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ROYAL VISITS

TO

ETLEY AND WOOLWICH HOSPITALS.

By Lieutenant-Colonel E. ROGERS.
(Late Staff Officer of Pensioners.)

AUTHOR OF

"Campaigning in Western Africa, and the Ashantee Invasion,"
achine-Rifle Batteries for Volunteers," "A Modern Sphinx,"
"Sportive Adventures at Home and Abroad," &c., &c.

ted from the "Admiralty & Horse Guards Gazette," Savoy House,
trand, W.C.; and Published by Forster Groom & Co., Military
Publishers, 15, Charing Cross, S.W.

PRICE ~~ONE SHILLING~~. 3d

Edgington P.O.

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HER MAJESTY'S ARRIVAL AT THE PRINCIPAL ENTRANCE.

Reprinted from the "Admiralty & Horse Guards Gazette," Savoy House, Strand, W.C.; and Published by Forster Groom & Co., Military Publishers, 15, Charing Cross, S.W.

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PREFACE.

IN view of the forthcoming Report of the Hospitals Commission in South Africa, this pamphlet may be interesting, as tending to prove, to the Services and the public at large, the perfection of scientific treatment of patients as practised in the Herbert and Royal Victoria Hospitals in England.

E. ROGERS.

SAVAGE CLUB,
London, Sept. 9th, 1900.

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ROYAL VISITS TO NETLEY
AND
WOOLWICH HOSPITALS.

[*March 1st*, 1900.]

CHAPTER I.

Description of the Royal Victoria Hospital, Netley.

THE general public have very little notion of the magnificence and exhaustive utility of this establishment on the banks of Southampton Water.

The Victoria Hospital was erected 1856-58, at a cost of £350,000, from the designs of Mr. James Lewis Thomas, late Chief Surveyor, War Office (and who, I am thankful to say, is still to the fore). Mr. Thomas was present at the laying of the foundation-stone by her Majesty on May 19th, 1856, to whom he was presented on the occasion, and exhibited for the Queen's inspection a bird's-eye view of the establishment.

In the basement of the building, to the south of the central portico, may be seen the stone in question, bearing the following legend :—

"THIS STONE
WAS LAID ON THE 19TH DAY OF MAY, 1856, BY
HER MOST GRACIOUS MAJESTY VICTORIA,
QUEEN OF GREAT BRITAIN AND IRELAND,
AS THE FOUNDATION-STONE OF THE
VICTORIA MILITARY HOSPITAL,
INTENDED FOR THE RECEPTION
OF THE SICK AND INVALID SOLDIERS OF
HER ARMY."

From the sea this superb building is a picturesque object, surrounded by beautifully laid-out grounds, studded with trees and skilful landscape gardening. In the foreground stands a graceful Crimean gothic monument, in memory of the medical staff who fell in that fatal campaign, the first stone of which was laid by H.R.H. the Prince of Wales, in 1864. The façade of Netley Hospital is 480 yards long, divided into a projecting centre block and two wings. On a plinth of Cornish granite, 6 feet in height, the superstructure is erected, of red bricks with Portland-stone window dressings, cornices, architraves, and string courses. The centre block, surmounted by a lofty octagonal tower with dome and lantern, contains the chapel, museum, swimming and other baths, as well as the administrative departments of the establishment. The wings have bold central porticos of Portland-stone, projecting sufficiently for carriages to drive under. They consist of three bold rusticated arches in front and one on each side. These arches are surmounted by four Roman Doric columns, supporting a pediment in which are the Royal arms, and a group of military trophies on the apex. A lofty campanile rises from the centre of each roof, forming the ventilating shaft of each wing, and which, together with the Italian towers at each end, give to the sky-line a picturesque variety most pleasing when viewed from Southampton Water and the grounds in front.

The lower corridor, stretching from end to end of the building, is over a quarter of a mile in length, and each wing has on each floor a front gallery of 220 yards long, protected by glass in cold weather, and warmed by coils of hot water pipes, in which galleries the convalescent patients can take exercise. There are central kitchens to

each wing projecting into the yards at the back, and lifts connecting the same with the wards on each floor.

Other structures there are in the background, notably a handsome vine-covered building for the officers' mess, accommodation being found for many of the medical staff in the upper storeys. The ante-chamber and mess-room are apartments of the handsomest design, and of noble proportions, the walls decorated with portraits of the Queen and the Prince Consort, together with those of successive Principal Medical Officers since the opening of the Royal Hospital.

At mess, discipline is maintained to the point of punctilio, the S.O.P.'s (surgeons on probation) being repressed to an extent unusual at other messes.

Glancing down the ranks of these S.O.P.'s may be noticed more than one coloured youth. These are Indian cadets for medical service. Naturally in so educated an assembly many of the S.O.P.'s possess musical or histrionic ability, which is always turned to good account at the entertainments frequently given, free of charge, in the Hospital theatre, for the benefit of the patients and of the garrison.

Here is the home of the celebrated "Army Medical School." In addition to Surgeon-General J. Jameson, Director-General Army Medical Service (President), the following officers compose the Senate of the Medical School: The President, Medical Board, India Office; the Principal Medical Officer, Netley. *Professors:* Clinical and Military Medicine, Lieut.-Col. McLeod, M.D.; Military Hygiene, Col. Notter, M.D; Pathology, A. E. Wright, M.D. *Assistant Professors:* Major W. Dick, M.B., Lieut.-Col. Webb, M.D., Major Hor-

rocks, M.B.; Major W. Leishman, M.B. *Secretary:* Captain Webb, M.D.

The Assistant-Adjutant-General is Col. Creagh, who resides in premises outside the grounds of the hospital. Guards, &c., are found by a company of the Lincoln militia from Parkhurst, and at present the duties of the Army Medical Corps as orderlies, bearers, &c., are performed by the Militia Medical Staff Corps. In the Hospital itself there are two divisions—the medical and the surgical. Lieut.-Col. Webb is in charge of the medical division (situated in the lower wards), and Major William Dick, of the surgical division, in the upper wards.

These officers, as Assistant Professors, lecture to the students during term. There are two sessions for the study and training of S.O.P.'s, beginning respectively on April 1st and October 1st. The average number of S.O.P.'s who qualify each session for the Army and the Indian Medical Service may be set down as fifty. The hospital affords accommodation for 1,000 patients, but just at present over 800 occupy the wards. Curiously enough, in normal times the average number of patients in the medical and surgical wards are almost identical, but now, owing to the war, the proportion of surgical cases to medical ones is as six to one. Of course there are constant changes in the strength—or shall we call it weakness?—of the establishment; for example, a transport from the Cape, on Friday last, brought 148 wounded men to the hospital, and another is due. While I write, this transport has steamed up alongside H.M.S. Leda, whose crews are cheering the invalids on board. Ample provision is made for female supervision, there being a lady superintendent, Miss Norman (sister of General Sir

Henry Norman), and an average of ten "sisters"—just now their work is interminable—but Miss Norman and her staff grudge neither time nor trouble. It is, indeed, a treat to see how smilingly and cheerfully they fulfil their duties. Miss Norman, I may add, is beloved and respected by everyone, and is, moreover, a *persona grata* with Royalty itself.

At the back of the hospital there is, or was, an open space, beyond which is the Military Lunatic Asylum, under charge of Colonel Chester, whose kindly, sympathetic disposition eminently qualifies him for the post. One fact in connection with the entire establishment should be brought home to every mind, and that is that no patient afflicted permanently with mental or other disablement is turned adrift. Unless such a man has a good home and friends to go to, he is retained on the books of the Royal Victoria Hospital. Now depend upon it the country that adopts this thoughtful provision, that treats its invalid soldiers with such tender solicitude, will never want for an Army, nor the Army for a reserve! Conscription is wholly unnecessary. On the hither side of the asylum stands a row of cottages, built by subscription in 1878, for the accommodation of wives and families of soldiers who are inmates of the hospital. Before these cottages were erected, the poor wives of invalids had perforce to live in the back slums of Southampton, several miles away, exposed to the temptations of that rowdy sea port. The then chaplain of the garrison, the Rev. Mr. Ponsonby, was the local secretary of the fund, and the donors were the people of the United Kingdom, who were roused to action by circular appeals from Mr. Ponsonby, and by leading articles in the Service journals. An article on the subject, *by the writer*,

in the *Broad Arrow*, brought in subscriptions to the amount of £70.

On the vacant space referred to before are now erected thirty convalescent huts, or wards, built of canvas and felt. The following inscription is to be read on the frontal walls:—

Transportable Baracke
des
Central Comite
der deutschen vereine vom rothen Kreus.
Berlin. Octob: 1899.

Certainly these huts come in quite handy for present emergencies. The floors, I may mention, are covered with linoleum, 7,000 yards of which stuff, at 1s. 6d. a yard, have been generously presented to the authorities by Lady Gordon Lennox. Moreover, to brighten up the interiors, ladies of the garrison and others have kindly contributed picture-screens of more or less patriotic character, which, by the way, will be transferred to the wards of the noble hospital when the necessities of the situation have ceased to exist and the huts are removed. Mrs. Stevens, wife of Captain Stevens, R.E., was, I believe, the originator of this "happy thought."

