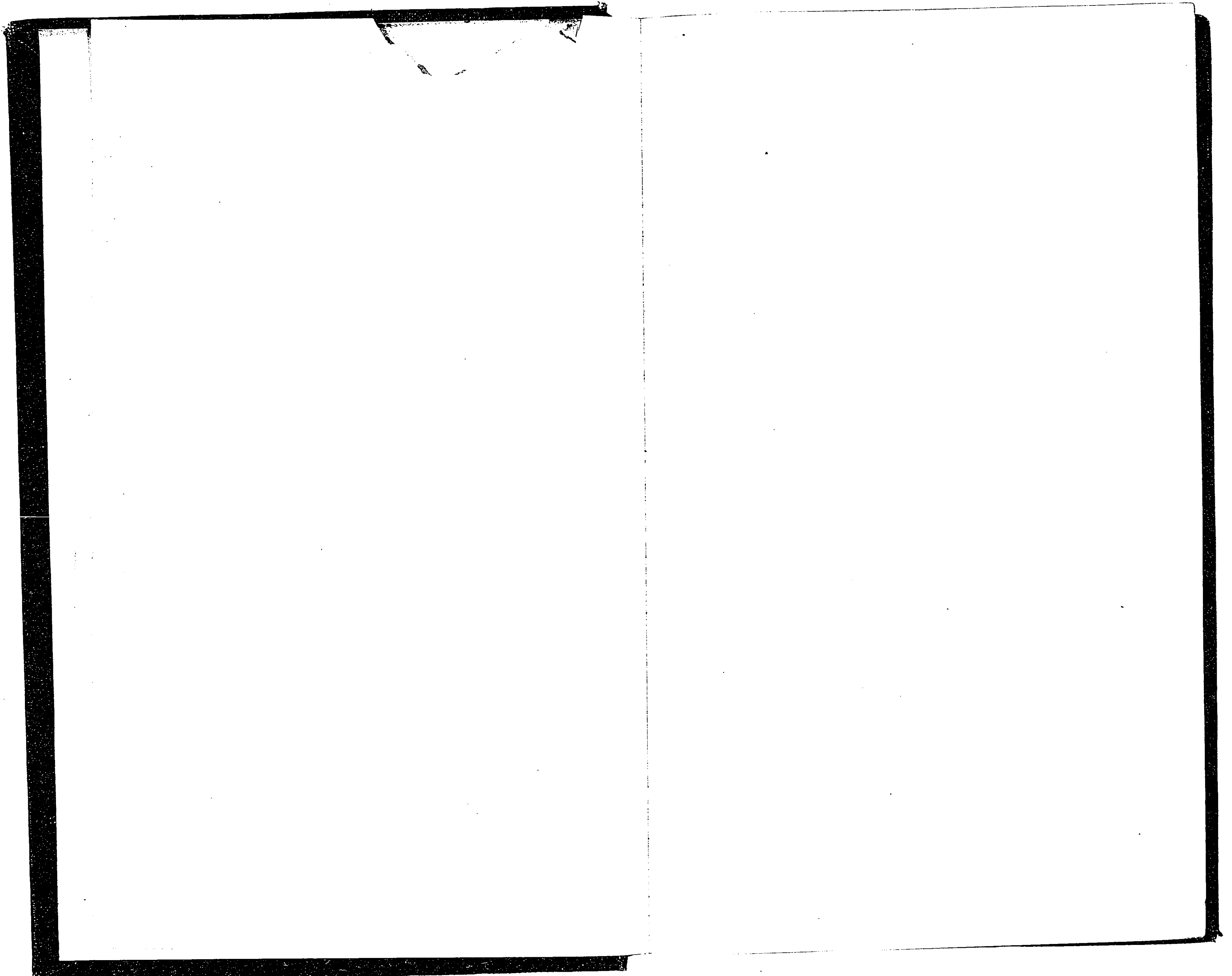
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# REPORT

TO THE

RIGHT HON. LORD PANMURE, G.C.B., &c.,

MINISTER AT WAR,

OF

THE PROCEEDINGS OF

THE SANITARY COMMISSION

DISPATCHED TO

THE SEAT OF WAR

IN

THE EAST.

1855—56.

BOOK FOR  
DATE  
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*Presented to both Houses of Parliament, by Command of Her Majesty.  
March 1857.*

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DIGEST OF THE REPORT

OF THE  
SANITARY COMMISSIONERS ATTACHED TO THE  
ARMY IN THE EAST.

1855-6.

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Gave directions to inspect and report on, and powers to urge and enforce sanitary regulations for, the Hospitals on the Bosphorus, and in the Crimea; the transports and hospital ships; any new hospitals that might be established for the Army in the East; the harbour at Balaklava; and the Camp before Sebastopol. Forbade all interference in the treatment of the sick.	
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PART I.

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5. The Hospital Burial-ground, p. 21. Mode of burial; too many bodies buried in one grave or pit; regulations enjoined.

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Description. Population from 500 to 600; configuration of harbour; its local position cannot be considered healthy; besides these local sanitary defects, other causes of disease came into operation; harbour filled with shipping, town overcrowded with inhabitants and with horses and cattle, putrescent organic matter accumulated where most hurtful; difficulty of removing this; every sort of refuse thrown into the harbour, whose margin became a mass of filth, manure, offal, and dead carcasses of animals, p. 87; the marsh at the head of the harbour used in the winter of 1854-55 as a place of interment, where the corpses, laid almost in water, were sparingly covered with earth; the latrines were insufficient, and nuisances covered the hill sides; the state of the harbour was most unsatisfactory; the mass of corrupting matter in it, increased by the action of the salt water, produced the most horrible smells, and endangered the public health both in Balaklava and the camps near it, p. 88; fevers were prevalent, passing into typhus.

Commissioners met in Balaklava April 6, 1855; statements of Dr. Gavin and Mr. Newlands; chief difficulty in carrying out improvements was the want of labour, which was never overcome until the Army Works Corps arrived, p. 90; the Commissioners were obliged to restrict their requirements to measures of necessity only; precautionary measures enjoined, p. 91; Report to Lord Raglan; difficulty of obtaining labour; death of Dr. Gavin, p. 93. 500 labourers asked for, 155 only granted; Mr. Newlands returned to Liverpool, and the direction of the sanitary works reverted to the military authorities, p. 94.

Progress of improvements, exertions of Admiral Boxer, p. 96.

In May, after great heat and heavy rain, the cholera appeared on board ship; a system of medical inspection organized, the harbour divided into three districts; instructions to the medical inspectors, p. 97. Extracts from reports of the inspectors; attention required as to the sanitary condition of ships used for the transport of animals; the emanations from the margin of the harbour proved to have been the most powerful localizing causes of the pestilence; inability of charcoal, though a deodorizer, to remove the effects of organic effluvia, p. 100; instance of the "Chester," a charcoal vessel; development of cholera checked by the precautionary measures taken, p. 102. Sanitary works pushed on; extracts from diaries of the inspectors; removal of the manure and offal by barges or by burning; improvement of the sanitary state of the town of Balaklava, p. 103.

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*Position of the Camps.*

The Marine Heights . . . . .	107
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Medical topography; hard, dry, and well drained, but exposed to rapid changes of atmosphere, high winds, and sea fogs; generally the ground had been well prepared for the erection of the tents and huts, and they were in good sanitary condition, except as regards ventilation, which was deficient.

The Camp of the 79th Highlanders . . . . .	109
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Sites of upper huts badly prepared; earth heaped up against their sides, drainage insufficient, ventilation bad; lower huts were in a very unhealthy position, ground wet, and earth in contact with sides for two or three feet in height.

Report of Sir Colin Campbell that fever had been very prevalent in these huts; statistics of the disease; wetness of the subsoil caused the floor to be very damp, and the huts were overcrowded; removal of the men from the lower huts, recommended by the Commissioners, carried out by Lord Raglan; consequent abatement of fever; subsequent history of the huts; occupied by the 31st Foot, cholera and diarrhoea became prevalent; afterwards occupied by the Artillery, with a like result; and were then pulled down, when the ground was found exuding water at every pore, p. 109.

The Camp of the Royal Artillery in the hollow . . . . .	113
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Was not well situated for health. Much water was found here, and a good deal of manure left about.

The Guards' Camp . . . . .	114
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Situation not very good, means of drainage ample; the damp clay ravines near were not wholesome. Much attention had been paid to the preparation and improvement of the camping ground, but earth was heaped up against the walls, and the ventilation was bad.

The Land Transport Camp . . . . .	115
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The topographical position, in April 1855, was one of the worst in the whole occupation; the ground was covered with filth, manure, and offal; numerous fever cases. This camp was afterwards moved.

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Cavalry Division Camps, in the Valley of Karani . . . . .	115
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Description of the valley; well calculated for winter protection, but became an impassable clay swamp after heavy rain; ground not marshy, but sufficiently wet to emit malaria in hot weather; great prevalence of zymotic diseases. Space overcrowded with men and animals; malarious emanations from the ground resulted. Accumulation of stable manure; when burnt, the operation imperfectly carried out. The best mode of disposing of the organic refuse of a fixed camp is the Indian mode of employing a furnace like a lime-kiln. Difficulty of erecting such furnaces in the Crimea; two erected at Scutari in 1856. In the Crimea, those camps where there were large numbers of animals were the most unhealthy; some excess of sickness in the Cavalry and Artillery camps. Sanitary defects of the huts in the Cavalry Division; foundations not properly prepared or drained; earth raised against the sides; ventilation defective. One Cavalry regiment, which was under canvas, had little or no fever.

Sanitary Condition of the Camp before Sebastopol . . . . .	119
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Camp of the Guards . . . . .	119
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Excellent site, natural drainage good, and the position healthy.

Camps of the 3rd and 4th Divisions, and part of the 1st . . . . .	119
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On an elevated position; ample facilities of drainage; open to the free sweep of the winds. In some parts, the surface was deeply covered with wet retentive clay. Camps on such ground not the most healthy on the plateau, and when cholera first appeared, in May 1855, it seemed to attack them by preference.

Camp of the 2nd Division . . . . .	120
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Not very good, being clayey; in parts it was better.

Camp of the Light Division . . . . .	120
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Natural drainage good; the position a healthy one, except the lowest points.

Camp of the Naval Brigade, under 3rd Division . . . . .	120
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Site good for winter protection, but close to a swampy ravine. Camp removed.

The site of the camp before Sebastopol was, with limited exceptions, as healthy a district as could have been found within the whole occupation, but it was, of course,

Proceedings of the Commissioners—continued . . . 64 to 148

exposed to those local and climatic conditions common to the country, which are known to give rise to periodic fevers, p. 120.

Before communicating with the Commander of the Forces, the Commissioners made several inspections of the Camp. It was found remarkably clean, and the external sanitary arrangements on the whole well attended to. There was considerable difference in the condition of different camps, which appeared to depend very much on the pains taken by Commanding Officers and Surgeons. There were some Regimental Camps in regard to which it would have been difficult to have suggested improvements, p. 121.

Sanitary defects were, however, observable in various parts of the camp, p. 121.

1. The huts were Portsmouth huts, the boarding was single throughout, the majority had only partial floors; they had no independent means of ventilation, and, when used as hospitals, the thin boarding was hardly sufficient protection either from the cold or from the intense sun heat. The ground was not properly prepared, the site was sometimes undrained, or badly drained, the floor below the level of the surrounding ground, earth was piled against the sides, the surface drainage around was defective. This damp condition of the subsoil is one of the most common local causes of disease; is fraught with danger to health wherever it exists, and especially in fixed camps, p. 121.

2. Tents. The spaces between were generally sufficient, sometimes not so. The most obvious sanitary defect in the tents was the want of ventilation; the air-holes were of too small a size to be of use, the atmosphere was consequently foul. Animal effluvia absorbed by the earth; hence tents are apt to become unhealthy, unless the ground is changed; and hence the faint, sickly, unwholesome odour, observed after the removal of camps. This peculiar odour was especially observed to last for days on camping ground vacated by the Allies after the conclusion of peace, p. 122.

Necessity for frequently removing the tents. This could not be done in one instance, when recommended by the Commissioners, as the tents were stated to be too much decayed to admit of removal, p. 123.

Common practice in pitching tents to dig a circular pit, and to pitch the tent over it; often no provision made to drain off the water collected in it. Charcoal used to remove the effects of the consequent damp; fatal results of this, p. 123

3. Latrines badly made, kept open too long, and were not deodorized, p. 124.

Proceedings of the Commissioners—continued . . . 64 to 148

4. Burial of the carcasses of dead animals in many cases not well performed, not being buried at a sufficient depth, p. 124.

5. Slaughtering-places well conducted, and caused no offensive smell; a slaughtering-place of the French Commissariat caused much nuisance, p. 124.

6. British burial-grounds sixty-six in number; except those killed at Inkermann and the Redan, the dead were buried in single graves; the interments were conducted with care and decency, and the grounds decorated by the soldiers with great taste and feeling, p. 124.

7. Manure heaps; the stables and picketting-grounds were in tolerably good condition, the manure was swept up, and on the whole well burned, p. 125.

Sanitary Improvements recommended for the Huts during the warm weather . . . . . 126

The hospital huts of the Naval Brigade, erected according to the recommendation of the Commissioners, presented all the necessary improvements.

General recommendations for the Camp . . . . . 127

Appearance of cholera in the Camp, and Sanitary Precautions recommended by the Commission . . . . . 129

Military and Naval Hospitals in the Crimea . . . . . 131 to 144

1. The General Hospital at Balaklava . . . . . 131

A stone building; was a Russian school-house; consisted of two divisions, one built against the slope of the hill, with windows only on one side; was unhealthy, and fever had originated in it; Portsmouth huts added; main objection was its position, from the bad sanitary condition of the neighbourhood; ventilation good, wards well lime-washed and very clean, the latrines in a bad state, water good.

This hospital being used for natives, and latterly as a transit hospital for sick about to leave the Crimea, was at times overcrowded; with the above exceptions, its sanitary condition was as satisfactory as could be expected, p. 133.