Between the huts and the hospital proper runs the as yet unfinished branch line of railway from Netley station, by means of which patients will be enabled to reach the central wards under the tower without change of carriage. Moreover, it will in future permit of her Majesty, the Queen, travelling direct from Windsor to her cherished undertaking without let or hindrance, and with the utmost privacy.

[*February 26th and 27th.*]

Chapter II.

The visits of her Majesty the Queen, and of their Royal Highnesses the Prince and Princess of Wales, and the Duke of York, to the Royal Victoria Hospital, Netley.

February 26th, 1900.

THE morning broke grey and lowering, indicative of dubious weather; gradually, however, the clouds assumed a fleecy aspect, and the blue firmament peeped forth. Before noon the sun shone refulgently on the many-domed edifice, and on the expectant groups lounging near the principal entrance of the noble hospital. Punctual to the hour notified their Royal Highnesses the Prince and Princess of Wales and the Duke of York drove up to the portico, where they were received by General Sir Baker Russell, commanding Southern District; Colonel Charlton, P.M.O.; Col. Creagh, Assistant-Adjutant-General; and Miss Norman, Lady Superintendent, by whom they were conducted through the wards of the surgical division. Here were assembled about 540 patients, including convalescents, all, or nearly all, suffering from wounds received in South Africa. The Princess of Wales was most solicitous in her enquiries as to

particular cases, and spoke very graciously to each man as she passed, conducted by Major Dick, R.A.M.C., in charge of the division. There was no available time for the Royal party to visit the medical division in the lower wards, and they left by the 4 p.m. train for London. Scarcely had they departed when the wounded men from the Princess of Wales's hospital ship arrived from Southampton. I was in the corridor of the surgical division when Major Dick told the poor fellows off to the various wards. They were in all 174 men, 164 suffering from wounds in action, and 10 only from ordinary diseases, to be treated in the medical division. There were representatives of all three of the Foot Guards, the Argyll Highlanders, the Black Watch, Royal Artillery, and in fact of all the regiments that took part in the frightful battles of Magersfontein and the Modder river. Bullet wounds in the head and feet were in excess of those in other parts of the body. This is explained, as the men told me, by the wild shooting of the Boers. But of course there were other and more ghastly wounds to notice, and many of the men still retained in their persons the bullets that brought them down. In the majority of cases bullet wounds had healed up, and the men looked as if quite recovered. No doubt the voyage and the good food on board had done much to set them up. It was exhilarating to see some of the Highlanders shaking hands with comrades who had preceded them to the hospital. One poor fellow in particular seemed to be a universal favourite, as he worked his way on crutches along the war-worn line of casualties.

MAJUBA-HILL-DAY, *Feb. 27th*, 1900.

While awaiting her Majesty's arrival at the porticoed entrance of the hospital, about 1.30 p.m., a field officer announced to the privileged few near the entrance the pleasing and appropriate news that Cronje had surrendered unconditionally. It turned out that this intelligence was confirmed by the Queen herself, who imparted it to Colonel Charlton while visiting the wards, thoughtfully asking him to let the patients know the grand news.

About 2 o'clock the first of the carriages arrived from the station with her Majesty's bath-chair; next, her two Indian attendants, and then her Majesty, who was accompanied by the Princess Beatrice and the Princess Victoria of Schleswig-Holstein.

A guard of honour of the 4th Lincolns, with colour and band, received the Queen with the Royal salute.* She bowed gravely, and then, assisted by an Indian attendant and Colonel Charlton, P.M.O., walked across the platform into the hospital, and proceeded by lift to the surgical division. Her Majesty was received by Lieut.-Gen. Baker Russell and the medical staff. The number of spectators was greatly in excess of yesterday.

Whilst her Majesty was visiting the wards, the band of the Lincoln Militia discoursed sweet music, and notwithstanding a few drops of rain that fell intermittently (for we had Queen's weather, on the whole) the spectators remained loyally to the last to witness her Majesty emerge after her inspection of her brave soldiers who were wounded in defence of the country. Convalescents mingled freely with

* *Vide* Frontispiece.

the villagers, who lined the esplanade, and were keenly expectant. About 4 p.m. the cavalcade of carriages, to be preceded by Sir John McNeil and outriders, was formed up. Her Majesty soon re-appeared, and, amid the respectful salutations of the staff and the assembled ladies of the garrison, drove off, the guard of honour presenting arms to the strains of the National Anthem.

I have been informed that our good Queen made close enquiries into the special cases among the wounded, whose medical histories were explained to her by Major Dick, in charge of the surgical division. This officer's work is cut out for him by the large increase of casualties landed from the Princess of Wales's hospital ship. He is assisted by two officers R.A.M.C., and four civilian surgeons. The men were highly gratified by the gracious consideration of the Queen and Royal Family. I may add that no reporters were admitted on this private visit of her Majesty, nor were even the General of the District and staff. The Queen, in her womanly character, had desired this privacy, and it was respected. What did the men think? They appreciated it to the full. For once they had her Majesty all to themselves!

[*March 22nd*, 1900.]

Chapter III.

Visit of Her Majesty the Queen to Herbert Hospital, Woolwich.

HAVING no official status at Woolwich I was unable to be present in the Royal Arsenal to witness the cordial reception of the Queen by the artificers of that immense establishment, who, as I have been told, to the number of 20,000, lined the route, and cheered themselves hoarse. As I ascended the hill from the station along the decorated line of communications between the Arsenal and Herbert Hospital, the streets and roads teemed with the suburban population, all of them wearing rosettes of red, white, and blue in their coats or on their hats. It was a gala day, rife with interest to every officer and man of this artillery centre—the storehouse of the kingdom's war material.

The common seemed to be invaded from all sides by sightseers, who lined the main roadway twenty deep, while thousands of children were marshalled in front; and these woke the welkin with shrill cries when a Royal salute proclaimed the fact of the Queen's arrival. Shortly afterwards the shouting became a continuous roar, as the Royal cavalcade, preceded by scarlet outriders, rounded the corner of the barracks, and drove slowly past General Gordon's birthplace. Here it was I had stood expectantly in a throng that held its place

determinately. Once a position was taken up there was no budging from it. But there was much to interest one during these hours of expectation, with a bleak easterly wind chilling us to the core, in the remarks and pranks of bystanders and the children. Beside all this, regiments of volunteers, with bands, and sometimes cavalry or artillery corps, marched past in quick succession on their way to line the approach to the hospital.

"Here they come! Here's our gracious Queen! Hats off! Three cheers for our Queen!" shout the mob; and we do so, lustily. Her Majesty bows kindly, but glances the while with interest at the house where her brave Soudan hero was born. The *cortège* passed on slowly, and then at the apex of the grounds of the Royal Academy it turned off to enable her Majesty to have a close inspection of the statue of the Prince Imperial, which stands revealed in mournful memory of his having been a cadet of the Academy, while it records his miserable death at the hands of the Zulus.*

The sight of the statue may have recalled to the memory of her Majesty the occasion of a review of the Household Troops in Bushey Park during the early seventies, when the Prince Imperial, arriving from the Academy, galloped up, sword in hand, to the Queen's carriage, saluting her in the most fascinating and graceful fashion, for the Prince was a splendid swordsman and a perfect equestrian. I was present, and will never forget how the gallant young officer swept up to the carriage, and then wheeled his charger into a halt beside it. But her Majesty's long and eventful career is so crowded with memories of the past that reference

* I may here be permitted to state that Captain Jaleel Carey, who was in nominal command of the party, was at one time a subaltern of my company in the late 3rd West India Regt.

to any such circumstance becomes a mere historical record.

Thence to the hospital is not many yards, and here the Queen drove through the rather gloomy but decorated portals, and was conducted round the surgical wards by Colonel Bourke, P.M.O. There were 700 patients in all to see, 500 of whom hailed from the gory fields of South Africa. As her Majesty was wheeled through the various wards, she enquired into every case, always expressing her sympathy direct to the wounded man, who replied, in most instances, that they "were all right now," although the bandaged arm or lopped leg venially belied the statement. The Queen was particularly solicitous about her Irish soldiers (news of the disaster to the Irish Rifles had just arrived), but to each and all of her maimed soldiers she presented a spray of blooms from the Royal conservatories. Said one man: "The Queen asked me about the wound I got at Modder river, and said how glad she was I was getting strong again. Then she signalled to a servant, who took a bunch of flowers out of a basket, and the Queen herself handed it to me with a kindly word. I was so taken aback I hadn't a word to say by way of thanks."

Before leaving for Windsor her Majesty intimated to Colonel Bourke her pleasure at finding the arrangements of the hospital so excellent and replete with comfort for the patients.

The cheering of the crowd at the gates of the hospital almost drowned the boom of the Royal salute on the Queen's departure. This was taken up and repeated by the throngs that lined the route to Blackheath Station, where a still more dense multitude assembled to respectfully, but none the less enthusiastically, wish her Majesty "God speed," and the welcome to Ireland which she got.

[*May 16th.*]

Chapter IV.

Visit of her Majesty the Queen to the Royal Victoria Hospital, Netley.

AT a quarter to four on the eventful Wednesday, May 16th, the privileged ladies of the garrison and their friends assembled near the lift, in the central corridor of Victoria Hospital, awaiting her Majesty's approach.

Punctual to the moment the Royal train of six carriages arrived at Netley station, where another engine was in readiness to take the train to the hospital, by the connecting line of rails recently laid down at the Queen's own suggestion. Her Majesty (whose arrival was signalled by the hoisting of the Royal Standard on a stout pole erected in front of the hospital railway platform) was received by Lieut.-General Sir Baker Russell, commanding Southern District, with his Staff; as also by Col. Charlton, Principal Medical Officer, who subsequently presented his surgical and medical staff to the Queen. A guard of honour of 100 men, 4th Battalion Oxfordshire Light Infantry, under command of Captain Warner, M.P., with band and colours, was mounted on the platform, whence a covered way, 86 ft. long, permits of the Queen being wheeled to the south corridor, and thence, turning

to the right, to the lift. At this point of junction the medical staff, consisting of Lieut.-Colonel Webb, assistant professor of medicine, Lieut.-Colonel Hughes, Major W. Dick, acting professor of surgery, Major Leishman, Major Buist, Captain Johnson, and Miss Helen Norman, Royal Red Cross, Superintendent of Army Nursing, assembled, and were duly presented. A few Press representatives stood about, but inside the passage to the lift none were allowed except those specially invited. The covered way and corridor were prettily festooned with flags and rich with the flowers of May, while bannerettes and other mural decorations effaced the severe white painted walls, which, by the way, in their normal state are adorned with numerous pictures and prints hung here and there. In this corridor, near the lift, were grouped a number of S.O.P.'s in their pretty new uniform of blue coats and smartly gilt belts, ready to receive the Queen "at attention." A warning "hush" from a young lady, and quite suddenly and noiselessly her Majesty appeared before us in her chair, with Colonel Charlton on her right and Miss Norman on her left; and so the Queen was wheeled into the lift, followed by the Princess Beatrice and her children (Princess Victoria Eugenie and Prince Leopold), Princess Victoria of Schleswig-Holstein, the Dowager Lady Southampton, and Lady Churchill. Was it treason to harbour the thought of danger in that lift? It has been known to stick between two floors; suppose it does now? But the authorities had tested the machine in every way, too carefully for any such mischance. At all events we felt completely relieved when, shortly afterwards, we saw our beloved Queen moving along the upper or surgical division, conducted by Major Dick, R.A.M.C. As

usual, he explained the special cases of the war-worn wounded to her Majesty, who made close and solicitous enquiries, comforting her brave, uncomplaining soldiers by kind words and by handing a choice bouquet to each—appreciated more than diamonds. Moreover, with rare thoughtfulness and sympathy with Tommy's mode of passing the leisure hour, with his queer proclivities, in fact, her Majesty presented hanks of coloured worsted to the men (through Miss Norman), who thus are encouraged to turn their rifles into knitting needles, as the warriors of old did their swords into ploughshares.

Many and most interesting incidents occurred during the tour of the fourteen wards traversed by her Majesty, which have been duly recorded in the daily Press, but with a view to their permanent publication in pamphlet form (as we propose to do shortly) they may here be repeated. The awful proportion of losses of legs and arms to other injuries, by shot, shell, and accident, was noticed by the Queen, who is a keen observer into details, and she was particularly struck by the case of Sergeant Boseley, 53rd Brigade Royal Artillery, who was knocked down by a bursting shell, which took off one arm and one leg, at the relief of Ladysmith, and yet who cried out pluckily: "Roll me out of the way, lads, and fire away!" Another man's spine was injured in the same fight by his horse having rolled over him. Indeed, the shocking cases of paralysis from shot and shell, as well as from such accidents as mentioned, are out of all proportion to the losses in former campaigns. Her Majesty, I believe, spoke long and tenderly to Trooper F. Parker, of the Remington Guides, who was shot through the spine at Magersfontein, and is, alas! permanently paralysed in both legs.

I had some talk with this gallant young fellow, and he tells me he is leaving the hospital in a day or two. He spoke rather disparagingly of the dieting system in military hospitals. "The food itself is, of course, excellent," he remarked, "but chicken, for instance, every day for dinner palls on the appetite; and then again, when the meals have to be eaten three times a day, at stated intervals, appetite may not wait upon digestion. What I require is food, a little at a time, frequently, and *with variety*."

Micky Farrell, of the Connaught Rangers, the "auld Faughaballaughs," is another case in point. He was shot in three places, in as many seconds, at Colenso, and is paralysed in both legs. Another man is paralysed all down the left side, by a gunshot wound in the same battle. But there is hope of quick recovery in these latter cases. "Sure, Sir," said Michael Farrell, "I seen seven of us paralysed soldiers carried on board the hospital ship at Durban, and five of them were able to walk ashore at Southampton." This Micky Farrell was engaged in a curious exercise while I thus interviewed him. He balanced himself between the arms of a sort of tricycle, with crutches, which can be raised or lowered according to the height of the patient, and was, like an infant, *learning to walk!* This useful machine was presented to Netley Hospital by Mrs. David Fullerton, of Pennington Chase, Hants. In the corridor, sitting at an open window, overlooking the lovely garden-like grounds of the establishment, and the blue waters of the Solent, was a poor soldier whose knee had been shattered by a bullet at the relief of Ladysmith. "Not by a Mauser, surely?" "Oh, no, Sir; it must have been an 'Express,' or some of those big-barrelled rifles." As the Queen passed along the wards, a patient

ventured to complain of not getting the box of chocolate presented by her Majesiy when he was in Ladysmith. "*Don't trouble about it any longer*," said the Queen, graciously; "*you shall have one without fail*"—an answer that delighted the poor legless man almost out of his wits. The Colonial contingent who, to the number of thirteen, are inmates of the hospital, but are rapidly becoming convalescent, came in for special recognition at the instance of the Queen. Of the few officers under treatment, the Queen saw and conversed with Major Ottley, Yorkshire Light Infantry, whose knee and thigh were shattered by a shell at Modder river, and Major Hart, who was badly wounded on the same occasion; Major Onslow and Lieut. Gill, R.F.A., suffer from enteric fever. It may here be mentioned that when visiting the "medical division," the Queen refrained from speaking to the patients, *lest they should become excited.* Was there ever so thoughtful and practical a woman as our Queen? She even felt the pillows of the patients' beds with her own hands, and condemned them as not soft enough for the afflicted to sleep easily upon; and they are accordingly to be replaced without delay. In all, the bedsides of 223 wounded and 380 sick men were visited by the Queen, and almost to every man of them she spoke words of sympathy and encouragement, presenting each with a bunch of exquisite blooms.

And now, while the Queen is so engaged, our party repair by the covered way to the platform and the Royal train, observing en route the legend, "A Hearty Welcome," on a scroll suspended across the passage. We find the Queen's carriage is tastefully upholstered in grey rep, and one armchair has fastened to the back of it what

appears to be an air-cushion, to check vibration. On a small table is a beautiful bouquet of red roses, while another (that presented by Mrs. Charlton) is composed of pink and white roses tied with green ribbon.

At five o'clock we again assembled near the lift to greet her Majesty on return. But what is this rumour that assails our ears? "Mafeking is relieved." The Queen brought the news, as she did last time that of Cronje's surrender. Bah! it is all cruelly untrue, the wish being father to the thought! What the news was, soon leaked out, to the effect that a telegram had been handed to the Queen, in one of the wards, that Glencoe had been occupied by the Fifth Division. And now there is a rustle in our throng. It has been known for some few minutes that the Queen was traversing the last of the fourteen wards visited. At 5.15 the lift, which was draped with flags, was seen to move, and came slowly down. Her Majesty was then wheeled out into the red-carpeted passage, and, as noiselessly as before, moved out of our sight. It was not till she had taken her seat in the special train that the exuberance of her subjects found vent in hearty cheering and waving of handkerchiefs, while the band played the National Anthem, and the troops presented arms.

After the Queen's departure I made the round of the wards and the hutments at the back of the hospital. The latter have now been increased in number to fifty-six in all, of which we will presently give full details; for I forgot to mention my talk with Private Loughrin, R.A., to whom, as previously recorded, the Princess Victoria of Schleswig-Holstein presented the scarlet and white quilt knitted by herself, under the impression that he is the "oldest inhabitant" of the hospital. "The

Princess came over to me to-day, Sir," said he, "and asked how I was getting on. But, sure, there's a man longer than me in the hospital, and that's Corporal Grey, of the 11th Hussars. He has been here over three years, I believe. I've only been in for a little over two years. But *I* can't leave my bed. *He* can." How pathetic, and yet uncomplaining, this simple statement. Corporal Grey suffers from paralysis, Private Loughrin from tubercular disease of the hip.

The library I have already spoken of, and its "corridor of skulls." But I have not before mentioned the museum. Besides weapons of all nations —spears and arrows, pistols and scimitars—there are various models of camp hospitals, showing the plans of permanent and temporary buildings; and more particularly there is the model of a proposed pediment, with carved figures, which, if money were no object, would long since have adorned the frontal porch of the hospital.