2. The Castle Hospital . . . . . 133

Situated on one of the finest natural positions that could have been selected, natural drainage excellent, esplanade towards the sea, always dry; consisted of huts; the Portsmouth huts were defective from absence of independent means of ventilation, and from the thinness of the sides and roof; the Chester huts were much better,

Proceedings of the Commissioners—*continued* . . . . Pages 64 to 148

more roomy, capable of better ventilation, and the sides were double; the latrines were at a considerable distance from the hospital. Few hospitals can show more favourable results than were exhibited by the Castle Hospital; it was originally intended for wounded, but a few sick were afterwards admitted, p. 133.

3. The Monastery, or St. George's Hospital 135

Consisted of a square of huts similar to the Chester huts, site well isolated, and drained by trenching; one large hut was formed of corrugated iron, a substance ill adapted for a hospital, whether in hot or cold weather; water supply obtained from wells; the site was naturally a good one, without local sources of malaria except a French cattle yard a quarter of a mile away; the chief cases were ophthalmia.

4. The General Hospital of the 3rd Division 136

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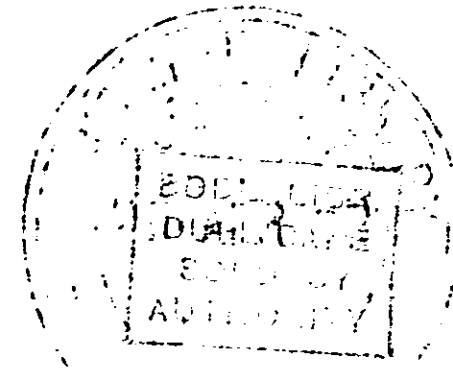
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## INSTRUCTIONS.

*War Department, February 19, 1855.*

GENTLEMEN,

HER MAJESTY having been pleased to assent to your proceeding on a sanitary mission to Constantinople and the Crimea, you are instructed to obey the directions which follow.

The utmost expedition must be used in starting on your journey, in the journey itself, and in the execution of all that is necessary at the place of your destination.

On your arrival at Constantinople and Balaklava, you will put yourselves instantly into communication with Lord William Paulet, Admiral the Honourable F. Grey, and Lord Raglan respectively, and you will request of them forthwith (according to the official directions they will have received) full powers of entry into every hospital, infirmary, or receptacle, of whatsoever kind, for the sick and wounded, whether ashore or afloat.

You will inspect every part of such infirmaries, ascertain the character and sufficiency of the drainage and ventilation, the quantity and quality of the water supply, and determine whether the condition of the whole is such as to allow, by purity of the air, and freedom from overcrowding, fair play and full scope to medical and surgical treatment for the recovery of health.



You will call to your aid for this purpose, whether as witnesses or as guides, any of the officers or attendants that you may require.

The result of your inspection and opinions, together with a statement of all that is necessary should be done, whether in the way of arrangement, of reduction of numbers in the wards, cleansing, disinfecting, or of actual construction, in order to secure the great ends of safety and health, must be laid as speedily as possible before Lord William Paulet, Admiral Grey, or Lord Raglan, as the case may be, or such persons as may be appointed by them to that special duty, and you will request them to give immediate directions that the works be completed.

As no time is to be lost, you may reserve your detailed and minute reports, and give in the first instance a statement only of the things to be done forthwith.

The Engineer Commissioner will be expected to conduct the inspection along with his colleagues, and to devise, and to see executed all such structural arrangements as may be declared indispensable.

You will examine the modes whereby the sick and wounded are conveyed to the transports, or to the hospitals ashore or afloat.

You will take care that, so far as is possible, all evil influences from without be removed, so that the air inhaled by the inmates of the hospitals be not contaminated. It is reported, for instance, that the hospital-ship in the harbour of Balaklava is much surrounded by dead carcasses.

As a necessary consequence, you will order that the dead be interred at a sufficient distance from the hospitals. You will lay down rules both as to the time and mode of interment, consulting, of course, the convenience of the constituted authorities.

Should any other hospital or receptacle for the sick be decided on, while you are on this expedition, you will

examine it, and state all that must be done for health, decency, and comfort.

You will not interfere in any way with the medical and surgical treatment of the patients, nor with the regulations prescribed to the nurses and attendants.

Upon your arrival at Constantinople, you will determine among yourselves in what way you can best carry out the objects of your mission.

It is important that you be deeply impressed with the necessity of not resting content with an order, but that you see instantly, by yourselves or by your agents, to the commencement of the work, and to its superintendence day by day until it is finished.

It is your duty, in short, to state fully, and urge strongly, for adoption by the authorities, everything that you believe will tend to the preservation of health and life.

The camp must also come under your immediate and anxious attention.

You must consider, and apply with the least possible delay, the best antidotes or preventives to the deadly exhalations that will be emitted from the saturated soil whenever the warmth of spring shall begin to act on the surface.

You must consider how all decaying substances, present and future, may be removed speedily, or otherwise disposed of with safety. Also in what way the feculent matter of the camp may be rendered innocuous.

You will pay special attention to the harbour of Balaklava, and state your opinion as to the best mode of cleansing it, and of keeping it clean from the accumulations of filth floating on the surface. It will be desirable to ascertain, not only for the convenience of the transport of the sick, &c., but also for the removal of all kinds of nuisances to the outside of the harbour, whether jetties might not be easily constructed.

As stated in your instructions relating to the hospitals, so here you will, with the utmost possible dispatch, lay your plans before the proper authorities, in order that they may be carried into execution.

I have, &c.

(Signed) PANMURE.

JOHN SUTHERLAND, Esq., M.D.  
HECTOR GAVIN, Esq., M.D.  
ROBERT RAWLINSON, Esq., C.E.

R E P O R T  
OF THE  
PROCEEDINGS OF THE SANITARY COMMISSION  
DISPATCHED TO  
THE SEAT OF WAR IN THE EAST.

MY LORD,

THE Sanitary Commission dispatched to the seat of the late war in the East was not merely a Commission of Inquiry. Its duty, as laid down in the instructions issued by your Lordship on the 19th of February, 1855, was not simply to examine and report on the sanitary condition of Her Majesty's Forces and of the vast hospital establishments belonging to the British army on the Bosphorus; its work was intended to be mainly of a practical kind, and, while using all diligence in ascertaining whether any and what removable causes of disease connected with the camps and hospitals existed, the Commission was directed to represent such defects to the military and naval authorities; to issue instructions for their removal, and to see that their instructions were complied with.

The Commission was precluded from interfering with the treatment of the sick or with the discipline of the wards, and in like manner it could not interfere with anything connected with the personal hygiene of the soldiers. It had, in a word, to deal with the hospitals, but not with the sick, and with the camp, but not with the troops.

At the period of their appointment, the Commissioners had no specific information as to the extent or nature of the sanitary defects with which they would have to deal, nor of the kind of works which might require to be executed; neither had they any knowledge of the amount or quality of the labour or materials which might be at the disposal of the military authorities in the East.

There was, moreover, no opportunity of making inquiries on these points, for the Commissioners had to leave London within three days of their appointment. All they could do, was to request that a supply of materials most likely to be required for the hospitals, such as perforated zinc plates, piping, &c., should be sent to Scutari with as little delay as possible; and that they might be accompanied by a few skilled officers whom they might place at the disposal of the military authorities for the organization and direction of the native labour employed in those special sanitary works and measures which the Commission might see necessary to recommend.

Such assistance appeared to be indispensably necessary to liberate the Commissioners from the personal superintendence of minute details of works, and to enable them to exercise a general oversight of sanitary operations, extending from Smyrna to the camp before Sebastopol.

This request for assistance and materials was at once complied with by your Lordship.

It was necessary that the officers selected should be men who had had sufficient experience; and knowing that a Sanitary Act had been longer in operation in Liverpool than in any town in Great Britain, application was made to the Mayor for three sanitary inspectors, who were at once placed at the disposal of the Commission. Mr. James Newlands, Borough Engineer of Liverpool, also offered his services for a short time, with the concurrence of the local authorities, to direct the Inspectors in their duties, and his offer was accepted. Mr. Arnold Taylor was appointed Secretary to the Commission.

The Commissioners, with their officers, left London on the 22nd February, arrived at Constantinople on the 6th March, and commenced their examinations of the hospitals at Scutari the same afternoon. Their proceedings were continued, day by day, until the instructions for the sanitary improvement of each hospital were completed and sent to Lord William Paulet and Admiral the Honourable F. W. Grey. On the 2nd April, the Commissioners proceeded to the Crimea, where they were joined by Dr. Milroy, on his arrival from England, on the 22nd July following.

We have now the honour to report to your Lordship

the results of our inquiries and observations as to the sanitary condition of the hospitals, and the improvements carried out in conformity with the instructions given to the naval and military authorities.

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## PART I.

### § I. THE HOSPITALS ON THE BOSPHORUS.

The Bosphorus, from its northern entrance in the Black Sea, until it joins the Sea of Marmora, at *Stamboul*, has very much the appearance of a river flowing between lofty and beautifully wooded banks, studded with palaces, houses, barracks, mosques, and gardens. The strait is about twenty miles in length, and varies in breadth from about a third of a mile to a mile. It has several bends and bays, and its general direction is from north-north-east to south-south-west. The deepest part of the channel is about sixty fathoms. There are strong currents and eddies in several places, which are powerfully affected by the force and direction of the winds on the Black Sea and on the Sea of Marmora.

The Strait appears to have been formed by some great natural convulsion, which has disrupted the neck of land between the two seas. Its shores are broken into round-topped hills, valleys, and ravines, between which the water flows, giving its varied character to the surface. These hills rise from the water's edge to the height of from 400 to 500 feet; the valleys and ravines ascend between the hills to the general level of the country. Some of the hills near the Bosphorus are upwards of 1,000 feet high.

Towards the opening of the Sea of Marmora, the shore presents, on the eastern or Scutari side, an elevated rocky margin from 100 to 150 feet in vertical height.

The lowest geological formation of the district is clay-slate, which forms the mass of the high grounds on the southern half of the Bosphorus. Over this rock, at *Kulali*, are beds of limestone. The formations of the country have been much disturbed by volcanic forces.

The immediate surface of the ground is formed of loam and clay often very dense and plastic. There are no marshes of any consequence in the vicinity of the Bosphorus, but the country is, to a great extent, uncultivated and undrained, and there is a general tendency to periodic fevers similar to those found over other uncultivated lands of the East.

The climate has a high mean temperature, and is subject to extremes. The summer sun heats are often intense, and so are the winter colds. The proximity of such large masses of water keeps the air moist; night and morning fogs are very frequent, but they are usually dispelled by the heat of the day.

So far as concerns the topographical and climatic features of the country, the banks of the Bosphorus are as well suited for hospitals as any part of the East; and there was sufficient convenience of access from the seat of the war.

The larger hospital establishments in possession of Her Majesty's forces were at Scutari, directly opposite Stamboul, and at a distance of about a mile and two-thirds from Tophana.

The hospital at Kulali, is about four miles above the mouth of the Bosphorus.

The Royal Naval Hospital was at Therapia, opposite the entrance to the Black Sea, and about five miles below it. All the hospitals except the last, are situated on the eastern or Asiatic side of the Bosphorus.

The ground occupied by the British hospitals at Scutari, is part of an undulating plateau, the sides of which, for the most part precipitous, dip on the north-west into the Bosphorus, and on the south-west into the Sea of Marmora.

The extent of open ground within which the hospitals are situated, is about a mile and a-half in length, by three-quarters of a mile at its greatest breadth.

On the north-west, next the Bosphorus, a prolongation of the town of Scutari intervenes between the area and the sea. On the north-east is the great cemetery of Scutari. Towards the south, the ground extends to Kadikoi, and the Sea of Marmora bounds it on the south-west.

Beginning from the landing-place on the Bosphorus, the

ground rises rapidly towards a ridge having an elevation of 98·75 feet at the cliff overhanging the Sea of Marmora, and attaining a height of 208·81 feet near the cemetery.

The great Turkish barrack, known as the "Barrack Hospital," is built across this ridge of ground. From the barrack, the surface falls to the south-east, towards a water-course opening on the level of the Sea of Marmora. The large washing establishment for the hospitals was situated in this hollow close to the sea. The surface rising again, forms part of an irregular plain of some extent, on which is situated a large hospital belonging to the barrack, and about a third of a mile from it. This building is the second in dimensions, and was known as the "General Hospital." That part of the plain on which it stands is ninety-six feet above the sea level. The ground falls towards the east from this hospital, and forms a broad, shallow valley, with a small stream running through it. In this valley is situated a kiosk and buildings attached to it, which formed the "Palace or Haidar Pascha Hospital." The buildings are about thirty-five feet above the sea level, and are at a distance of fifty chains inland. Beyond them, to the south and south-east, there is a low ridge which forms the boundary of the area occupied by the hospitals at Scutari.

There was another small hospital consisting of a few wards over a stable near the barrack. There were also some temporary wooden erections used chiefly for convalescents within the barrack square.

Except a few houses at Haidar Pascha, there were no buildings of consequence besides those used for hospital purposes within the area described. It was quite open and exposed to the sea breezes. The soil is loam, thinly covered with turf, and there were no local sources of malaria, with the exception of some undrained ground at Haidar Pascha.

### 1. *The Barrack Hospital.*

The Barrack Hospital first demanded the attention of the Commissioners, as being the largest of the establishments

at Scutari. It consists of a vast quadrangle with a lofty tower at each corner, and a square in the centre. The building is situated at the south-western extremity of the town of Scutari, from which it is separated by a broad ill-paved street. It occupies a crest of land at the point where the Bosphorus joins the Sea of Marmora, and between the sea cliff and the hospital wall is a spacious esplanade. The elevation of this cliff is 98.75 feet above the sea, and the highest point of the land opposite the barrack gateway is 148.27 feet. The ground slopes rapidly from the crest of the ridge towards the north-west and south-east.

The building is arranged in a parallelogram, the longest sides of which are 840 feet, and the shortest 630 feet. It is three flats in height, and there are eighty-four windows arranged in threes, extending in a straight line in each flat on the shortest side, and one hundred and seventeen windows similarly arranged along each flat on the longest side.

The barrack overlaps the crest of the ground, and rests on its summit and two sides; the result of which circumstance is that a considerable part of the building, that is to say, its lower flat, is unfit for hospital purposes, and was used for stores. The two upper flats are continued round the square, while the lower flat is only partially so. Another result of the configuration of the ground is that the rainfall flows downwards on two sides towards the walls of the hospital.