The representation of Britannia, surrounded by her wounded soldiers, with surgeons and nurses in attendance, was, I believe, designed by the Princess Royal (now Dowager Empress of Germany), and the sculptor was the late Mr. Thomas, brother of Mr. J. Lewis Thomas (architect of the hospital). It is not yet too late to carry out the idea, with special reference to the present deplorable war, and in commemoration of our victory. Why should not a committee be formed locally, and subscriptions be invited, so as to raise the needful thousand pounds or so? At present the vacant spot above the portico demands filling up. Nature abhors a vacuum—why not art? I pause for a reply. On the ground floor there is another "library and patients' games room," which is open from 11.15 in the morning till 9.30 p.m. in summer, with

bagatelle tables, and the sundries of draughts, backgammon, &c.

Next I visited the hutments, as they are termed, and entered several haphazard. The Russian huts are divided into compartments, two central bunks, with a passage between, and two rooms. There is also a reading room, kitchen, and other appurtenances, with accommodation for twelve patients, as in the German constructions. There are twenty spare huts, in pieces, four of which will be erected to afford storage for the rest, ready to be sent to any station that may require them.

I found that just now only 44 convalescents occupy the huts, leaving 500 beds vacant for the expected income of 600 wounded by the next hospital ship from Durban. The total number of patients in Netley Hospital can scarcely ever be estimated, as on every Tuesday and Friday invalids have to be examined by the P.M.O. with a view to their discharge.

I then went for a chat with some of the wounded men in the upper, or surgical division.

Among them I conversed for some time with Sergeant Boseley, 53rd Brigade R.A., who told me the circumstances of his bad luck at the relief of Ladysmith, when the shell took off his arm and leg. "Clean off?" "No, Sir; both hung by the skin for hours, till the surgeon saw me." Then I talked with Private Thomas Whelin, of the Dublin Fusiliers, whose knee was broken by a fall off a rock, and who hobbles about on crutches with his leg in a sling. "I'm mending fast, Sir," he assures me. "I can put my foot on the ground already, but it won't bear my weight just yet. It was a big battle at Colenso, and hard work. Know Mr. Athel Moore, of my regiment, Sir? Why, of *coorse* I do. A fine young gentleman, under nineteen, I believe.

Well I'm glad he has been promoted to his lieutenancy, as you tell me; but in *our* battalion there'll be plenty of promotion among officers and men, for weren't we always in the thick of the fight?" And here I may record the fact that, after talking with numbers of the patients, there was not one who complained of his treatment. "Both on board ship and here we have had the best of everything; there's nothing too good for us," is the universal cry. Sergeant Chapman, 2nd Queen's, was hit on the ankle by a bullet in the fighting round Ladysmith. It was early in the day, and he had to lie on the veldt for four hours before being taken to the field hospital. "It's a nasty place to be hit," he remarked, with a grim smile, "but I know I'm getting on all right in this grand hospital. I've been in the grounds to-day for the first time. They *are* beautiful, and the view across the water to the New Forest. Well, you see, Sir, I was able to bear a boot on my wounded foot for the first time to-day, and it is a great joy; but, for all that, I won't forget the trouble those Boers have given me and my comrades."

I could go on for pages recording the quaint and appreciative remarks of Mr. Thomas Atkins, but pressure on our space (in these hours of glorious glee and thankfulness for the relief of Mafeking) renders it impossible. Indeed, I had almost forgotten to say that "Queen's weather" distinguished the 16th of May; that the grass was never greener, the beds of flowers never more gorgeous, the sky never clearer, the sun never brighter than during this, the third visit of her Most Gracious Majesty to her sick and wounded in the hospital that bears her august name. *God Save the Queen!*

Printed by the "A. & H. G. G.." Savoy House, Strand, London, W.C.

Evolution of Human Communities in Relation to Disease.

BY

BUSHELL ANNINGSON, M.A., M.D.

Reprinted from "Public Health," August, 1895.

PRINTED BY W. H. AND L. COLLINGRIDGE,
148 AND 149, ALDERSGATE STREET, LONDON, E.C.

EVOLUTION OF HUMAN COMMUNITIES IN RELATION TO DISEASE.

PART OF AN ADDRESS TO THE MEMBERS OF THE CAMBRIDGE SUMMER SCHOOL OF MEDICINE.

By Bushell Anningson, M.A., M.D.

It is becoming more and more clearly demonstrated that the factor of man's environment has a greater determining influence in the incidence of disease than was formerly attributed to it, but it is difficult to conceive any effective influence of environment till man began to form permanent settlements. The nomadic tribes of our day in Europe, such as the gypsies, cannot altogether be excepted, inasmuch as they are brought from time to time under the influence of settled communities.

Sir John Simon, in his work on English Sanitary Institutions, thus describes the earliest conditions: "Man, as the geologist finds him, the troglodyte flint-clipper who inhabited Europe, in its alternate glacial and inter-glacial prehistoric times, for ages with the reindeer and other arctic animals; for ages, again, with the great pachyderms, which we now know as African, he, apparently without agriculture, without domestic animals, without pottery, without metals, having for tools and weapons only his broken flints and such implements as with their aid he could cut from wood and horn and bone, would have been almost as predatory towards his fellow-men as

towards the other wild nature against which he struggled for continuance. Except where conditions as to food were most favourable, mere procreation could have hardly had more effect to make village communities of human beings than to make village communities of bears or foxes." In approaching, therefore, the subject of the relation of individual man, or communities of men, to disease (especially infectious disease), the latter must be regarded as a force in nature, and a potent factor in the struggle for existence; but, it may be asked, in what way can a mere process be regarded as a competitor with man for the right to exist?

For my purpose, those diseases which are as yet mere processes within our knowledge may be regarded as comparable to the other forces in nature injurious to man—cold, flood, drought, and consequent famine, &c.; while the group of diseases which are called "zymotic," "infectious," &c., are now well known to be processes which result from the growth and numerical increase within the human body of organisms which may be made to go through similar phases without the body; for example, the numerical increase in milk and in other nutrient media.

Whether pre-historic man was or was not assailed, as we know him to have been assailed, from very early historic times by the minute but potent factors of disease, the great fact remains that man has persisted thus far the victor in struggle, but the struggle still goes on. Many of man's potential foes are now known only by their fossilized remains; while, on the other hand, many disease organisms have gathered power, and the fight has become more intense.

The incidence and propagation of disease among early races of mankind would prove an interesting subject of research, but at the present moment the materials are too scanty for profitable pursuit.

Only those diseases, such as Rheumatoid arthritis, Tubercle, Scarlatinal otitis, Syphilis, etc., which leave evidence on the bony skeleton can be studied.

At one time I was inclined to hope that the examination of skeletal remains would justify some conclusions of at least a general character; that, for instance, the comparative fewness of youthful skeletons might lead one to suppose, were there not other explanations, apart from the accidents of very early life and the organised practice of infanticide among some races, a larger number of lives were projected into the later age periods than in more modern times, and young life therefore had a better chance under savage or semi-savage than under civilised conditions. No doubt, though no conclusion can fairly be drawn from the above premises, what I may call distributive as opposed to concentric manner of life was the more friendly to the young; it was when mankind began to concentrate in stationary centres of population that the influence of his environment would operate with greatest force. He would then come under the influence of

1. Locality, with its varying qualities of air, water, and soil, and increasing density of population, of which I shall say more anon.

2. Vicissitudes of climate; abundance or scarcity of food and their consequences; his domestic habits, religious beliefs and superstitious practices, and marriage systems.

I have no present leisure to discuss in detail the latter group of influences.

Sir Henry Maine (late Master of Trinity Hall), in his work on the early history of institutions, arrives at the conclusion that the "earliest tie which knitted men into communities was consanguinity or kinship." The family regarded as a unit of the tribe is descended from a common male ancestor. This idea involves the existence of marriage between single pairs, which was not always the

practice among different races or among members of the same race at different epochs. Among some races, especially wherein Polyandry was the rule, ancestry through the female was of necessity the recognised practice. "An epoch is reached," continues Maine, "at some time by all the portions of mankind destined to civilisation at which tribal communities settle down upon a definite space of land." The land then begins to be the basis of society in place of the kinship. This view of Maine must not, however, be accepted as absolutely true. There are still groups of mankind from whom the designation of "civilised" cannot fairly be withheld, who still lead a nomadic life.

The village communities thus established in localities which they considered suitable (he continues) gradually evolved co-operative effort for the purpose of (1) defence, (2) communal stores, (3) supply of water, thence to the (4) establishment of communal agriculture, and at length (5) orderly government for the regulation and protection of the common life. Hence arose what has been called customary law, which was not interfered with by the great aggressive conquerors, who contented themselves with levying tribute till the period of legislative activity was inaugurated by the Romans.

It is interesting to observe that the great Aryan race had first planned out a system of communal agriculture, and probably diffused a "land custom" over Europe, and that this has had a determining influence — to which I shall advert later, in speaking of village life—on the character of our villages.