The natural facility for drainage is all that could be desired, provided advantage had been taken of it when the barrack was erected.

The whole line of buildings forming the four sides of the square is divided longitudinally into barrack-rooms and corridors by a wall perforated with small windows and doors, affording access from the corridors to the rooms. The barrack-rooms which were used as wards face outwards, while the corridors face inwards to the square.

The rooms are large and lofty, and have generally three windows, much too small for their cubic contents, and the heads of these windows do not reach to within five or six feet of the ceiling. The window space in the corridors is considerable, and the heads of the windows come up much

closer to the ceiling. The different flats of the building communicate by large roomy stone staircases.

Four detached buildings within the courtyard, one at each angle of the square, and communicating with the corridors, contain the privies. These buildings open into each line of corridors by two large doors, one on either side of the angle. By this arrangement each corridor in the circuit of the building communicates with the privies by eight doors. The privies consist merely of a marble slab with an opening communicating with a vertical pipe of red tile carried down into a drain at the basement of the building. The privies, and the galleries between them and the corridors are lighted by a number of glazed windows, which we found were all closed, so that there was a direct communication between the sewers, which were loaded with filth, and the corridors and wards of the hospital.

The corridors were paved with unglazed tile or porous stone, materials ill adapted for the floors of hospitals, on account of their absorbent powers. The floors of the wards were of wood, some portions of which were not in good condition.

Both wards and corridors were used for the sick at the time of our inspection, and the corridors had two rows of beds placed close together.

Having given this general outline of the structure of the Barrack Hospital, we shall next proceed to state those sanitary defects, which, in our opinion, were calculated to interfere injuriously with the medical treatment and recovery of the sick.

The first step taken by the Commissioners was to examine carefully the outskirts of the hospital, to ascertain whether there were any external causes likely to affect the purity of the surrounding atmosphere.

The site of the hospital, as already stated, is open and airy, overlooking the sea on two sides, and on a third side facing the open country; on the fourth side it is contiguous to one extremity of Scutari, which, like all Turkish towns, we found to be in a bad sanitary condition. The paving was rough and badly laid, and the channelling very defective. The surface in many places was filthy, and had putrefying

mud lying in hollows, and there were nuisances among the houses. The ravine already mentioned to the south-east of the hospital, contained offensive deposit, which tainted the air on that side of the building. There was some refuse, and several dead dogs lying close to the hospital walls.

The surface of the inner square was uneven, badly formed, imperfectly drained, and very dirty.

On entering the hospital, the first thing that attracted our attention was the defective state of the ventilation.

Excepting a few small openings here and there, there were no means of renewing the atmosphere within the hospital. The large cubic space above the top of the ward windows always retained a considerable amount of hot and foul air for which there was no escape. There was not even an open fire-place connected with the building, and the wards were heated by stoves, the pipes of which passed through a small hole at the top of one of the windows.

There was no communication between the wards and corridors in the majority of instances, except by the doors, and hence that free circulation and perflation of the atmosphere, so necessary in military hospitals, was impossible.

The wards and corridors being both occupied by sick, they could, in fact, be considered only as two hospitals built back to back, with the foul air in each intermingling by the doors.

The effluvia from the privies had free access to the corridors, and added materially to the impurity of the air.

We found the whole of the Turkish sewerage belonging to the Barrack Hospital in a defective condition. The sewers and drains were badly formed, badly constructed, badly laid, and untrapped.

It may be here stated generally, that all the buildings used as hospitals were seweraged. Turkish sewers are made of rubble-stone, or coarse brick-work. The bottoms are flat, rough, and uneven; there are no means of external ventilation, no means for cleansing or flushing, and the ends or mouths of the sewers at Scutari opened above the level of the sea, and were exposed to the action of the winds, which, in certain directions blew into the sewer-end, and carried the foul emanations from the deposits within them through the

pipe drains to the privies, and thence into the corridors and wards where the sick were placed. It was stated to us that a change of wind had been observed to be attended by an accession of fever cases from among the sick, and that existing fever cases put on a more aggravated form. We found that the winds to which these results were attributed blew in the direction of the open mouths of the sewers. These sewers were, in fact, cesspools of the most dangerous description, through which, and through the privies the wind forced sewer gases directly into the wards of the hospital.

The exhalations escaping through the defective walls and covers of sewers, where they happened to pass close to or underneath occupied rooms, could in some instances be distinctly observed within the rooms, and there is reason to believe that fatal cases both of fever and cholera arose from this circumstance among the inmates.

At the time of our first examination, the Barrack Hospital cannot be said to have been much overcrowded, as the estimated cubic space for each patient was from upwards of 850 to 1,000 cubic feet.

Overcrowding, however, is a relative term, the meaning of which must be settled with reference to other considerations besides the amount of cubic space. Lofty wards, such as were the corridors, may have apparently a large cubic space allotted to each patient, and may, nevertheless, be overcrowded, if the beds be too close together, and the cubic space mostly above them. The corridors had at the time two lines of beds, and we are of opinion that they were overcrowded from that circumstance. Again, the capabilities of a hospital for thorough ventilation also affects the question of overcrowding. A well-ventilated ward will accommodate with safety a larger number of sick than one of the same dimensions not well ventilated.

On a careful consideration of all the circumstances, we arrived at the conclusion, that the corridors could not with safety have more than one row of beds.

Connected with this question of overcrowding, we may state, that we found a considerable portion of the Barrack Hospital in use as a depôt. We considered that the presence of so many soldiers and other persons not necessary for the treat-

ment of the sick, was a source of danger, from occupying cubic space within the building, and increasing the impurity of the air from the defective privy drainage, of the truth of which opinion we had subsequently two striking confirmations.

All the hospitals had a water supply. That for the Barrack Hospital was found to be hardly sufficient in amount for so large a number of sick. The water was not so pure as could have been desired, and it was received into tanks within the barrack square.

Speaking generally, we were of opinion that the walls of the wards and corridors were not so clean as they might have been.

There were false floors in the wards, which had been used as sleeping berths for the Turkish soldiers, and which had the bedsteads of the sick placed on them. There were also box seats along the walls of the wards, for the use of the soldiers. We were of opinion that there ought to have been no such inclosed spaces capable of collecting dirt and foul air within the wards, and that it would have been advisable to have removed the whole of this useless woodwork before the sick were put into the wards, had there been time and means for doing so.

On several occasions, both in the barrack and other hospitals, we saw the excreta of patients in utensils under the beds, instead of having been at once removed.

Within the barrack square, a number of wooden sheds had been erected; part were occupied by soldiers belonging to the depôt, and part were intended to be used as convalescent wards. To the latter of these were attached a series of open privies communicating with a drain, but having no means of flushing or cleansing.

The ventilating arrangements of these convalescent wards were defective.

While stating pointedly the sanitary defects we found in the Barrack Hospital, we think it only justice to add that there was abundant evidence that the military authorities had been actively engaged, before our arrival, in improving this hospital, and much had evidently been done with that object.

The additional works required by our instructions for improving the sanitary condition, not only of the Barrack

Hospital, but of all the other hospitals, were of far greater extent than we at all anticipated, and it was obvious that, under any circumstances, much time would be necessary for their execution.

The following were the measures which the Commission directed to be put in force for improving the Barrack Hospital.

1. Mr. Newlands was requested to examine carefully the vicinity of the hospital and the square, and to organize a system of constant cleansing and removal of nuisances; to determine the points to which the refuse might safely be carried, and to give the necessary instructions to the inspector charged with the superintendence of this department.

These instructions met with the approval of the Commission, and the men and materials for carrying them out were supplied by Lord William Paulet.

The inspector was required to start his men at five o'clock every morning, to sweep the whole ground surrounding the hospital; to divide his men into gangs to sweep the streets of Scutari nearest the hospital, and to see the refuse removed directly to the place of deposit; to appoint a man to each dirty locality, to see that it was kept clean; to see that all dead animals were immediately buried; to see the hospital refuse immediately removed; to cover any accumulations which did not admit of removal with charcoal and fresh earth. The inspector was further required to report his proceedings once a week.

In order to facilitate the cleansing, it was further advised that the surface of the ground should be equalized; that proper channels for surface drainage should be formed; that the paving should be repaired and laid down, where necessary, for access to the hospital; that suitable dust boxes, baskets, wheelbarrows, and tools should be provided.

To remove the nuisance from the open ditch in the ravine on the eastern side of the hospital, we directed that the ditch should be covered over as far as its point of outfall. We further directed, for the improvement of the barrack square, that the unpaved parts should be formed, and coated with broken stone or gravel.

2. To remedy the defective ventilation, the Commis-

sion recommended that the upper portion of the windows should in all cases be opened, and the current of air modified by the insertion of perforated zinc plates, louvre boarding, or otherwise, that adequate space for the escape of foul air should be provided as near as possible to the ceiling of each ward, and that the staircases should be used for ventilating shafts by openings being made through their ceilings to the roof.

3. In order to diminish, as far as practicable, the injurious emanations proceeding from the sewers and privies, it was directed that the outfall sewers of the hospital should be extended, and a canvas cover placed over their mouths to prevent the wind driving the effluvia into the hospital; that three openings for ventilation should be made in each main sewer, between the hospital and the outfall, with a water trap at each ventilator, and a man-hole for cleansing: water tanks for flushing the sewers were also directed to be placed immediately outside the walls of the building. These tanks consisted of hogsheads, each having a large wooden valve, covering a pipe communicating with the head of each sewer. The inspector was directed to see that these flushing tanks were filled with water three times a-day, and the valves opened by himself.

All the privies, sewers, and drains were directed to be thoroughly cleansed, and their contents deodorized and removed. It was further directed that peat charcoal should be freely used as a deodorizer for these purposes.

The upper parts of the windows in the privies and in the galleries connecting them with the corridors were at once removed so as to allow the emanations to escape into the external atmosphere.

4. In order to obviate the evils of overcrowding, we directed that in all cases the amount of space for each patient, exclusive of ventilating shafts and window recesses, should not be less than 1,000 cubic feet, and that considering the state of the ventilation, no more than one row of beds should be permitted in any of the corridors.

5. We found that negotiations were in progress by which a larger supply of water would be obtained from the Turkish authorities. We recommended the filtering of the water to

remove impurities, the cleansing and covering of open water tanks, and the construction of lavatories for the sick.

6. We directed the frequent use of quicklime-wash for the purpose of cleansing the walls and improving the atmosphere in the wards and corridors. This we considered one of the most important sanitary precautions which could be adopted. Experience has shown that all porous substances, such as the plaster of walls and ceilings, and even woodwork, absorb the emanations proceeding from the bodies and breath of the sick. After a time, the plaster becomes saturated with organic matter, and is a fresh source of impurity to the air of the ward. It hence follows that unless the walls and ceilings of hospitals be constructed of absolutely non-absorbent materials, it is necessary, at short intervals, to use some application capable of neutralizing or destroying the absorbed organic matter. Of all known materials quicklime wash is the best and cheapest for this purpose. Its effect in freshening the air in crowded wards and rooms is immediate, and it is one of the most efficacious agents for mitigating the virulence of epidemic disease.

7. We were of opinion that the erection of sheds in the hospital square was likely to interfere with the ventilation of the hospital itself, and that the open privies attached to them would add impurity to the external air. They had been erected, however, and were partially in use, and it was, therefore, necessary to consider how far the evil could be obviated.

With this view the Commission directed that the inclination of the drains leading from the privies should be improved, and that a flushing tank should be erected, the valve of which was to be opened at stated times each day, so as to wash away the whole of the contents.

The sheds themselves we also directed to be thoroughly ventilated at the roof.

8. We directed the immediate removal of the excreta of the sick out of the hospital.

Lastly, in anticipation of the heats of summer, we advised the removal from the building of all soldiers or persons not necessary for the care and comfort of the sick.



*2. The General Hospital.*

This hospital is a large quadrangular building, 440 feet by 340, consisting of three flats (except on the north-east side, where there are two flats) with a court inside. So far as the accommodation of the sick is concerned, it contains somewhat less than two-thirds of the space of the Barrack Hospital. It was the best of the hospital establishment at Scutari, both as to structure and arrangements. When we first examined it, we found it scrupulously clean, and from its open isolated position, there were fewer of those external removable sanitary defects which we found in the neighbourhood of the Barrack Hospital, with the exception of the overcharged burial-ground belonging to the hospitals, and which lay much too close to its walls.

The General Hospital, like the Barrack Hospital, is divided longitudinally all round into wards and corridors; the wards facing outwards, and the corridors facing towards the courtyard. But it differs from the Barrack Hospital in one important particular, namely, that the wards and corridors communicate not only by the doors but by numerous large lofty windows in the division wall, so that by proper management of the windows, by the introduction of perforated zinc panes, and by suitable ventilating openings at the ceiling of each ward, a thorough ventilation could be at all times secured.

The privies of this large building are situated in four square towers, built on the outside of the hospital, instead of being within the square, as in the Barrack Hospital. One of the towers is situated at each angle of the main building, and communicates with the interior by means of a gallery opening into each corridor. The windows of these galleries were all closed at the time of our examination, and as the structure of the privies and the arrangement of the drainage were essentially the same as in the Barrack Hospital, the effluvia entered the corridors, and could be easily detected within them at some distance from the doors.

This constituted the main sanitary defect of the General Hospital, but it was a very dangerous one, and neutra-

lized, to a great extent, the advantages possessed by the building.

The flooring of the wards and corridors was formed of square slabs of Maltese stone, which from its soft and porous nature was continually wearing away, so as to impregnate the air with dust and to soil the bed linen. It was an inconvenience rather than a defect, and was partially remedied by the military authorities substituting wooden flooring in some of the wards.

Part of the courtyard was laid out as a garden, and another part was used as a thoroughfare. This latter part was damp and uneven, from defective formation and want of drainage. The kitchens were at that time undrained, and water was lying on the floor.

Both wards and corridors were used for the sick, but the disposable means of ventilation were such that the hospital could hardly be said to be overcrowded.

The improvements required for the General Hospital were essentially of the same character as those directed by the Commissioners to be carried out at the Barrack Hospital.

1. The state of the sewerage demanded our first attention, and we directed that the main sewer should be extended, with similar appliances for external ventilation and for flushing as those recommended for the Barrack Hospital.