A dangerous condition for health is the transitional stage between the old village and the modern town. Just as the old cave-dwellers cast their filth simply out of the cave mouth, and the lake-dwellers cast theirs into the water beneath them, wherein traces can now be found in the tur-

baries or dry lagoons of North Italy, so the modern villager disposes of his refuse at his cottage door.

The determining influences, apart from and beyond those quoted from Maine, which brought about the aggregation of civilized man, were this one of land tenure, and mutual defence against war and political oppression; but there was one militant force against which communities of men did not take any heed, viz., the pestilence begotten of filth.

The Hebrew race alone appear to have included in their political scheme any rules of sanitation; other races took pains to remove excremental matter only so far as it may have occasioned mechanical obstruction. The Romans even, who built aqueducts to bring them pure drinking water, baths for personal cleansing, and cloacæ to carry storm water away, have left us their midden pits as the now innocuous evidences of their once pestilential waste.

A reason for this indifference to filth may fairly be found in the ignorance of its relationship to any form of disease; infectious disease particularly, was thought by many to be the act of an offended deity, and to be entirely out of human control, just as the thunder was thought to be the voice of an offended Jupiter, and the rain the expression of his relenting humour. Achilles, in his address to the sea-goddess, thus speaks:—

> "Not so, Atrides: he with wonted pride
> The sire insulted, and his gifts denied:
> Th' insulted sire (his God's peculiar care),
> To Phœbus pray'd, and Phœbus heard the pray'r:
> A dreadful plague ensues; th' avenging darts
> Incessant fly, and pierce the Grecian hearts."
>
> *Pope's Homer.*

Kingsley's Great Cities, etc.—"We have no eastern despotism (and it is well we have not) to destroy an old Babylon, as that mighty genius Nabuchanosor

did, and build a few miles off a new Babylon, one half of the area of which was park and garden, fountain and water-course, a diviner work of art to my mind than the finest picture or statue which the world ever saw.

"They fasted, they prayed, but in vain. They called the pestilence a judgment of God, and they called it by a true name. But they knew not (and who are we to blame them for not knowing?) *what it was* that God was judging thereby (foul air, foul water, unclean back yards, stifling alleys, houses hanging over the narrow streets, till light and air were alike shut out). There lay the sin, and that to amend that was the repentance which God demanded."

The relationship of man to his environment, be it determined by political and economic laws, by climate, by food supply, by beliefs or superstitions, by evolution, expresses his relation to many forms of disease, and these will have regard to climate, physical contour of surface, character of soil and geological sub-stratum, degree of aggregation, nature of his dwelling, his domestic habits, etc.

The susceptibility, then, to disease of any place, be it town, village, or open country, depends upon the inter-relationship of three sets of factors:—(1) Those peculiar to the disease; (2) Those peculiar to the place; (3) Racial and individual susceptibility. The vehicles of infectious disease, as they have force in all communities, are:—(1) Air, including sewer emanations, dust, clothing, fomites, social intercourse, school assembly; (2) Water: (*a*) Intrinsic deleterious quality; (*b*) Extrinsic contamination; (3) Foods: Milk, diseased meat, tinned food stuffs; (4) Soils.

The facilities for inception of disease depend on natural and artificial circumstances which may favour or hinder the operation of the above-named agencies; and herein comes the difference between town and country epidemic influence and susceptibility; for infectious diseases may be classed in groups according to their mode of propagation, and these are differently met and differently encouraged in town and village communities; but before entering upon the consideration of this part of my subject, I desire to allude in passing to the influence of site. The geographical distribution of disease, although recognised previously in a partial manner, as, for instance, (1) Goitre, of Derbyshire lime-stone districts; (2) Ague in Fen districts, etc.

Woodhead (Morton Lectures), quoted by Haviland, writes of the coccideal origin of cancer as follows:—"A coccidean described as occurring in the liver of the rabbit where it is known to set up a peculiar irritating condition of the bile ducts, which ends in the formation of psorosperm nodules, which are really cysts containing papilliform projections covered with rapidly proliferating epithelium in the cells of which are numerous parasitic protoplasmic bodies; other domestic animals present similar proliferating changes in epithelial cells of the intestines."

Cancer, according to Haviland, is most common in marshy regions and on the wet soil of river basins subject to inundations. "The conditions present in these localities are exactly those necessary for the development of the psorosperms of rabbits, a disease which is most frequently met with amongst rabbits whose run is over marshy grounds or over narrow areas where the drainage is imperfect."

Advancing pathological research is continually giving further proof that geographical influence, and so-called hereditary influence, may be resolved into fitness of locality for the vitality of microbes of some sort or another. The above-quoted conclusions of Woodhead, taken together with the results previously obtained by Haviland as to the circumscribed area over which cancer is most

prevalent, point with the greatest force to a microbic cause.

An objection may be urged against the theory of hereditary disease, that it is incapable of inception in a way similar to that of well-known microbic disease, and that if the diseases in question have a tendency to appear in succeeding generations of the same family, and in many instances at well-defined age periods, the objection may be answered by a comparison with syphilis on the one hand and diphtheria on the other; the one is a microbic disease that can be transmitted from one generation to another, diphtheria is a microbic disease that has a well-known tendency to appear in the several members and generations of the same family, and has a well-marked age limit of greatest incidence.

The existence of endemic disease with occasional irruptions beyond the territory affected has long been known as a fact in medicine, and the reason usually assigned for the limitation has been, with the exceptions of ague, goitre, etc., conditions of climate considered meteorologically, but the investigations of Buchanan, Haviland, and others, while they have extended the list of territorial diseases, have added as an important factor of causation that of soil and surface contour.

Within the general area this principle may be carried a step further, and the dwelling with its immediate curtilage taken as a unit; this is true of diseases like rheumatism, and is becoming nearly true of such diseases as diphtheria and typhoid fever; many a health officer has been forced to think that the germs of these two diseases can live for years independently of a human organism amid the organic waste and dirt of the same dwelling or groups of nearly placed dwellings.

When, however, one considers the case of relapsing fever, a disease associated not so much with physical as with physiological conditions, the relationship of the environment is not obvious.

When a community of men are stricken with famine, whence come the other factors:—the microbes of relapsing fever?

Once established, relapsing fever is more infectious than typhus, and may be contracted in the same manner, moreover its materies morbi cling to a dwelling for months, but ~~to account~~ for many epidemics, years of quiescence are needed to account for ~~its~~ revival.

Nor has this disease been confined to territory or race.

Longfellow's rendering in his poem of Hiawaitha of ancient North American Indian tradition as to the association of famine and fever is an illustration in point.

Whatever peculiarities may attach to the incidence of disease, whether infectious or general, as it affects detached hamlets, compact villages, or considerable towns of our own day in Britain, the most obvious one which has been regarded as having a specially determining force is density of population. But there are many other consequential factors besides the density which have a determining influence on the healthfulness of a community.

So far as the unhealthiness of a town is a question of air supply, it may be stated that the displacement of the atmosphere of towns is effected by ascending columns and by circumfusion, and must diminish as the proportion of the surrounding to the enclosed houses decreases.

Taking density as a basis of classification, the Registrar-General has made three groups:—(1) Healthy districts, 166 persons to the square mile; (2) all England, 367 persons to the square mile; (3) unhealthy districts (such as Liverpool), 65,823 persons to the square mile.

Mortality does not, however, increase in a direct ratio with density, but, according to Farr's calculation, as the sixth root of the density; for on institution of a comparison between districts

grouped according to the order of their mortality and according to the order of their density, it is found that the groups of districts of highest mortality are the densest, but that the least dense districts have not always the lowest rates of mortality; and this result is to be expected, for, says Farr, "The maximum advantages in country districts being once attained, further isolation is a disadvantage; the insalubrity of marshes and forests can only be subdued by numbers, and the country parts thinly peopled must have been much less salubrious in ancient than in modern times."

The parallelism between disease and density of population, and the generally lower death rates of rural communities, lead to erroneous conclusions unfavourable to town life; a little consideration will soon dispel many a pleasant fancy of rural beauty and healthfulness; it is not always the honeysuckle and the briar on the trellis of the cottage door in the summer time, or the fragrant burning turf on the hearth in the winter time, that greets the sense of smell, neither are all that meet the eye objects of delight.

The general features of an English village are familiar to all; that which most distinguishes it is its discontinuity, consisting as it often does of a succession of detached dwellings of various sorts and sizes, with occasionally a confined alley without a patch of open ground near by; short terraces, farmyards, and open lands intervening.

There is, moreover, a curious feature observable in some villages but less marked in others, the result of the Aryan system of land tenure before referred to, which may be briefly described as follows:—The virgate or yard-land consisted of a messuage in the village street, and acre or half acre narrow strips of land in villinage, scattered over and intermingled with other holdings in the open fields (generally three according to the season system), the result being that no homestead or

buildings of any kind were erected on the land, but were collected near the messuage in the village street, and at the present time, notwithstanding the consolidation of estates and farms under the Enclosure Acts, many of our villages consist of a succession of farmyards mingled with the cottages in the centre of population, and are a serious cause of befoulment and hindrance to sanitary improvement. There is little or no paving, except in stony districts, and rarely any system of drainage, scavenging, or water supply; midden pits, guzzle holes, and dumb wells near the dwellings constitute the methods of excrement disposal, while the overmastering necessity of water is supplied by a shallow well, a pond, or rain-water tank.

The well-ordered town, on the other hand, by means of that very proximity of population which, when intense, becomes so dangerous a feature, provides a continuity of structure which permits communal effort. Thus a town of our day may possess a continuity of paving, roads, and impervious concreting of the building sites, so as to render it to a large extent independent of the nature of the geological formation on which it rests. It may by a combined system of sewering convey away for safe disposal that which the villager must keep; it can bring water in bulk from a pure source and distribute it to every household; it can also provide in common for the necessary comforts of life by a regular service of supply of food and other things. Last, but not least, by possession of powers of orderly government it can regulate the width of streets and the character of the dwellings that border them. It may therefore, I think, be conceded that a modern town has many advantages over even a modern village.

I have spoken intentionally of a modern town and a modern village, but I cannot forbear to enter an emphatic protest against methods of so-

called improvement of buildings in both sets of communities, especially if it is, as is not infrequently the case, done in the honoured name of hygiene. The first one is the absorption into one enormous building, with one central staircase, of many residential units, involving, as this system does, a community of air space which cannot but be mischievous. Our own college buildings and the ancient hostelries, the central open yard and gallery, of which it is the insane mission of this generation to destroy, are examples of a better system. One other, for which there is not the excuse of cost of site, is the replacement by brick and slate of the cottage of our villages built of nogging or stud work and thatch; these latter are generally spacious, always warm in winter and cool in summer, while the former are the exact opposite in character, and have the further disadvantage of being hideous to behold. Such sanitary zeal reminds one of the fanaticism of other sorts of reformers.

In regard to air convection of disease germs, the town is more directly menaced in regard to such diseases as small-pox, which strikes at short distances, and contiguity favours its action; moreover, the town is more likely to contain amongst its members persons unprotected by vaccination.

Scarlatina, measles, and whooping cough vary in their incidence very much as school assemblage is localised; in towns with distinct school districts their incidence may be limited to the district, for social intercourse among children elsewhere than at school is not so distinct a feature of town life as in a compact village, or in a hamlet.

Different methods of hygienic treatment are therefore required in the different instances.

School closure for the scattered village or associated hamlets is generally a successful measure; but not generally needful for compact villages and towns.

Excrement—polluted air when it operates as a vehicle of the filth—diseases, diarrhœa, typhoid fever, diphtheria, does so with greater effect and at greater distances in an ill-managed town than in a country district, the otherwise beneficial circumstance of "community" of drainage becoming a distributor of disease.

The disease most intimately associated with air impurity is typhus fever, which Howard, the famous sheriff of Bedfordshire, did so much to extirpate, but one which still lingers in closely-packed courts and alleys, and among back to back houses of certain towns in the kingdom, the colliery towns especially, where the air stagnates and is breathed over and over again till it becomes loaded with organic particles.

A disease which until quite recently was as peculiar to rural districts as typhus to towns is "diphtheria." The most recent inquiries as to its incidence have elicited that it is propagated more by social intercourse than by any other channel, and this characteristic may be the reason of its greater prevalence in rural districts where neighbourliness is more observed than it is in towns; none the less, it cannot be ignored that apart from social intercourse diphtheria loves the ill-circumstanced rural cottage with its guzzle hole and privy vault in rear, better than the town house with its water-closet and daily scavenged dust-bin.

Organic dust in India is an active agent in the diffusion of cholera, and everywhere of influenza; it may have been noticed in the recent epidemics that an abundant rainfall has been followed by a temporary mitigation.

Water convection of disease as it affects towns in contrast with country districts is limited to the risk of contamination of a public supply (1) at the intake or (2) line of distribution; when a town is supplied by private shallow wells its relation to this vehicle does not differ much from

a rural community except in this that the area of potential pollution is wider.

When a town has a public water supply by a company distributing water by mains passing along the streets, any befoulment at the intake may suddenly carry disease and death over a wide area, as for instance the recent experience of the towns of Worthing and King's Lynn.

Rural communities of the Fen district that obtain their water supplies from polluted rivers, are especially liable to sporadic cases of typhoid fever; of this circumstance I have many examples on my sanitary notes.

Most rural epidemics of typhoid fever, where water is the vehicle of disease distribution possess distinctive features, and are of considerable interest especially where, as is frequently the case, the epidemic is of unequal incidence, and may be due to the geological position of the village or to some artificial method of distribution. Two of the simplest instances which have occurred in my experience are—(1) The case of Cottenham, near Cambridge, where an imperfect scheme of pipe distribution had been in use for many years; and (2) at Stretham, near Ely, where the north side of the village street was affected in all its length while the south side entirely escaped, the north side rested on a pervious stratum and the south side rested on Kimmeridge clay.

Rain water collected from the roofs of domestic cottages, befouled by domestic birds suffering from "snichups," has been in several instances the only assignable cause of diphtheria.

In regard to transmission by food, it is not proposed to speak of food stuffs rendered unfit for use by reason of disease peculiar to the animal or plant producing, nor to poisonous characters which have been acquired by methods of preparation or storage.

There is one disease—tubercle—which may be just allowed as transmissible to the human subject

from diseased cattle by their ill-cooked flesh or by their milk.

The diseases of the group usually found to be communicated by food as a vehicle are scarlet fever, diphtheria, and typhoid fever, and each of these may be caused by any kind of food which has been handled or befouled by discharges, and is generally further reaching in a town community than in a village.

My general conclusion is that a well-ordered town has many hygienic advantages over rural communities.

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NORTH WEST FRONTIER
of
INDIA.

MEDICAL ARRANGEMENTS
for
AN ARMY CORPS.

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Med. Staff.

Printed at the Lawrence Military Asylum Press, Sanawar.
1887.

MARCH 1886.

MEDICO-TOPOGRAPHICAL REPORT OF THE NORTH-WEST FRONTIER OF INDIA, BELUCHISTAN, AND SOUTHERN AFGHANISTAN.

MEDICO-TOPOGRAPHICAL REPORT

OF

The North-West Frontier of India, Beluchistan and Southern Afghanistan.

Recent events, and the not distant possibility of military operations being necessary in the above districts, as well as having, for some time, served in those parts, have induced me to adopt them as the theme for my medico-topographical essay.

Frontier. Before entering more particularly on the special regions embraced in this report, it may be well to remark a rugged and lofty barrier of mountains separates Beluchistan and Afghanistan from the plains of Sind and the Punjaub, and that the North-Western Frontier of our Indian Possessions, from Peshawar to Kurachi, all lies west of the Indus. On the left or Indian side of this wide and unfordable river, with its tributaries, we have a broad guage single line of railway, nearly 1,000 miles long, extending from Rawal Pindi, through Lahore, Mooltan, and Bhawalpur to Rohri,

Cis Indus Railways.

where it strikes the river. There is here, unfortunately, a break in the line, and the Indus has to be crossed by steam ferry to Sukkur. From Sukkur the line follows the right bank through Ruk and Kotri to Kurachi on the sea-board.

In order to enable the Indian Government to mass any number of troops at any given point along this defensible line between Peshawar and Kurachi, it is now proposed to complete the bridge over the Indus at Sukkur, and make further additions to our frontier railway system.

Frontier Railways.

From the main line above described, several short railways run towards the Frontier. The first extends from Rawal Pindi to Peshawar, near the mouth of the Khyber Pass, the terminus being only 160 miles from Kabul. On this very important strategical line there is a bridge over the Indus at Attock, both for rail and ordinary traffic. The second joins Rawal Pindi with Khushalgarh, on the Indus. The third runs from Lala Musa below Jhelum to Bhera. This narrow guage line, now known as the "Salt Branch," has been converted to broad guage, and forms the first section of what will be one of our most important strategical railways. This new line, starting from Lala Musa, will cross the Jhelum

to Pind Dadan Khan; follow the right bank of that river until it reaches Kushab, opposite the city of Shahpur, on the high road from Lahore to Dera Ismail Khan: strike due west across the Sind-Sagar Doab, to the left bank of the Indus, some distance below its junction with the Kurrum River. Thence, following the left bank of the Indus, it will run south past Darya Khan, which is opposite Dera Ismail Khan. From Darya Khan it will skirt the river for nearly 100 miles, then, taking a final bend to the S. E., it will join the Chenab opposite Sher Shah, which is but a few miles from Mooltan. A short line (25 miles) will connect the Chenab at this point with the Indus at Kurashi, facing Dera Ghazi Khan. The Jhelum will be bridged, and there will be ferries over the Indus and Chenab. This line will connect Dera Ismail Khan, Dera Ghazi Khan, and the Derajat generally, with the main railway systems of Upper India, and at Mooltan with Kurachi and England, and will be of considerable service in all military operations in Beluchistan and Southern Afghanistan.

Sind-Peshin Railway.