2. The privy drains, which at the time passed under the building, were directed to be diverted into a sewer outside the building.

3. The upper window sashes in the privies and galleries were directed to be removed, so as to prevent, as far as practicable, effluvia from entering the corridors.

4. The privies, sewers, and drains were directed to be thoroughly cleansed, and their contents deodorized with charcoal and removed.

5. The drainage of the kitchen was to be improved, and the surface of that portion of the inner court used as a thoroughfare was directed to be formed, and coated with stone or gravel.

6. Permanent and independent ventilating arrangements by perforated zinc panes in the windows and ventilating

openings at the ceilings, were directed to be introduced for the wards, the same as those for the Barrack Hospital.

7. It was directed that not less than 1,000 cubic feet of space should be allowed for each patient.

8. That lime-washing should be practised at intervals throughout all the wards and corridors, and that proper lavatories for the sick should be provided.

### 3. *The Palace Hospital.*

The Palace, or Haidar Pascha Hospital, consisted of three buildings:—1st. The hareem apartments; 2nd. A theatre and ball-room; 3rd. A kiosk, situated in the grounds, and used as a hospital for sick officers.

The buildings were chiefly of wood, and the locality they occupied, although raised above the sea sufficiently to admit of drainage, was, from the want of it, little better than a swamp, and water was lying on its surface at the time of our visit.

The buildings were situated at a short distance from each other.

We found the apartments of the hareem intricate in structure, badly ventilated, overcrowded, and altogether not well suited for hospital purposes. A large open privy had been erected for this portion of the establishment without any drainage, the foul exhalations from which tainted the air to a considerable distance.

The theatre and ball-room, which together formed a long, lofty wooden building, were by far the best portions of the hospital. The wards were large and lofty, well adapted for the treatment of the sick, and had but one defect, namely, the ventilation, for which no suitable provision had been made. The privies attached to this part of the hospital were placed over a running stream; but at the time of our visit, offensive exhalations arose from them, in consequence of some temporary obstruction. They were, however, well removed from the sick wards.

The kiosk was an ordinary private dwelling, and appeared to be tolerably well adapted for its purpose.

The water was obtained from wells.

There was considerable difficulty in dealing with the most prominent sanitary defects of the Palace Hospital, on account of there being no proper outlet for the drainage, and the distance to which the outfall would have had to be carried in order to reach the sea.

We considered it nevertheless necessary to direct that the low marshy ground in which the hospital is situated should be at once thoroughly drained; that the privy accommodation should be improved by flushing through the drains if eventually found to be practicable; and if not, that movable boxes should be provided, and their contents frequently removed; that the privies should be thoroughly cleansed and deodorized; that lime-washing should be used; and that all parts of the hospital should be thoroughly ventilated by panes of perforated zinc inserted in the windows, and by suitable openings as near the roof as possible.

There was a closed gallery between the theatre and ball-room, in which there were a few patients. We directed this portion of the hospital to be disused, as it was unfit for sick.

### 4. *The Stable Hospital.*

This hospital consisted of four wards, over a line of stables belonging to the Barrack Hospital, and at a short distance from it.

The situation was, in our opinion, a bad one, and the relative position of the wards and stables, besides the generally foul condition of the place, rendered it unfit for the reception of sick. We are glad to state that this hospital was immediately evacuated.

### 5. *The Hospital Burial-ground.*

The burial-ground for the hospitals at Scutari is situated on a cliff overhanging the Sea of Marmora. The ground follows the line of the cliff, and is of an oblong irregular form. Part of it, devoted chiefly to the interment of officers, occupies the space of ground between the cliff and the wall bounding the outer courtyard of the General Hospital.

The portion which was being used at the time of our visit for the interment of common soldiers is situated at a distance from the hospital boundary wall, on a bank sloping towards a stream of water flowing from Haidar Pascha to the sea.

At that period the interments in the officers' burial-ground took place in single graves; but the mortality among the men in the hospitals had been, and was still, so considerable, that it was the practice to bury the dead in common graves.

The plan adopted was to dig shallow graves of sufficient size to hold the number of corpses expected. These were wrapped in sheeting, and placed side by side, as close as they could be laid: the graves were filled up with earth, which was also heaped over them. In one such grave we saw twenty-two corpses interred.

It was notified to us that the Turkish authorities considered this plan of burial injurious to health, which it was very likely to be, especially in warm weather.

The only hospital liable to be affected by the emanations from the ground was the General Hospital.

Considering the large number of dead which had already been interred, as well as the current daily proportion, it appeared to us that some regulation as to the mode of burial was absolutely necessary for the protection of the health of the General Hospital.

The comparative smallness of the area of the burial-ground rendered it impracticable to open a grave for each corpse. We thought it sufficient to direct that no interment should take place within one hundred yards of the wall inclosing the General Hospital; that no more than one layer of corpses should be placed in any grave or trench; that a space of not less than twelve inches should be left between each body; that the grave or trench should be at least six feet deep below the ordinary level of the ground; that a layer of peat charcoal should be placed over the bodies instead of lime, which was used at the time; that all interments should take place during the morning and evening, and not during the heat of the day; and that with respect to the ground already occupied, a layer of peat charcoal be

at once laid over it, the ground levelled, and sown with grass-seeds.

#### *6. Hospital at Kulali.*

This hospital consisted of two large buildings, one of which was a Turkish cavalry barrack, having a range of stables underneath part of it. The buildings occupied three sides of a square, which was completed by a range of sheds formerly used as stables, but which were being converted into hospital wards by thoroughly cleansing and ventilating them, concreting the floors and plastering the walls.

Kulali barrack is situated on the Asiatic side of the Bosphorus, about four miles above Scutari. Its front presents a long line of brick-coloured buildings rising immediately from the level of the water. The Bosphorus is bounded at this point by a steep range of limestone hills, and the square of the barrack has been built in a small valley where the hills recede a little from the water.

The other portion of the hospital is a pile of buildings erected against the steep hill-side, close to the barrack, and above it.

Considered as a whole, the site of this hospital could not be deemed a very healthy one. The barrack buildings were the least adapted for the purpose, except a large riding-school at the north-eastern extremity, which formed an excellent ward.

The hospital had, however, one advantage—that the sick could be landed close to the entrance in all weathers, which was not the case at Scutari. It might be considered, therefore, as a complement to the other hospital establishments on the Bosphorus.

The chief sanitary defects connected with the vicinity of the hospital were the following:—

The ground about it was irregular, wet, and dirty. The courtyard was not paved, and the surface was soft and damp. The natural configuration of the ground caused the water from the higher land to drain down towards the hospital site, keeping the neighbouring ground generally in a

moist condition, breaking out in springs upon the hill-side, and running over the surface.

The sanitary defects within the building were of a far more serious character.

We found a considerable area of the basement under the wards and officers' quarters fronting the Bosphorus occupied by about fifty Turkish privies, the emanations from which pervaded the whole of this part of the building, and could be traced even into the courtyard.

On the same basement, and under other wards and quarters, there were stabled 200 Turkish cavalry horses, and as a consequence, the wards and quarters above were pervaded by the exhalations. From these defects fever and diarrhoea had originated within the building, amongst the sick, medical officers, and nurses. There were during the month of March twenty-two cases and four deaths from fever, including one of the lady nurses, all originating within the building.

The wards already occupied by sick were long roomy apartments, extending the whole height of the building, which had two rows of windows on each side, one above the other. A wooden gallery carried round the wards at the height of the second row of windows, partially divided the ward into two flats, but left the ventilation free up to the roof. The beds for the sick were placed underneath, and also upon these galleries. At the time of our first examination we found the ventilation very imperfect, and the wards overcrowded.

The interior of the wards required lime-washing.

The water supply to the hospital contained vegetable tissue and threads of fungus.

The stable-sheds, which were being converted into sick-wards, were not completed, and suggestions were required for improving the ventilation, and for giving more cubic space for the sick.

To remedy the sanitary defects enumerated, the Commissioners directed :—

1. That eight new privies should be erected outside the barrack, with provisions for draining, flushing and cleansing ;

that in the meantime those in the basement fronting the Bosphorus should be cleansed and deodorized ; and that on the completion of the improved arrangements they should be abandoned and covered over.

2. That the sick wards and quarters over these privies, and also the wards over the stables, should be abandoned as soon as new wards and quarters could be got ready.

3. That overcrowding should be prevented by allowing not less than 1,000 cubic feet of space for each inmate, and in no instance placing the beds nearer than six feet from centre to centre.

4. That to insure adequate ventilation, the upper rows of panes in each window should be removed, and perforated zinc plates inserted ; that the upper part of windows in partitions between corridors and wards should be permanently opened ; and that adequate space for ventilation should be provided as near as possible to the ceiling of each ward.

5. That all the wards should be thoroughly lime-washed at frequent intervals.

6. That the land outside the barracks should be properly drained, the water-stream diverted, and the whole neighbouring ground regularly cleansed at short intervals.

7. That the unpaved portion of the barrack-square be formed, and coated with broken tile, stone, or gravel.

8. That the water-tanks be examined, and cleansed when necessary, and the water in future filtered.

9. That peat charcoal be used as a deodorizer in the removal of all offensive matter.

10. We found the burial of the dead conducted with suitable precautions, and the only direction which we deemed it necessary to give was, that interments should not take place during the heat of the day.

The upper portion of the hospital, situated on the slope of the hill, was in many respects much superior to the Cavalry Barrack. It consisted of wards and corridors communicating freely with each other by doors and windows, but it had one structural disadvantage, arising from its position, that the slope of the hill rose considerably above the floor of the wards, so that a thorough perfation of the building from back to front was hardly practicable.

The chief evil, however, was the offensive condition of the privies which were within the building, and unfortunately at such an elevation that water could not be obtained to cleanse them except by hand labour.

The remedies applied to the sanitary defects of this building were in principle the same as those already mentioned.

#### 7. *Landing of the Sick and Wounded.*

The Commissioners, while making a detailed examination into the condition of the hospitals, directed their special attention to the means in use for conveying the sick and wounded from the transports to these establishments.

There were two points at Scutari at which the sick were landed. One of these was on the Bosphorus, directly under the north-west wall of the Barrack Hospital, and the other was to the south of the General Hospital, where the ground slopes down to the Sea of Marmora. At each of these places there was a jetty, alongside which large boats could be conveniently moored.

The ascent from the landing-place under the Barrack Hospital was very steep, and the road not a convenient one. The ascent from the southern landing-place to the General Hospital was more easy but more distant.

The sick ships arriving from the Crimea were anchored as near as practicable to the jetties, and the sick and wounded slung over the ships' sides on stretchers into the boats, or, if they were able to descend the steps, they were carefully assisted to do so.

On our arrival, the boats used for the purpose were open, but during the summer, covered barges were employed. On arriving at the jetty, a fatigue party, with stretchers and proper superintendents were in waiting. The sick and wounded were lifted on stretchers, or assisted to disembark, as the case might be. They were carried slowly on men's shoulders, or supported in walking up to the hospitals.

Whenever we saw the sick disembarked, it was impossible not to feel gratified with the care with which they were treated both by the soldiers and officers.

We considered it to be unnecessary to make any recommendations on this head.

The chief disadvantage attending the landing of the sick at Scutari was the frequent bad weather, especially at those seasons when a larger number were likely to arrive, and the exposed nature of the anchorage, which rendered communication with the shore by boats very uncertain at times. From this disadvantage the hospital at Kulali was exempt. There was deep water close to the hospital, in which ships could be moored, and the sick and wounded could be landed at all times. There was a small steamer attached to the hospitals, which was of great use in assisting in the conveyance of sick and wounded.

#### 8. *Hospital Ships on the Bosphorus.*

In addition to the hospital establishments at Scutari and Kulali, two ships, one the "Bombay," the other an old Turkish line-of-battle ship, were used at the time of our arrival for sick and convalescent soldiers.

We carefully examined both these ships, and found them ill adapted for their purpose. We ascertained that, after the reception of some sick soldiers on board, a low typhoid fever broke out and prevailed to some extent in the Turkish ship, and to a very great degree on board the "Bombay." In the latter, it originated in the orlop deck, first attacking the orderlies, and then spreading to the crew and some of the convalescents, and only declining when the numbers on board were reduced.

On examining into the probable causes of this outbreak of disease, we arrived at the conclusion that the unhealthy state of the ships proceeded:—

From poisonous miasmata arising from the foul state of the bilge-water.

The prolonged confinement to bed of a number of persons in a low-ceiled, confined space.

Defective ventilation, chiefly in the orlop deck of the "Bombay."

Overcrowding.

Incomplete lime-washing.

To remedy these defects, the Commission recommended:—

1. That the condition of the bilge-water should be frequently examined, the water deodorized when necessary, and frequently pumped out.

2. That more effectual cleansing and lime-washing be carried out.

3. That overcrowding be diminished, and the use of the ships restricted to convalescents.

4. That more effectual means of ventilation be at once adopted.

While giving these directions, we deemed it to be our duty at the same time to point out that ships, especially when moored in such positions as those occupied by the "Bombay" and the Turkish line-of-battle ship, were by no means the best places for the reception of convalescents, and that a well-arranged convalescent institution on shore would be far preferable to the use of floating hospitals of any kind.

#### *9. Royal Naval and Marine Hospital at Therapia.*

This establishment consisted of two separate buildings, one a Turkish private residence, chiefly constructed of wood, and used for the reception and treatment of the sick, the other a kiosk belonging to the Sultan, and partly in use as a convalescent hospital.

Both buildings are situated close to the shores of the Bosphorus, and their basements are only a few feet above the water-level. The ground rises from behind them to an elevation of above 500 feet.

The kiosk is situated in a fine garden; its rooms, staircases, and landings are spacious and lofty; the means of ventilation are amply sufficient, and the building presented many sanitary advantages.

The private residence used as a hospital had the customary defects of Turkish houses, and, as a consequence of these sanitary imperfections, upwards of two-thirds of the low typhoid fever cases treated within it had originated in the building. Fever prevailed throughout all the wards and

rooms; and, beside the cases among the patients, three out of nine female nurses had been affected.