The fourth railway line runs north from Ruk near Sukkur, on the right bank of the Indus, through Shikarpur and Jacobabad to Sibi, one of the districts assigned to us by the treaty of Gandamak. Though only 133 miles long, it is most important from a military

and medical point of view, as it connects the roads and intended railways leading from the Quetta-Peshin, and Kandahar valleys with the main or Indus valley line; at Ruk with Kurachi, Bombay, and England; and at Sukkur with the large cantonments and Hill Sanitaria of Northern India. Unfortunately, it is liable to interruption during the season of the year it would be of most value; *viz.*, during the hot weather, its lower portion being altogether dependent on the stability of a series of enbankments, along the right bank of the Indus from Kasmor to near Sukkur. A break in this bund would submerge the country for miles. The upper section is in considerable danger of being washed away by the flood-water of the mountain torrents. Before the construction of this line, the road from the Indus to the foot of the hills at Dadur in the Sibi district, was through the Put or Desert, and even now water for the engines has to be carried the whole distance by rail. Indifferent drinking water is procurable along this desert road, and it is utilized to some extent as an adjunct to the railway.

Indus Line.

It is intended to further perfect our military communications by a broad guage railway, right up to and all along the left bank or Indian side of the Indus. To attain this desirable object it would be necessary to connect Attock with Khushalgarh, Khushalgarh with Kandian, on the Sind-Sagar railway. The line from Ruk to Karachi being on the right, or enemy's side of the river is a source of danger, and a new line should run from Rhori to Hyderabad, with a bridge at Kotri, and thence on to Karachi. Efficient steam-ferries and boat-bridges at Kalabagh, Dera Ismail Khan, Dera Ghazi Khan, and Chachar would make the river equally important as a base of operations and as a line of defence.

The Darajat

Our territory between the Indus and the eastern slopes of the Suleiman mountains is more or less of an arid, sandy waste, and with the exception of the Sind-Peshin line, has no railways, and but indifferent roads. The extension of the Khushalgarh line to Kohat, and a railway from Bannu to the Indus, along the Southern bank of the Kurrum River, to join the Sind-Sagar line would be of great assistance in either massing troops at Tull, for the defence of the Kurrum Pass; or for furnishing military and commissariat stores for a force operating beyond our frontier in the direction of the Shuturgurdan. It is decided to improve our communications in this region by constructing a good metalled road from the railway at Khushalgarh through Kohat and Bannu to Dera Ismail Khan, with bridges over the Kurrum and Gumbela Rivers. In all operations beyond

our frontier, Dera Ismail Khan will attract considerable attention, as it is the nearest station to Ghazni, and would, no doubt, be used as a base, for the purpose of either barring an enemy marching through the Goumal Pass, or for feeding an offensive army, pushed along the Sarmalan plain, through Katawaz to Ghazni. It is further of importance from the fact that the chief roads from Peshin, through the Zhob valley, join the Goumal or Ghazni-Dera Ismail Khan road just before it debouches on the plains in front of Dera Ismail Khan. The military significance of the Sind-Sagar Railway will be understood when we remember it practically links Dera Ismail Khan with Mooltan and the large garrisons of Northern Punjab.

Suleiman Range.

South of the Goumal Pass, the Suleiman Range is pierced by numerous defiles all along the line facing the Dera Ismail Khan-Mangrota-Dera Ghazi Khan road. These passes lead into the Zhob, Bori, and Thal-Chotiali valleys, and thence on to Peshin and Kandahar. Some of these routes are perfectly practicable for troops, and have been traversed by considerable columns. The water along many of these roads is brackish, but fresh water could, no doubt, be found under the surface of the rivers. They are at present impassable for wheeled carriage, and supplies are very scanty, but a good

military road is now being made from Dera Ghazi Khan, by Fort Munroe, the Rakni plain, the Chamalang and Bori valleys, and thence by Yusaf Katch to Peshin. These routes are of considerable importance, as they lead very soon to elevated plateaux which are comparatively cool in the hot weather, and could be used for marching small bodies of troops at that season, or even for large bodies, railed through Mooltan to Dera Ghazi Khan, when from any cause the Sukkur-Sibi Railway was impracticable. They afford alternative routes to Peshin and Kandahar, and a cool climate could be reached in seven days after leaving the terminus at Kurashi, opposite Dera Ghazi Khan. The climate of the strip of country between the Indus and the hills is too well known to need description. Suffice it to say there are few places with such an oppressive hot weather, which is very much aggravated by the scarcity of water.

Main Roads.

The chief highways, however, from Sind to Peshin, Kandahar, and Central Asia are the Bolan and Harnai routes ; and would be adopted by an invader from the North West for the main body of his army, and by the Indian Government for throwing supplies, men, and munitions of war into Quetta and Peshin—not only to resist attack on our frontier at the Kojhak, but to strike beyond it in the direction of the Kandahar-Herat, or

Kandahar-Kabul lines. The Bolan route follows the course of the Bolan River, and the Harnai the valley of the Nari River. There are two short railways running from Sibi for some distance along these roads. One, the continuation of the main line, goes North to Kilat-i-Kila on the Harnai route, and the other due West, across the well-watered plains of Gundava-Kutch, to Pir Chowky, at the mouth of the Bolan. The climate of Pir Chowky and Kilat-i-Kila, and, indeed, on either road until Mach or Harnai is reached is tolerable in Winter, but the heat is terrific in Summer. The writer had charge of No. 3 Field Hospital at Pir Chowky for some months during the last Afghan war, and though he left it as early as the end of May, has vivid recollections of the intense heat. Cholera, sun-stroke, scurvy, small-pox, liver disease, dysentery, and fatal fevers are common, and during last Summer the railway works between Pir Chowky and Mach had to be suspended in consequence of the extreme unhealthiness of the Pass. Over 50 per cent of the railway staff were at one time on the sick list from fever, dysentery, and sun-stroke, and the coolies left in a body, scared by a fatal epidemic of cholera.

Climate.

Bolan Route

We will first follow the Bolan route, as it is the best and shortest. During the last war Pir Chowky, at

the entrance of the Pass—as the rail head—was the Depôt from which troops and material were despatched to the front, and all sick convoys coming down the Pass, after having halted at No. 3 Field Hospital, were railed to the Indus, for subsequent despatch either to Kurachi or Lahore. It was also the starting point for transport trains and hired carriage. The presence of such a large number of men and animals made the water liable to pollution, and later on the Depôt was retired to Rindili, which is some three miles nearer to Sibi. At Rindili the water was plentiful and good, and mud-sheds were built for the convenience and protection of the troops returning to India on the evacuation of Kandahar. The arrangements were then so complete that not a man of the returning army died there from sun-stroke, although the heat was intense. The importance of both Rindili and Pir Chowky has dwindled into insignificance since the line has been pushed on to the central Bolan station of Mach. The latter becoming the rail-head and Depôt, the former way-side stations. When we remember there is nothing produced in the Peshin or Quetta Districts but what is required for the support of the inhabitants, and that food for a force, for the army of followers, and food even for the transport animals themselves must be sent from

Mach.

India, the advantage derived from this railway extension to Mach will be apparent. Transport trains will start from here, and men and baggage animals will be spared the rugged and tortuous defiles of the lower Bolan. As Mach is 3,000 feet higher than Rindili troops detraining there will at once enjoy a comparatively cool climate, and will not have to undergo the long and dusty 42 miles between Pir Chowky and Mach.

Bolan Railway.

This new line is laid in the bed of the Bolan River, and winds up the Pass by steep gradients and sinuous curves, reaching an elevation of 1,100 feet at the Baluch village of North Kirta; 2,500 feet at New Ab-i-gum, and 3,500 feet at Mach. The rail follows the road, between precipitous cliffs and over stony plains, crossing and re-crossing the river, and not more than a few feet above its normal level. It is hoped the Bolan floods, which are very sudden and violent, will pass as harmlessly over the rails as traffic over an ordinary level crossing. But as these freshets sometimes reach a height of ten feet, this anticipation requires the trial of experience, and as the military road may have to be at times resorted to, it may be well to give a short description of it.

Bolan Road.

The road from Pir Chowky to Kohandilani, after crossing the river frequently, between high conglomerate hills, enters the Kohandilani gorge—about

300 yards wide—distance 8 miles. From Kohandilani to South Kirta is 8 miles, and 4 more on to North Kirta. The road at first enters a narrow gorge, frequently crosses the river, and is especially liable to flooding. From South to North Kirta it ascends a long low hill, which separates it from the river. At North Kirta there is a walled enclosure, bungalows, a hospital for natives, Commissariat, Transport, and Railway Depôt.

Water.

Water is obtained from the stream and a well in the vicinity; it is plentiful and good. Of the Bolan water generally it may be said to be excellent though somewhat hard. The usual precautions of taking the drinking water higher up than the portion reserved for ablution and watering of animals must be strictly attended to, as well as the removal and burying, or burning, of any transport animals that may have died in the vicinity of the stream. From North Kirta the road ascends to New Bibi Nani, 9 miles, and thence on to New Ab-i-gum, 7 miles. The water on these stages is uncertain and liable to be interfered with. From New Ab-i-gum to Mach, the distance is about 6 miles, thus making it six marches to Mach from Pir Chowky, or somewhat more than 42 miles.