The ceilings of the wards were not lofty enough. The windows did not reach the ceiling; most of the upper sashes would not open. There were no flues or open fire-places, and, at the time of our inspection, the windows had generally to be kept closed, on account of the coldness of the weather; the means of ventilation were thus very deficient.

The impurity of the internal atmosphere was increased by the improper position and faulty construction of the Turkish privies, some of the doors of which opened directly into the wards and rooms occupied by the sick. Chloride of zinc had been used for disinfecting these privies, but they were still offensive.

The drainage of the building was defective, the drains being merely trenches on the level of the Bosphorus, filled with water, having no current in them.

Some parts of the hospital were overcrowded. The water supply was good and abundant, and the arrangements for the interment of the dead were satisfactory.

The following directions were transmitted to Rear-Admiral the Hon. F. W. Grey, for remedying these defects:—

1. That the ventilation be immediately improved by the introduction of suitable openings near the ceilings of the wards, and by removing the upper panes in the windows, and inserting perforated zinc plates or wooden louvre boards instead; and further, that where practicable, curtains should be substituted for the ward doors.

2. That to diminish overcrowding, the beds be placed apart at a distance of not less than six feet, measured from centre to centre, and that at the same time, each patient should have at least 1000 cubic feet of space.

3. The Turkish privies, in the basement of the hospital, to be deodorized and closed up, and that those in the upper and middle floors of the building be converted into water-closets, and ventilated through the roof.

4. The drains to be thoroughly cleansed and their contents deodorized and removed.

5. As in the case with the other hospitals on the Bos-

phorus, directions were given for the regular and immediate removal of all refuse from the building.

We have pleasure in stating, that before our visit to this hospital, the officers of the establishment had been using their best efforts to improve its sanitary condition, though much still remained to be done.

Having concluded the preceding statement of the removable sanitary evils which the Commission found in all the hospitals on the Bosphorus, and the measures for remedying them, it remains to be mentioned, that the directions with respect to the military hospitals were embodied in two reports addressed to Brigadier-General Lord William Paulet, and transmitted to his Lordship on the 15th March, 1855. The report in regard to the two hospital-ships in the Bosphorus, was sent to Rear-Admiral the Hon. F. W. Grey, on the 17th, and that respecting the hospitals at Therapia, on the 27th March.

The total sick in the military hospitals, when the directions for their improvement were issued were as follows:—

				Sick.
Barrack Hospital	..	..	..	1,800
General	..	..	..	899
Palace	..	..	..	467
Kulali	..	..	..	949
Total	..	..	..	4,115

On the 16th March, the Commissioners received a communication from Lord William Paulet, assuring them that all instructions and suggestions pointed out in their reports would be strictly carried out as far as his Lordship was enabled to do so.

Similar communications in regard to the directions for the hospital-ships and the Naval and Marine Hospital at Therapia, were received from Rear-Admiral the Hon. F. W. Grey, on the 18th and 29th March.

We may here state incidentally, that in consequence of its having been represented to the Commission that the buildings occupied by the Russian prisoners at Constantinople, were in a defective sanitary state, Mr. Rawlinson

inspected them, and found the Turkish barracks, where the prisoners were kept, in so bad a condition, that they could not be improved except at great expense, and he therefore advised Admiral Grey to remove the prisoners to a more healthy place.

As soon as the examinations of the various establishments were completed, and the necessary improvements determined on, Mr. James Wilson, one of the Liverpool Inspectors was directed to proceed to Scutari to report himself to Lord William Paulet, and to carry out the instructions for surface-cleansing at the hospitals there. Similar instructions were also given him for the cleansing operations at Kulali.

On the 14th March, the Commissioners made an order directing Mr. Newlands, and Messrs. Freeney and Aynsley, the Inspectors, to proceed to Balaklava with a letter of introduction to the Commander of the Forces. Mr. Newlands was directed to commence the sanitary inspection of Balaklava and the neighbourhood immediately on his arrival, and to draw up an estimate of the cleansing staff and appliances required for improving its sanitary condition to be ready for the Commissioners on their arrival in the Crimea.

In conformity with a resolution of the Commission, our late colleague, Dr. Gavin, left Constantinople for the Crimea on the 21st March, Dr. Sutherland proceeded to Smyrna to inspect the hospital there on the 22nd March, and Mr. Rawlinson remained at Constantinople to initiate the works at Scutari, Kulali and Therapia, the details of which had been explained to that able officer, Captain Gordon, R.E., who undertook, with the greatest readiness, to carry them out.

Dr. Sutherland arrived at Smyrna on the 24th March, and proceeded immediately to the hospital there, where he saw Colonel Storks, the Commandant, and Dr. Meyer, who had charge of the medical arrangements.

At that time, doubts were entertained as to whether the site of the Smyrna Hospital was such as to be conducive to the recovery of the sick, and the facts on this head were amongst the very first that demanded attention.

Dr. Sutherland received evidence on the subject from

Dr. James M'Craith, who had practised as physician in Smyrna for eight years, but had known the country for the last eighteen years, and Mr. Charles Wood, M.R.C.S., surgeon to the British hospital at Smyrna, and who had practised for eighteen years in the city. Dr. Sutherland also examined the sanitary condition of the hospital itself, and of that part of the town of Smyrna in its vicinity. He likewise visited, in company with Colonel Storks, the Quarantine establishment, which it was proposed to use for convalescents, and several sites in the neighbourhood of Smyrna, with the view of ascertaining how far they would be suitable for convalescent stations.

We next proceed to state the result of these inquiries.

#### 10. *Civil Hospital at Smyrna.*

This establishment consisted of a large Turkish barrack, situated close to, and almost on the level of the sea, at the south-west angle of the city of Smyrna. The building forms three sides of a square, open to the bay on the fourth side, so that the whole range of the barracks is exposed at all times to the sea breeze, and to the summer wind, the "Imbat," which blows directly from the sea to the hospital from 9 A.M. to 6 P.M.

The sea in front of the hospital was clean, and contained no decaying matter. Behind the buildings is an enclosed square, which contained the washhouses, kitchens, stables, &c., and on the south-west side of it is a large open space of ground on which it was proposed to build hospital sheds if necessary.

The building was thus entirely open on two sides; but on the other two, it had the streets of the town of Smyrna coming close up to its walls.

With reference to the sanitary condition of the vicinity, it may be stated, that the whole of the lower district of Smyrna, extending along the sea-shore, affords perhaps one of the worst examples of the neglect of sanitary precautions anywhere to be met with.

It occupies low and flat ground, receiving the drainage of the higher portions of the town and of the mountain

ridge, the site of the ancient city, behind it. A considerable portion of the modern city, along the sea-beach, is built on the filth of the town, which has been carried down and thrown into the water in order to bank out the sea and to obtain building space.

This is done by pushing out the houses on piles, so that the sea comes underneath their floors, and the vacant space is filled up by throwing in rubbish, filth, and decaying matter of all kinds.

This foul subsoil is traversed at short distances by open sewers passing under the houses and crossing the streets, and these sewers are bridged over by a few planks, to admit of the passage of traffic.

To a stranger the exhalations arising from the soil, and from the filthy streets and sewers in the lower portions of the town, are sometimes overpowering, especially in the bazaars, which are only long lines of narrow dirty streets, covered over between the ranges of houses in such a way as to preclude the free circulation of air and admission of light.

The drainage, paving, and cleansing are all as bad as can be, and, indeed, the bad sanitary condition of these lower districts of Smyrna, is more than sufficient to account for the pestilential fevers and plague epidemics from which the town has suffered almost from time immemorial.

The only wonder is, that pestilence in some form is ever absent from such places as Smyrna, Constantinople, Dardanelles, Samsoun, &c., all of which exhibit the same general indications of neglect of the most ordinary sanitary precautions.

At Smyrna, there is, besides, a large extent of marshy ground, lying to the east and north-east of the town, at the opposite extremity to that at which the hospital is situated.

The streets in the immediate vicinity of the hospital, although bad enough, were not in so bad a condition as those further removed; but still there can be no doubt, that although the site of the hospital was by far the most open, the best drained, the cleanest, and the most healthy in the town, the general atmosphere must have been more or less affected, according to the state of the wind, by the bad sanitary condition of the town itself.



The evidence of the medical witnesses already named, goes to show that continued, remittent, and intermittent fevers are the prevailing diseases; that in autumn, cases of fever occur with yellow skin, and apparently allied to yellow fever; that cases of a pernicious fever called the "remittent malarial fever," occur during spring and autumn; that occasionally, epidemic remittents show themselves; that, although there had been no plague for eighteen years, there had been three cholera epidemics within that period, and that the houses where these diseases prevail, are precisely the houses built on the foul foundations already mentioned.

The high average temperature, which is 80° in summer and 60° in winter, no doubt aggravates the effect of the many and powerful local causes of disease.

The evidence of the medical gentlemen, as well as personal observation, went to prove that the site of the hospital, although low, was certainly the most healthy in Smyrna, but that fevers would be likely to occur in the basement flat of the building.

It is, in fact, a rule in that part of the country that the lower flats of houses are unhealthy, and for people to sleep as high above the ground as they can.

Besides the defective sanitary condition of the streets in the neighbourhood of the hospital, there was a considerable extent of foul open ditches close to the boundary wall, and one of these ditches passed immediately in front and on one side of the medical officers' quarters.

The general drainage of the site of the hospital was imperfect. In some places water was lying on the surface, and the drains passing under or close to the hospital required examination.

Open privies were still in use, but were in process of being replaced by water-closets.

The building, like the hospitals at Scutari, consists of wards and corridors, communicating freely with each other by doors and windows. There were thus considerable structural facilities for ventilation, and all that was required was that these means should be properly made use of, and a few ventilating openings introduced where there was not a sufficiently free current of air.

The hospital was rather overcrowded with sick, and the wards and corridors required frequent lime-washing.

On examining the basement it was quite evident that it was unfit for the reception of sick, both from its defective construction and from the fact of the floors resting directly upon the ground. On inquiry it appeared that fever cases had already occurred, to some extent, among the patients and orderlies in this part of the building.

The burial-ground was situated on a lofty hill behind the hospital. The only defect in it was that the graves were too shallow on account of the rocky nature of the soil.

Having completed the examination of the hospital, Dr. Sutherland sent to Colonel Storks, on the 28th March, the following instructions for the requisite sanitary improvements:—

1. That the streets nearest the hospital should be cleansed daily, and the hospital square kept free of nuisances.

2. That the open ditches in the neighbourhood of the hospital should be cleansed, and where necessary laid with tiles or covered over.

3. That the drains passing under or close to the hospital should be examined and cleansed, and where necessary relaid and kept clear by flushing. That ventilating openings should be made in the drains at a distance from the hospital, to prevent the sea or wind driving the foul air into the building. Also that all water lying on the surface of the ground should be drained away.

4. That the condition of the privies should be carefully attended to, and those disused, cleansed, disinfected, or otherwise rendered innocuous. That the water-closets then being substituted for open privies, should be carefully kept clean, and their ventilation made altogether distinct from that of the hospital.

5. That special attention be paid to the thorough ventilation of the hospital by making use of existing facilities, and by providing ventilating openings in any corners where the air could not be sufficiently changed by the present means of ventilation.

6. The immediate removal of all excreta from the hospital.

7. That the wards and corridors on the ground floor should cease to be used either for sick or convalescents.

8. That not less than 1,000 cubic feet of space should be allotted to each patient.

9. That all the wards and corridors should be thoroughly washed with quicklime at short intervals.

10. That all water used for the sick should be filtered.

11. That no interment should take place during the heat of the day, nor in a grave less than five feet deep.

It was in contemplation to extend the hospital accommodation at Smyrna, either by the erection of hospital sheds on the vacant ground in the vicinity, or by the adaptation of the quarantine buildings for the reception of the sick or convalescents.

In the event of sheds being erected, a recommendation was made that their floors should be raised three feet above the level of the ground to cut off the emanations proceeding from it; that the ground itself should be thoroughly drained, and that the same sanitary principles should be applied in the sheds as in the hospital itself.

The quarantine establishment of Smyrna is situated at some distance to the west of the hospital, and consists of sheds for the reception of merchandize, and other buildings for the accommodation of travellers undergoing quarantine. The establishment is erected close to the sea-shore, and a few feet above its level. It covers a small area of ground, in a kind of recess of the sea-coast, with high land behind it. No provision had been made for diverting from the site the surface water flowing from the hills, and as a consequence it flooded the site of the buildings so as to render it marshy and unhealthy. The drinking water was also very bad.

There appeared to be no objection to the use of this building for a few convalescents, provided such necessity arose, and provided also that the surface waters were diverted from the site, the drinking water filtered, and the upper flat of the building used in preference to the ground-floor, all of which was recommended to be done.

Between the hospital and the quarantine station was a large slaughter-house, which was also recommended to be placed under regulation to prevent nuisances from it.

Colonel Storcks, who had been most actively engaged in improving the Smyrna hospital, gave immediate orders for carrying out all the improvements, in which he was efficiently seconded by Dr. Meyer, medical superintendent, and by Mr. Brunton, the engineer attached to the hospital.

Before leaving Smyrna, Dr. Sutherland made inquiries as to sites for a convalescent establishment near the city. Three villages were named as the most healthy in the neighbourhood, Dourlack, Bournabat, and Boudjah. Several sites were found near the two latter villages, which would have answered the purpose.

Dr. Sutherland left for Constantinople on the 29th March, and arrived there on the 31st.

Dr. Milroy visited the hospital at Smyrna in the middle of July, on his way from England to Constantinople. At that period there were only 104 sick in it, and 400 beds were vacant. There were also about 100 convalescents at the Lazaretto, ready to return to the Crimea. The sick appeared to be progressing favourably, and scarcely any cases had arisen spontaneously in the building since the use of the basement floor had been discontinued. The state of the wards and corridors left nothing to be desired in point of cleanliness. They were also well ventilated. The water used for drinking was regularly filtered. Wherever old drains had been opened, they had been found charged with cesspool deposit, an immense quantity of which had been removed from different points close to the hospital walls.

At this time the beach in front of the hospital was covered with myriads of dead locusts, which perceptibly tainted the air. The only point calling for special notice was the unwholesome state of the stables in the rear of the hospital, respecting which Dr. Milroy addressed a letter to General Storcks, and the nuisance was immediately corrected.

The Smyrna Hospital was again inspected by Dr. Sutherland on the 9th November, 1855, shortly before it was converted into a barrack. It contained very few sick, and its sanitary condition continued good, with the exception of the basement, the damp exhalations from which rendered the wards unfit for occupation by troops, unless the floors

were previously covered with concrete, which he recommended to be done.

§ II. PROGRESS OF THE SANITARY WORKS AT THE HOSPITALS ON THE BOSPHORUS.

IN conformity with a special clause in the instructions issued to the Commission, Mr. Rawlinson, as already stated, remained a short time at Constantinople to superintend the initiation of the sanitary works at the various hospitals on the Bosphorus.

These works, although not of greater extent than was barely necessary for the removal of the more urgent sanitary defects, involved improvements requiring special materials and better skilled labour than could be obtained at Constantinople for their execution. It was of course requisite to make the best use of whatever means were available on the spot, and the improvements which could be carried out with these means were at once proceeded with.

The special materials required were on their way from England, where they had been ordered in anticipation by the Commission, but they could not arrive at Scutari for several weeks after the instructions had been issued by the Commission to the military authorities.

Dr. Sutherland and Mr. Rawlinson visited the hospitals on the 31st March, and up to that date the instructions were being carried out to the following extent:—

External cleansing was began by the Inspector with a staff of thirteen men, on the 17th March, and up to the end of the month there had been removed from the precincts and square of the Barrack and General Hospitals 556 hand-carts and large basketsfull of filth and rubbish, and two tons of filth from Kulalie; twenty-four dead animals, including two horses, had been buried, and the sewers of the Barrack Hospital, for which flushing-tanks had been erected, had been flushed out twenty-two times.

Cleansing, deodorizing, and general improvement of the sewers and drains leading from the Barrack and General Hospital to the sea, including arrangements for external ventilation and for flushing, were in progress.

The cleansing, whitewashing, and deodorizing by means of peat charcoal of all the privies at the Barrack, General and Palace Hospitals; the erection of flushing apparatus at the new privies erected in the barrack square; and the improvement of all privies within the hospitals, by removing the upper portions of the windows external to the corridors, so as to secure, as far as practicable, to the privies a ventilation separate from and independent of that of the corridors.

The lime-washing of wards and corridors, the repairing of the floors where necessary, and the removal of some of the old wood-work from the wards of the Barrack Hospital.

The formation of channels round the outside of the shed hospitals in the square of the Barrack Hospital, and the improvement of the ventilation of these sheds by means of louvred turrets constructed in the roofs.

The cleansing and partial repairing of the inner squares of the Barrack and General Hospitals. Macadamized stone was being broken for their further formation and improvement.

The water-tank at the Barrack Hospital had been cleansed and roofed over, and additional works of water supply were ready to be begun by Captain Gordon, R.E., as soon as the requisite permission could be obtained from the Turkish authorities.

The regulations respecting the burial-grounds were being enforced.

With regard to the hospitals at Kulali:—

The drains had been examined and cleansed.

The privies had been lime-washed.

The inner square of the Barrack Hospital there had been partially repaired, and stone was being got ready for completing the whole of the surface.

An additional supply of water, the works for which had been begun by Captain Gordon, R.E., before the Commissioners arrived at Constantinople, was being brought to the hospital.

The surface cleansing of the neighbourhood was being carried out.

The burial of the dead was being practised in accordance with our instructions.

At the same date, there were several important directions that had not been carried out.

The overcrowding of the Barrack Hospital had not been entirely remedied. The sick had not been removed from the wards over the privies and stables at the hospital at Kulali, and the ventilating arrangements at all the hospitals were still defective. The receptacles in the wards for the refuse and excreta had not been emptied or removed with sufficient regularity.

The delay in improving the ventilation arose from the non-arrival of the materials from England.

The other matters were represented to Lord William Paulet, by the Commissioners, both personally and in writing, and were attended to.

With regard to the Naval Hospital at Therapia, the works for its improvement had been commenced by Admiral Grey, and were being carried out with all possible despatch. The convalescent ship "Bombay" was shortly cleared and closed, as also the Turkish line-of-battle ship.

It thus appears, that at the time of the departure of the Commissioners from Constantinople for the Crimea, on the 2nd April, the works devised and ordered for improving the sanitary condition of the hospitals, especially those for removing the dangerous defects in the drainage, had upon the whole made satisfactory progress.

Copies of the directions respecting the hospitals, made by the Commissioners, had been sent to the War Department as soon as they were issued; and a letter in reply, dated 30th March, was received from your Lordship by the Commissioners, while in the Crimea, expressing your Lordship's anxiety about the progress of the works, and requesting to be informed how far the instructions had been complied with. A communication was in consequence addressed to Lord William Paulet, on the 14th April, requesting information on the further progress of the works.

A report was received in reply, dated 21st April, in which his Lordship showed that, besides the works and measures completed when the Commissioners left Constantinople, the following additional steps had been taken to give effect to the instructions:—

The drainage of the ground round the *Palace Hospital* had been improved; the obstructions in the privies removed; the closed gallery between the ball-room and theatre emptied of sick, and the number of sick much reduced throughout the hospital.

The *Stable Hospital* had been discontinued.

In the *Barrack Hospital* the beds in the corridors had been almost all reduced to one row. At least 1,200 cubic feet of space had been allowed to each patient. Lime-washing was in continual use: the excreta were removed as soon as possible from the wards. The outfalls of the Barrack Hospital sewers had been extended and protected from the action of the wind, three ventilating openings had been made in the main sewer, and a wooden flushing-tank had been placed over each drain. The inclination in the sewer at the sheds in the Barrack Hospital square had been improved, and flushing-tanks for the privies erected. Barracks for convalescents, and for the soldiers of the depôt, were being constructed outside the Barrack Hospital.

The sewers at the *General Hospital* had been extended, altered, improved and ventilated in the same manner as those at the Barrack Hospital.

At the *Hospital at Kulali* the privies in the basement fronting the Bosphorus had been abandoned and closed. The sick wards and officers' quarters over the privies and stables had been abandoned. Overcrowding had been remedied as directed; the upper halves of windows between wards and corridors had been removed, and the ventilation generally improved by partial removal of windows. The excreta of the sick were immediately removed from the hospital. Lime-washers were constantly at work. Lavatory accommodation had been provided. The barrack square had been drained, and coated with broken tile and gravel. The improvements suggested in regard to water-springs had been carried out, and a filter bed was being constructed.

The permanent ventilating arrangements in the hospitals had not yet been completed, on account of the non-arrival of the materials from England.

The cleansing operations at all the hospitals were proceeding energetically.

The melancholy death of Dr. Gavin, and the urgency of the sanitary works at Balaklava, rendered it impossible for either of the remaining Commissioners to return to Constantinople as soon as was intended; but we received information from time to time which satisfied us that the works at the hospitals on the Bosphorus were proceeding in a satisfactory manner. On the 21st June, however, Dr. Sutherland went to Constantinople, and made an examination of all the hospitals, and the following was their condition at that period:—

### 1. *The General Hospital.*

This hospital was in a satisfactory state. The walls and floors of the wards and corridors were scrupulously clean, and the lime-washing had been very well attended to.

The directions issued by the Commissioners had been efficiently complied with, especially in the important matter of ventilation. Perforated zinc panes had been introduced into the windows, and wooden ventilating shafts, from fifteen to eighteen inches square, had been carried up from the ceiling of each ward to the space under the roof of the building, and louvred turrets had been erected on the roof to admit of the escape of foul air passing up the shafts from the wards. There was a powerful current up all these shafts, and they were answering their purpose most effectually.

The privies were clean, and the odours from them had been much diminished by flushing the sewers, although, from their defective structure, there was still an open communication between the sewers and the interior of the hospital.

The window-sashes of the galleries had been removed and a free current of air intervened between the privies and the corridors.

There was nothing approaching to overcrowding in any part of the hospital, and many beds were vacant.

The external drainage works were nearly completed, and the flushing of the sewers was regularly done.

The courtyard had been drained, and its surface was nearly formed. The floor of the kitchen had also been drained.

### 2. *The Barrack Hospital.*

The sanitary condition of this large establishment had undergone a marked improvement. There was no overcrowding in either wards or corridors. The ventilation had been greatly improved by the introduction of panes of wire-gauze and perforated zinc into the windows. There had not been sufficient time to introduce a separate ventilating shaft for each ward to fulfil the requirements of the instructions, but this essential improvement was about to be proceeded with.

The wards and corridors were perfectly clean, and lime-washing appeared to be thoroughly and continuously carried out.

The privies were well managed and ventilated, and as free from odour as the bad condition of the sewers and drains rendered possible.

The flushing of all the sewers and drains was regularly done according to the instructions.

The sheds in the interior of the barrack square were clean and free from odour, and not overcrowded. The ventilating turrets had been completed, and acted extremely well. The flushing of the privies was also efficiently done.

Arrangements for the accommodation of the depot had been completed, and it was being removed out of the hospital.

### 3. *The Palace Hospital.*

The hareem portion of this hospital had been somewhat improved in its ventilation. The swampy ground outside had been surface drained; but not sufficiently so, on account of the want of a proper outlet. The offensive privy had been drained into a deep cesspool without materially improving its condition. There had been two deaths from cholera in the hareem; fortunately there were very few patients there at the time, and it was advised to be used as little as possible.

The hospital in the theatre and ball-room had been

greatly improved by the insertion of ventilating panes in the windows, and of ventilating openings in the ceilings. The wards were clean and in good condition. The privy of this part of the establishment was still offensive, and required proper drainage. Hardly a single case of fever had occurred in the building.

Excepting the fundamentally defective condition of the Turkish drainage of the hospitals at Scutari, and the still incomplete state of the ventilation of the Barrack Hospital, these vast establishments had thus, at the beginning of the warm weather, been put into a good sanitary condition, and the spirit of the directions issued by the Commission had been complied with so far as time and means had permitted.

#### 4. *The Hospitals at Kulali.*

The barrack portion of this hospital had undergone great improvements; the wards and corridors had been thoroughly lime-washed, and were clean. The ventilation of the wards had been improved by the introduction of large square ventilating shafts passing through the ceiling and roof, and surmounted by louvred turrets. The windows were kept open, and the ventilation was sufficient. There was no overcrowding. The fifty Turkish privies under the front wards had been permanently closed and covered over; the wards over them were no longer used for sick; the Turkish horses had been removed from the stable, and the air in the neighbouring wards had become comparatively pure. The new wards were completed, and were clean and well ventilated: only one of them was in use.

The upper hospital, with the single exception of the drainage, was in a satisfactory condition as to cleanliness, lime-washing, and ventilation, and there was no overcrowding.

Considering their less favourable construction, the hospitals at Kulali had been nearly as much improved as those at Scutari.

A filter bed for filtering the water at Kulali had been completed.

#### 5. *Naval and Marine Hospital at Therapia.*

The instructions of the Commission in regard to this hospital had been substantially carried out. The privies in the basement of the building had been closed, and water-closets substituted for those in the upper and middle floors. The ventilation was sufficient, and there was no overcrowding.

#### 6. *Burial-Grounds.*

The sanitary condition of the great burial-ground at Scutari had been improved according to the directions issued by the Commission, and the burial of the dead at all the hospitals was properly conducted.

#### 7. *Cleansing and Removal of Nuisances.*

The cleansing and removal of nuisances had been diligently carried out by the Inspector of the Commission at Scutari and Kulalie. The streets and lanes of the town nearest the Barrack Hospital were kept quite clean. The whole surface of the ground round the Barrack and General Hospitals was cleansed every day, and also the interior of the squares; and peat charcoal was freely made use of wherever required in deodorizing all filth previous to removal.

The staff of men engaged in these sanitary works was well organized, and everything outside the walls of the buildings at all likely to injure the purity of the air, was speedily and carefully removed, and all dead animals at once buried.

The sewers at the larger hospitals had not unfrequently to be opened to remove the accumulated filth which almost choked them up. This was done by men under the Inspector, and the matter was always deodorized before removal.

The flushing tanks placed over the sewers outside the walls at the Barrack and General Hospitals, and those connected with the latrines, were filled by hand labour by the

Inspector's men, and he himself regularly discharged the contents of these tanks into the sewers at stated times every day. By these means the sewers were kept as free from deposit as their radically defective construction would permit.

The privies were deodorized and flushed regularly; those under the wards at Kulali had been cleansed and deodorized before being finally closed up.

The great point in these important sanitary precautions was doing the work regularly. Nuisances were prevented, and the air within the hospitals purified.

The Inspector's daily reports extend from March 17 to July 11. It appears from them that the men employed on working days averaged twenty-three per diem.

The flushing of the sewers at the Barrack Hospital was begun on the 24th March, and in the course of the ensuing week the sewers at the Barrack and General Hospitals were opened and cleansed by direction of the Commission. There were 100 hand-carts of filth removed from these sewers, after having been deodorized with peat charcoal.

In the month of March, from the 17th to the 31st, as already stated, there were collected and removed 556 hand-carts full of refuse from the ground around the hospitals, from the squares, and from the adjacent streets of the village, and also from cleansed sewers. Two tons of filth were removed from the vicinity of the hospital at Kulali. From the time the flushing apparatus for the sewers was erected at the Barrack Hospital the sewers were flushed twenty-two times. There were twenty-four dead animals buried.

In April there were 1,329 hand-carts, or large basketsful of refuse, swept up and removed. The sewers were flushed forty-three times, and the hospital latrines, for which flushing tanks had been erected, were flushed out fifty-one times. Eight dead animals, including three horses and a cow, were buried.

In May there were 1,159 hand-carts, or large baskets of refuse removed. The hospital sewers were flushed forty-three times, and the latrines forty-four times.

The filth and refuse removed from the vicinity of the hospitals in June, amounted to 1,544 hand-carts or basketsful. The flushing tanks for the sewers and privies at the

General Hospital were completed at the beginning of the month. Ninety-five flushing operations were carried out with the sewers at the Barrack and General Hospitals. The latrines and privies at both hospitals were flushed out ninety-six times. There were also two dead horses buried.

Up to the 11th July, the date when the Inspector's daily reports cease, there were removed 526 hand-carts full of refuse from the ground near the hospital. The sewers at the two hospitals were flushed out thirty-six times, and the privies and latrines thirty-six times.

Besides the amount of cleansing and prevention of nuisances carried out by the men placed at the disposal of the Inspector of the Commission, there was much filth removed from the Palace Hospital and from Kulali by a staff of men employed by the Purveyor; the Inspector confining his duty in regard to these men to seeing that the work was well and carefully done.

In the beginning of July the system of cleansing had been so well organized that it appeared to be unnecessary to detain the Inspector much longer from his duties in Liverpool, where he was required. Dr. Sutherland, therefore, recommended Lord William Paulet to appoint two men as Inspectors, one at Scutari, the other at Kulali, to remain for a short time under Mr. Wilson's instruction, and to succeed him on his return home.\*

\* The following abstract of a few of the Inspector's daily reports may be useful as showing the manner of proceeding, and the amount of cleansing, and the removal of nuisances required to fulfil the intention of the instructions issued by the Commissioners:—

On the 26th March there were fourteen men employed at the Barrack Hospital sweeping the ground outside, and the square inside. Removed forty hand-carts of filth and rubbish from the ground and from the privies. Swept the streets and removed ten large basketsful of filth. Employed four men in carrying water to the flushing tanks, and flushed the sewers of the hospital three times. Employed six men in removing filth from the vicinity of the General Hospital. Swept the ground outside and removed ten hand-carts of filth from it. Visited all the three hospitals at Scutari.

27th March.—Four men carrying water to flushing tanks at Barrack Hospital. Flushed the sewers three times. Six men removing contents of a large sewer opened in the barrack square, and forty-two hand-carts of filth removed from it, after being deodorized with peat charcoal. Six men swept the ground inside and outside the hospital and the adjacent streets; twenty

The following is a summary of the work done during the period of Mr. Wilson's inspectorship:—

Hand-carts or large basketsful of filth removed	..	5,114
Sewers and latrines flushed (times)	.. ..	466
Carcases of animals buried	.. ..	35

### *8. Improved Health of the Hospitals.*

We have already given the numbers of sick in each hospital at the time when the regulations were issued.

The following table gives the numbers for the week ending July 7, the period when the inspection was made:—

			Sick.
Barrack Hospital	.. ..	802	
General .. ..	.. ..	348	
Palace .. ..	.. ..	98	
Kulali .. ..	.. ..	355	
Total .. ..	.. ..	1,603	

During the time when the sanitary improvements directed by the Commissioners were being carried out, a marked improvement took place in the health of all the hospitals. Part of the result appears to us to be due to the less severe character of the cases sent from the Crimea to Scutari; but

large basketsful of filth removed, and three dead dogs buried. Five men employed at the General Hospital, who swept all the ground in the vicinity, and removed the contents of a sewer, fourteen hand-carts full were removed, after being deodorized with peat charcoal. Privies also deodorized with peat charcoal.

April 11.—Twenty men employed at the Barrack Hospital; twelve carrying water for flushing sewers and privies. These were flushed twice each. Two men swept the ground about the hospital, and six men removed the filth and rubbish. Forty hand-carts full taken away. Six men cleansed the ground around the General and Palace Hospitals; twelve hand-carts full of filth and rubbish removed. Purveyor has other men employed at these hospitals. Visited Kulali, and found that six men employed by Inspector had been taken on Purveyor's book. Purveyor has about twenty men removing refuse, and taking it down the Bosphorus in boats.

The hospitals are getting into a clean state.

April 19.—Twenty men employed at the Barrack Hospital; twelve carrying water to the flushing tanks. Sewers and privies flushed twice each.

there can be no doubt that the favourable change in the health of the hospitals advanced simultaneously with the progress of the sanitary works. All the sanitary measures adopted—the external cleansing, the deodorizing, cleansing, flushing, and structural improvements in sewers and drains, the limewashing of wards and corridors, the cessation of overcrowding, and the improved ventilation—had for their object the removal of numerous causes of atmospheric contamination which existed around, under, and within the hospitals at the time they were first examined, so as to preserve the purity of the air in the wards as far as it might be practicable to do so.

The palliating effect of the constant flushing of the

Two men employed sweeping, and nine men removing refuse. Fifty-nine hand-carts of filth and rubbish removed from the ground and from a sewer which had been opened. Charcoal used for deodorizing. Buried a dead horse lying near the hospital. Four men employed in surface cleansing at the General Hospital, and twelve hand-carts of filth and rubbish removed.

May 10.—Twenty-one men employed at the Barrack Hospital. Water carried by twelve men for flushing sewers and latrines, which were flushed twice each. Three men engaged in sweeping, and six in removing forty-three hand-carts full of refuse. Obtained assistance of the firemen, and flushed the sewers and privies at each angle of the hospital, with the fire-engine. Several tons of water were thrown down them. Three men employed in surface cleansing at the General Hospital, and eleven hand-carts of refuse removed. Visited Kulali, and the Palace Hospital and found all correct and clean.

May 25.—Twenty-two men engaged. Water carried as usual for flushing sewers and latrines. Ground swept, and thirty-nine hand-carts of refuse removed. Cleansing staff at the General Hospital removed fourteen hand-carts of refuse from the surface. General and Palace Hospitals kept very clean.

June 20.—Eighteen men employed at the Barrack Hospital; twelve in carrying water for flushing tanks. Sewers and latrines flushed twice each. Ground in the vicinity of the hospital swept, and thirty-nine hand-carts of filth and rubbish removed. Six men employed on similar duties at the General Hospital. Sewers and latrines there flushed twice each. Ground about the General Hospital cleaned, and sixteen large basketsful of filth and rubbish removed.

Visited the General Hospital and those at Kulali, and found all clean.

July 11.—Cleansing and flushing the sewers and latrines at the Barrack Hospital, done by fourteen men; and thirty-six hand-carts of filth removed from the ground and streets. Surface round General Hospital cleansed, and seventeen large basketsful of refuse removed. Water carried to tanks and sewers, and latrines flushed twice each.

Visited General and Palace Hospitals, and found them clean.



sewers was most beneficial. The wards were clean, bright, and airy. The sick had been much reduced in numbers, and those who remained looked more healthy than the inmates of the wards formerly did. With the exception of the defective structure of the drainage, the open privies, and one or two minor points, it is doubtful whether, at that time, any hospitals in existence presented greater advantages for giving full scope for the effective treatment of the sick, so far as that depended on cleanliness and on purity of the air.

The mortality among the sick had fallen very considerably, as will be seen by the following table of the percentages of deaths to the sick remaining and admitted into hospital for six periods of twenty-one days each, from March 17, when the sanitary works were commenced, to June 30:—

Twenty-one Days Ending	Barrack.			General.			Palace.			Kulalie.		
	Remain and Admitted.	Deaths.	Deaths to Sick per cent.	Remain and Admitted.	Deaths.	Deaths to Sick per cent.	Remain and Admitted.	Deaths.	Deaths to Sick per cent.	Remain and Admitted.	Deaths.	Deaths to Sick per cent.
March 17 .....	2482	186	7.49	1227	144	11.73	686	51	7.43	1127	133	11.80
April 7 .....	2495	99	3.96	1011	60	5.93	460	15	3.26	1094	66	6.03
„ 28 .....	1988	65	3.26	801	21	2.62	399	11	2.75	875	30	3.42
May 19 .....	1574	33	2.09	691	18	2.60	263	4	1.49	895	16	1.78
June 9 .....	1180	19	1.61	567	17	2.99	183	8	4.37	627	5	0.79
„ 30 .....	1408	15	1.06	524	8	1.52	242	2	0.82	610	4	0.65

During the month of May, when cholera prevailed in the Crimea, it also appeared at several points on the Bosphorus. At the end of the month, a few cases occurred in the General Hospital, and there was some diarrhoea among the sick. A drain on the south side of the building, 30 feet from the outside wall, had been opened to remove some obstruction in it. On the north side of the building, and about the same distance from the wall, were two manholes connected with a sewer, which had been left open. There was smell perceptible from all of these openings.

A single case of cholera occurred in a ward opposite one of the manholes. The other cases occurred on the south side of the building, opposite the opened drain. A nurse, in

another part of the building also had cholera. There was no further extension of the disease.

About the middle of June, cholera still prevailed in one or two villages on the Bosphorus, and it appeared on the 28th in the rooms of the Barrack Hospital occupied by the soldiers in depôt there. The Commission had formerly recommended the removal of the depôt from the hospital as a sanitary precaution, and the preparations being nearly completed, it was located outside the hospital on the 2nd July. In the four days from the 28th June, there had been in all, fourteen cases and nine deaths in the establishment. Ten of the cases took place in soldiers occupying the barrack rooms on the south-east side of the building. These rooms were by no means clean. The windows were low, and the ventilation inadequate. The rooms were besides rather crowded.

There was diarrhoea in the hospital at the same time, and two cases of cholera occurred among the sick. There was another case in the convalescent sheds in the square, and one in a shed opposite to it occupied by soldiers.

The cholera disappeared on the removal of the depôt.

At this period, the water supply for the hospitals was undergoing improvement. Permission for extending the supply had been obtained from the Turkish authorities and Captain Gordon, R.E., was executing the necessary works.

The source of the water was situated between four and five miles from Scutari, and is a natural spring issuing from the side of a lofty hill. The country between the source and Scutari is undulating and furrowed with ravines, and the spring was being conducted in red, unglazed, earthen pipes, about six inches in diameter, joined together by spigot and faucet joints. A trench, three to four feet deep, was being dug along the line of contour following the sinuosities of the ravines. At the bottom of this trench was placed a layer of concrete, in which the pipes were laid. The joints being made tight with fine hair mortar; a thick layer of coarser mortar was then laid over the pipes, and the earth filled in to the surface. Several springs along the course of the pipe were being connected with it. On examining the water at

various points along the line, it was found by Dr. Sutherland to be pure and good, and the impurities complained of at the Barrack Hospital, as well as the scanty supply, appeared to have proceeded from the circumstance that the old pipes had been laid too near the surface, and had been broken where the pipe crossed a public road.

Such is the usual Eastern manner of supplying towns with water. Springs taken at their source are preferred. If large, they are enclosed in buildings; if small, a well is dug to receive the spring, and carefully covered over. Earthenware pipes convey the water to the point of delivery, and there are settling wells with wash-out pipes and air-shafts along the course of the pipe. Tanks on the top of stone columns or buildings receive the water, which is distributed thence by pipes made of sheet-lead soldered. The water-taps at the fountains are well made. Some of them are elegant in form. Any overflow is received into marble basins for public use.

Notwithstanding the generally satisfactory condition of the hospitals at the beginning of July, they had all the very serious defect so often referred to, arising from the state of the drainage, a defect which might at any time give rise to most injurious consequences, especially if the number of sick were to be increased, and the hospitals at all overcrowded, or if any unusual epidemic influence were to prevail.

After several careful examinations, and much consideration of this subject, and remembering at the same time the unknown extent and duration of the military operations in the East, it appeared to the Commissioners that they would be incurring a very grave responsibility if they did not correct completely those defects, even at the cost of procuring from England materials and skilled labour.

After all that could be done in the way of temporary improvement, cleansing, and flushing, the drains under and near the hospitals, from their inherent bad construction, were still nothing but cesspools, communicating by open tubes with the interior of the hospitals; and it is an established fact that drainage of this defective description

gives off emanations which are, perhaps, of all known agents, the most certain in predisposing groups of persons, whether sick or healthy, to attacks of cholera, diarrhoea, dysentery, and fever, while they interfere at the same time with the successful treatment of the sick.

It was resolved, therefore, that Mr. Rawlinson, who had returned to London in the end of June, should communicate with your Lordship on these defects, and point out the means of remedying them.

It was recommended that drain-pipes, pan-closets, iron-piping, &c., should be dispatched to Scutari, and that a small party of the Army Works Corps, made up of skilled workmen, should go out with the materials. The proposal was acceded to, and the ship "Mary Ann" was dispatched early in October with thirty-four men of the Army Works Corps, and the requisite materials. Mr. Hugh Unsworth, having had considerable practical experience in the details of sanitary works, was selected, on account of his special knowledge, to superintend the proposed improvements, in accordance with instructions he received from Mr. Rawlinson.

The objects in view were to make the whole drainage of the hospitals efficient; to abolish the open privies attached to the wards, and to substitute soil-pans, as had already been done successfully in the Naval Hospital at Therapia; to construct proper urinals and lavatories for the sick; to drain effectually the ground and buildings of the Palace Hospital; and, in short, to put the whole of the establishments in such a condition as would make them suitable for any emergency that might arise in the course of the war.

### § III. THE HOSPITALS DURING THE WINTER OF 1855-56.

Mr. Unsworth, who had been dispatched overland, arrived at Scutari on the 11th November, and proceeded to make surveys for the works, in anticipation of the arrival of the "Mary Ann," which did not reach Scutari before the beginning of December.

Dr. Sutherland, who had returned from England to Scutari, went over all the hospitals with Mr. Unsworth, and

pointed out to him the defects to which remedies were to be applied.

At that time considerable changes had taken place in the hospitals. The comparatively healthy condition of the army in the Crimea had thinned them of sick. The Palace Hospital was no longer necessary, and was being converted into a barrack; and in all the other establishments there was abundance of spare room.

Preparations were being made at Haidar Pascha, and large stables were being erected, for the reception of the Cavalry Division from the Crimea for the winter. There was a considerable number of men in the depôt, and the south-east side of the Barrack Hospital had been cut off from the remainder of the building, and set apart as barracks for the German Legion and the Osmanli Horse Artillery.

The sick wards of the Barrack Hospital were in a good sanitary condition, and they had been further improved since the previous examination by carrying up a separate ventilating shaft from the ceiling of each ward to the roof of the building. The winter ventilation was thus completed.

The general condition of the hospital did not appear to be so satisfactory as it was before the re-occupation by troops of the part of the building whence the depôt had been removed in July, notwithstanding the evident care which had been exercised by Major-General Storcks in separating as completely as practicable the barrack portion from the sick wards.

There were 989 men in the barrack-rooms, which were certainly overcrowded. The ventilation was defective. Neither the rooms nor the corridors were so clean as they might have been, a circumstance attributable to the dirty habits of the men. The privies and drains connected with them had become very foul, and the most offensive odours from them could be traced, not only along the corridors towards the barrack-rooms, but also into the hospital part of the building. The same conditions were in fact reproduced, though in a more aggravated degree, as existed when the same part of the hospital was occupied by the depôt during the previous spring.

It unfortunately happened that the epidemic influence of cholera had manifested its presence on both sides of the Bosphorus, and the French troops at Stamboul were attacked.

A few cases appeared in the village of Scutari on the 9th November, and on the 13th it attacked some men among the troops in depôt, and also in the hospital among the German Legion and Osmanli Horse Artillery. The outbreak was a most severe one while it lasted, and death in not a few instances ensued within a very short time after the accession of the disease.

It lasted altogether about a fortnight, during which period there were about 225 cases, nearly three-fourths of which proved fatal. The severity of the attack was over after the first few days. There were a few cases among the troops at Haidar Pascha, at the General Hospital, at Kulali, and in the barracks of Galata Serai, at Pera, but, with the exception of these scattered cases, the outbreak was confined to the troops in the Barrack Hospital and to the huts of the depôt, which were beyond the walls of the buildings, but on the same side as the rooms where the German Legion and Osmanli Horse Artillery were quartered.

Immediately on the appearance of the disease, Dr. Linton, Principal Medical Officer at Scutari, communicated with Dr. Sutherland as to sanitary precautions he was desirous of adopting to arrest the progress of the outbreak. Dr. Sutherland accordingly met Major-General Storcks and Dr. Linton on the subject, when it was arranged that the troops within the hospital should be camped out; that the troops in depôt should be thinned; that the barrack-rooms should be ventilated; and all the part of the hospital where the troops were, cleansed and limewashed. The privies were also to be cleansed and deodorized. Medical officers were directed to keep up a rigid inspection of the men for the discovery and treatment of premonitory cases, and warm belts were to be issued to the troops.

The necessary orders were immediately given by Major-General Storcks, who himself selected the camping-ground to which the troops were removed. Everything having been prepared, the German Legion and Osmanli Horse

Artillery were camped out on the 18th November, at a distance of about three miles from Scutari, after which the disease speedily disappeared from among them. The other precautionary measures were also put in force, and were attended by an immediate decline in the number of cases. The admissions, which had been thirty-four, forty-one, and thirty-three, for the three days preceding the removal of the troops, fell to eight, ten, and six on the three following days, but only three of these cases occurred among the camped-out troops.

Up to the date of their removal from the Barrack Hospital,  $5\frac{1}{2}$  per cent. of the German Legion and Osmanli Horse Artillery, 989 men strong, had been attacked by cholera, and nearly 2 per cent. of the force had died. While among the troops, 2,030 in number, in the sheds of the depôt outside the building, where the ventilation was much freer, and the men not so crowded, the cases, up to the same date, amounted to  $2\frac{1}{2}$  per cent. of the strength, and the deaths to a half per cent.

A good deal of choleraic and simple diarrhoea prevailed at the same period among the troops and also in the hospital, and there were a few cases of cholera in the wards. Several valuable officers, who were exposed to the very offensive effluvia proceeding from the defective drainage, fell victims to the pestilence, and there were fatal cases among the civilians, and among the medical staff attached to the hospital.

The *hospital part* of the building, although under the same roof with the *barrack part*, suffered very little, and there was no reason for this except its superior sanitary condition.

The *General Hospital* was at this period in an excellent sanitary state, and had in no degree deteriorated since it was last examined.

The *hospitals at Kulali* were also healthy, but required drainage-works. There were very few sick in the lower hospital, and the upper one had been emptied.

There was a small wooden hospital being erected at *Galata Serai*, for the use of the Artillery there, which appeared to be tolerably well arranged.

On carefully examining into the requirements at the hospitals, and considering the diminution of sick and the change of circumstances since the means for improving the hospitals had been dispatched from England, it was determined that the works should be commenced at Haidar Pascha, where the sanitary conditions were the most defective, because the Cavalry regiments were being quartered there.

The ground was a deep, muddy swamp, in a hollow, receiving the drainage from the higher ground above, and having no sufficient outlet for the water. It was so bad in many places as to be almost impassable. The roads were in a similar condition, and required drainage and making. The latrine arrangements were imperfect, and there was no drainage for removing the filth.

Mr. Unsworth, surveyor to the Commissioners, was directed to make the necessary surveys for draining the whole area of the lower ground of the camp, and for conveying the filth and foul water direct to the Sea of Marmora.

He accordingly drew up a report and estimate for the works, which was transmitted to Dr. Sutherland, and sent by him to Major-General Storks, on the 1st December, for his approval, with a request that the materials specified might be placed at Mr. Unsworth's disposal, from time to time, as he might require them.

The ship "Mary Ann" arrived at Scutari on the 6th December, and as soon as accommodation had been prepared for the Army Works Corps party, the works were commenced and the materials discharged from the ship.

When the estimates were completed, Dr. Sutherland went to Renkoi and Abydos to examine the hospitals there. The following is an account of their sanitary condition:—

*Civil Hospital at Renkioi.*

This large establishment was under the superintendence of Dr. Parkes, and the structural arrangements which had been devised by Mr. Brunel, C.E., were in charge of Mr. Brunton, the Resident Engineer. The site it occupied was a sloping bank of sand projecting into the Dardanelles on

its eastern side, and about seven miles above the entrance of the strait.

There is deep water on both sides of the site, and on either side there was a wharf for landing the sick, which was being connected by short railways with the corridors of the hospital.

The sand-bank rises inland from sixteen to seventy feet in height above the level of the sea, into low sand-hills resting on a range of tertiary hills about 1,000 feet high. The whole area occupied by the hospital is cut off by deep natural gullies from the heights behind in such a way that none of the drainage from the higher land could reach the site. The sand, moreover, was so porous that after heavy rain, the surface became dry in an hour or two.

There is no marsh land near the hospital-site, and no source of malaria excepting that general malarial character incident to a rich, undrained, uncultivated country with a high average temperature. The position selected was one of the best that could have been found, so far as its sanitary relations were concerned.

Water could not be obtained from wells on account of the dryness of the subsoil; but there were natural springs of excellent water near the summit of the range of hills, which were conducted to the site by simple engineering works, similar to those already described, and with the execution of which the native workmen are familiar.

The several springs selected to supply the hospital were covered over at their source, and each conveyed by a branch pipe of red earthenware to a small main of the same material, for a distance of about three miles, to a covered masonry reservoir, on an elevation considerably above the hospital. From this reservoir, iron pipes conveyed the water down the corridors between the hospital wards, and there were hydrants all along for drawing water for use, and for fixing hose in case of fire. There were the usual branch pipes for supplying the water-closets, urinals, and lavatories. The average daily yield of water was at the time 20,000 gallons.

The wards were large, lofty, wooden huts, many times more capacious than any in the Crimea, arranged so as to

form three lanes perpendicular to the sea, ensuring, thereby, a free sweep of the sea breeze among the huts. The ends of the huts in which the doors were situated, faced to the lane, and the space between them was covered over so as to form a corridor in which the convalescents might take exercise, and by which the communications of the hospital might be kept up in all states of the weather.

Inside, the wards were divided longitudinally into two halves, by partitions about half the height of the ward, and each ward could accommodate four rows of beds.

There was a range of swing windows along each side under the eaves, and a space between the roof and end walls was left open for ventilation.

The drains for these buildings were formed of square wooden boxes, connected with larger square wooden trunks, laid in concrete, and carried down to the sea, under the surface of which they were covered with masonry. Each trunk had a ventilating shaft close to the outlet, to prevent the dash of the sea from driving foul air into the hospital. A flushing pipe was connected with the head of each sewer. Each ward had eight water-closets, with urinals and lavatories, all abundantly supplied with water, and outside the ward. There can be no question that this hospital offered great sanitary advantages for the recovery of the sick. The situation is one of the best the country affords. The wards were clean, lofty, and admitted of any amount of ventilation. There was abundance of space for the sick. The arrangements for supplying water, water-closets, &c., were unexceptionable as regards health.

Earthenware pipes would have been better and safer for drainage than the wooden trunks, which would probably have become leaky if the hospital had been used for a length of time.

The only points of improvement which suggested themselves in regard to this hospital were, that there was no roof guttering, and the heavy rains of the season endangered the dryness of the ground under the wards; and that there might have been a somewhat freer use of the means of ventilation. Both of these points were stated to Dr. Parkes, and would receive attention.

*The Hospital at Abydos.*

The hospital at Abydos is situated about ten miles above the hospital at Renkioi, and on the same side of the Dardanelles.

It was nearly disused at this period, and was perhaps the least adapted for hospital purposes of all the buildings in the British occupation.

It was part of a quarantine establishment, situated nearly on the water-level, and with high land rising immediately behind it. The hill had been cut away to find space for the walls; and the section of the ground rose nearly to the level of the top of the windows.

The internal arrangements were unsuitable, although a great deal had been done to improve them.

It was just such a place altogether as would be most likely to originate fever among the sick; but happily it had ceased to be used on account of better accommodation having been provided.

Dr. Sutherland returned from Abydos to Constantinople on the 9th December, 1855. By that time, the cholera at Scutari had subsided. The engineer had commenced his preparations for the works there, beginning at Haidar Pascha.

The mud was cleared away, and tile drains laid down for draining the foundations of the road about the palace, and for forming the roads with stone, which had to be quarried and broken for the purpose. This was done by direction of Major-General Storks. Though not properly a sanitary work it was a very necessary and useful one.

In the course of January 1856, the road-making was continued. A catch-water drain was dug to divert the surface water from the hollow at the hareem. A trench from five to eight feet deep was partly cut from Haidar Pascha to the Sea of Marmora for laying down a fifteen-inch pipe sewer to convey away the drainage of the latrines and refuse water from the site of the camp. Some works of immediate necessity connected with the drainage of the nurses' quarters in the Barrack Hospital were also done.

During February the main drainage was completed.

The fifteen-inch sewer pipe was laid down, and the road-making continued. Improvements of the drainage at the Barrack Hospital, and works for substituting soil-pans for open privies were commenced. Sanitary works were likewise carried out at the huts of the depôt nearest the Barrack Hospital. Trapped pipe drains were laid down to convey away the refuse water which used to be discharged into the water-course to the south-east of the hospital. The worst part of this course had been covered over, as advised by the Sanitary Commission.

In the beginning of March a number of men were engaged in examining the drainage of the Barrack Hospital, and as soon as the examination was completed, a plan and estimate was made by the engineer for fixing in the north-east angle of the building thirty-six soil-pans and six urinals, with proper pipe drains and flushing cisterns, with pumps to supply them with water. The estimates for the works were sent to Dr. Sutherland at Balaklava, and returned by him for approval to Major-General Storks at Scutari on the 14th March. The works at Haidar Pascha were progressing. Branch drains were laid down, and a large latrine, with suitable flushing arrangements for washing out the contents into the main sewer, was constructed.

The road-making was also proceeded with. The drainage works were extended, and the mouth of the main sewer at the Sea of Marmora was completed and trapped.

Further improvements were made in the drainage of the Barrack Hospital, and a number of water-closets with flushing cisterns were put up. One of the Turkish drains, loaded with filth and sewer deposit, had to be destroyed on account of its bad condition. Nine hundred yards of land drains were laid down at Haidar Pascha to improve the surface.

Dr. Milroy visited the hospitals at Scutari, and also the Royal Naval Hospital at Therapia, in the month of April, on his return from the Crimea to England, and found them in excellent sanitary condition, as far as regarded cleanliness and ventilation, and there was abundant space for the sick. The works for improving the drainage of the Barrack Hospital, which were then in progress, showed that even after all the flushing which the sewers had under-

gone, their condition, when opened, was so very bad that nothing short of the reconstruction which was in progress would have obviated the dangers to which the sick would have been exposed had the events of the war led to the full occupation of the hospital, especially while epidemic disease prevailed.

The improvements in the hospitals were continued in April, until the conclusion of the peace suspended the works by rendering them unnecessary, and the health of the army in the Crimea was so good, that from the beginning of February to the middle of April, 1,060 sick was the total number embarked at Balaklava for all the hospitals and for home. From the continued improvement in the health of the army, the hospitals were becoming gradually evacuated. The contingency, therefore, which the sanitary works at the hospitals were intended to meet, happily never arrived.

It was no longer necessary to keep up the establishment at Kulalie, and it was converted into a barrack for the German Legion, and the Barrack and General Hospitals afforded more accommodation than was necessary for the sick.

Whatever sanitary defects may have been connected with these hospitals when first given over to Her Majesty's forces, and whatever increased mortality among the sick may have arisen from these defects, and beyond all question there were local causes connected with the buildings of so serious a nature as to endanger life, not only among the sick but among the well, it is most satisfactory to know that they were either removed by suitable works, or kept under by the vigilance of the military executive, and that the sanitary condition of the hospitals underwent no material deterioration after having been once improved.

During the seventeen weeks which intervened from the 14th July, when Dr. Sutherland examined them with reference to the results of the improvements which had been carried out, and the 10th November, 1855, immediately before the outbreak of cholera among the troops, there had passed through the hospitals 9,070 sick, among whom there were 203 deaths, a fraction more than 22 deaths in 1,000 sick.

The following table shows the proportions for each of the hospitals:—

Mortality in the Hospitals at Scutari from the 14th July to the 10th November, 1855.

Hospitals.	Remained and Admitted.	Total Deaths.	Deaths to Sick. per cent.
Barrack . . . . .	4,759	87	1·82
General . . . . .	1,607	58	3·60
Palace . . . . .	1,149	22	1·91
Kulalie . . . . .	1,555	36	2·31

Had the whole drainage of the hospitals been relaid, and the open privies replaced by water-closets during this period, the mortality would have shown a still greater reduction.

The improvement in the health of the hospitals continued to the last, and when visited by Dr. Sutherland at the end of June 1856, immediately before they were finally evacuated, they were as healthy as the state of the drainage admitted.

The Commissioners cannot conclude this part of their report without expressing their acknowledgements to the military and naval authorities having command at the hospitals on the Bosphorus for the ready assistance afforded by them on all occasions.

They would at the same time bear their testimony to the devotion of the medical officers in fulfilling their onerous duties; and to the benign influence of that other ministering agency which has added a new name and a fresh glory to the annals of female heroism.