Mach.

The present camping ground at Mach is very cramped and occupies the high bank on the west side of

the river. The water is a considerable distance off, and has to be carried up a high ramp. During the last war there was a large depôt of Commissariat and Transport stores at Mach, and a rest depôt, with a Medical Officer, was established there. There was also a telegraph and post office at some distance higher up the Pass. As being the rail-head now, it will become a much more important place, and a large hospital will have to be provided there for the sick of parties either going up or down the Pass. At some villages near, eggs, milk, and fowls are procurable. There are some low hills on the opposite side of the river presenting indications of coal, and fossils abound. Geological specimens of the Bolan formation were presented by the writer to the Netley Museum.

Bolan Railway.

From Mach to Quetta, for the present, troops will have to march; and transport, which has hitherto been the great difficulty, hampering our movements beyond the Indus, will have to be resorted to. It is, however, contemplated to join Mach with Quetta by rail, and the works have already been started. From Darwaza to Quetta will present no difficulties; but the steep incline beyond Mach will be the crux of the undertaking. This latter section, it is intended, should be narrow gauge, and will be worked by powerful Fairley engines.

Rolling stock, rails, and materials intended for the extension of the line to the foot of the Kojhak will be placed on trucks and thus drawn up the steep gradients and sharp curves between Mach and Darwaza.

Upper Bolan Road.

But as at present the distance between Quetta and Mach has to be marched, a short description of the route is necessary. From Mach the road ascends one thousand feet to Sir-i-Bolan, distance over 4 miles. Sir-i-Bolan is the source of the Bolan river; the water comes sweet and wholesome—as a spring from the foot of the mountains. From Sir-i-Bolan to lower Dozan, is 4½ miles. A narrow defile, known as the Zigzags, is traversed on this march. At lower Dozan there is a large Commissariat and Transport Depôt, Bungalows, &c. The water is a long distance off, and comes by an aqueduct from the Dozan Spring. The water is excellent, but much inconvenience is caused by its being on the opposite side of the river. From Lower Dozan to Darwaza is 7½ miles. The Kharlaki Kotal, or termination of the Bolan Pass, is crossed on this march; it is about 6,000 feet high and 56 miles from the entrance of the Pass. From the Kotal the road descends to the plain of the Chota Dasht.

Darwaza to be avoided.

At Darwaza there is a fort and bungalows. Indifferent water is obtained from deep wells. In winter

time, at all events, Darwaza should be avoided as a halting place ; not only on account of the intense cold, but for the scantiness of the water. It is 5,800 feet high, and on no account should sick convoys, especially native ones, be halted there for a night in the cold weather. The 25 miles between Dozan and Sir-i-ab should be done in one march. When the railway is completed, it is intended to pump water from the Dozan Springs up to Darwaza, and thence, by pipes, onwards towards Quetta. From Darwaza to Sir-i-ab, a distance of 17½ miles, is totally without water, and the road is, for a good part of its course, through the Big Dasht.

Karez.

At Sir-i-ab the first Karez is seen. A Karez is an underground aqueduct leading from the hills. A likely place at the foot of the hills is chosen, and a shallow well is sunk; following the natural slope of the country another well is dug in a line and at a short distance from the first. The space between the two wells is then tunnelled by men working from each well. By a series of such wells and tunnels, water is brought from the hills to the villages of the plain. These Karezes are sometimes 2 or 3 miles long. The distance between Sir-i-ab and Quetta is only 6 miles. The road is good and runs through the Shál valley.

Brahooes.

The inhabitants of the Bolan are Brahooes, Mohamedans of the Sunite Sect. They are a brave and warlike race, and few of the chief men are without scars of old tulwar wounds. Most of the scars which came under writer's notice, when not on the head, were in the vicinity of the hip and shoulder joints, possibly dealt with the intention of opening a joint and disabling a limb. The Brahooes are nomads, and migrate to the plains of Gundava Katch in the winter, where they feed their flocks and sow barley, or, as it is more generally known, "Kusseel." These people are very well disposed towards us ; but it must be admitted the Bolan road is well "metalled."

Shal Valley.

The Shál or Quetta Valley is traversed by the Bolan road, and communicates on the South with the Dasht-i-be-daolat, and on the North and West with the Peshin district. It is about 20 miles long and 5 to 7 broad, and is shut in on nearly all sides by high mountains ; but to the North-West is a low range of hills, across the mouth of the valley, separating it from Peshin. This ridge, with its passes, extends from the Northern end of the Chilhaltan range to an off-shoot from the Takatu mountain, and is about 4 miles long. The Chilhaltan range bounds the Shál valley on the west, and separates it from the Kanak valley. The

latter, in its turn, is separated from the Sharod valley by the Kanak range. The Zarghun mountains bound the Eastern side of the Shál valley and separate it from the Harnai valley.

River. The Shál Lora is the principal river, and after draining the valley passes northwards, through a gap in the low range of hills above mentioned, to join the Kakar Lora at Haidarzai in Peshin.

Roads. The main road from Quetta to Peshin and Kandahar traverses the whole length of the Shál valley, crosses the Shál Lora, and leaves the valley through the Gazarband Pass. Roads communicating with the Kanak and Sharod valleys, Mastung, and Kelat, branch off from this at Samanguli, a large village, 7 miles from Quetta. The old road through the Kakar Lora valley, *viâ* Kuchlak to Kach; the old Kandahar road, *viâ* Haidarzai and Haikalzai, to the Kojhak, as well as thus Kehdil Khan—Ghazni Route, leave the valley, as one road, through the Marghi Pass, a narrow gorge to the west but near the foot of the Takatu mountain. Kuchlak is 12 miles from Quetta and 19 from Gharkai. To the East of the Takatu mountains, a road leading to Kach on the Harnai road in two marches, quits the Shál valley at the Sharkalla Pass. This road is of great strategical importance, as it would allow of a

flank attack from Quetta on an army endeavouring to force a passage down the Harnai route.

Nigandi. On the East, the Han Pass leads to the Han valley, at the head of which is the new sanitarium of Nigandi, which, though only 15 miles from Quetta, is 1,000 feet higher, and immensely more healthy. The principal water supply of Quetta comes through the Han Pass. On the left the Nishpa Pass leads to Mastang. The Shál valley is well watered and fertile. There are numerous walled villages, enclosing considerable orchards, and a large population.

Quetta. Shálkot or Quetta, Lat. 30° 12′ and 66° 55′ E. Long. and 5,514 feet above the sea, is at the Northern end of the Shál valley, and consists of the fort, military cantonment, civil lines, and the new bazaar or native town.

Fort. Originally, as in other trans-Indus towns, all the inhabitants lived either inside the fort or under the shadow of its walls; but in 1879 the houses within the fort were pulled down to make way for Artillery barracks, and those outside levelled to form the glacis. The fort covers about a quarter of a square mile. It is surrounded by a high mud wall and a deep wide ditch. There is a Citadel in the centre on which guns are mounted. The siege-train is composed of 40-pounder

and 25-pounder rifled muzzle-loading guns, and 6-3" rifled muzzle-loading howitzers. There are Artillery and Infantry Barracks, inside the fort, capable of accommodating some 70 or 80 men. All the drinking water is obtained from the outside. There are, however, two wells inside, which could be used if the water was filtered. The made ground, inside the fort, is some 14 feet thick, and contains human bones.

Cantonment

The Cantonment, which extends for about a mile to the N. E. of the fort, consists of the old and new

Barracks.

barracks, hospital, &c. The old barracks, now occupied by native infantry, are mud huts with flat roofs and mud floors, and admit the rain freely ; they are badly ventilated and very unhealthy. The native cavalry barracks have domed roofs, and are consequently somewhat better than the infantry ones. The new barracks are capable of accommodating an European Infantry Regiment, and consist of eight one-storied isolated blocks placed *en echelon*. They are built of sun-dried bricks, have zinc roofs, and are fairly comfortable.

Hospital.

The hospital buildings were originally built for stables. The roofs and floors are of mud ; they are low, dark, and dusty, and very unhealthy. They are capable of accommodating some 180 patients. During the last Afghan war they were full of Enteric Fever cases, and

still maintain their old reputation. A new hospital is, however, in the course of construction on some elevated ground about a quarter of a mile from the new barracks.

Bazaar.

The Quetta Bazaar is situated south of the cantonment. It contains a fruit-market and many shops. Everything can be got there ; but the prices, at present, are exorbitant. Peaches, pears, and apples are to be had in abundance. Notwithstanding its elevation, the climate of the Shál Valley is bad. Sun-stroke, Enteric Fever, Pernicious Ague, Cholera, Diarrhœa, Dysentery, Abscess of the Liver, Epidemic Pneumonia, Tonsillitis, Bronchitis, and Jaundice are very common, and the death rate is very high. Two causes contribute to make the Quetta Valley unhealthy : Bad water and extreme variations of temperature. To these are added, in cantonments, ill-ventilated and leaky dwellings. The water of the Quetta Valley comes from springs in the mountains, either by Karezes or open streams. It contains large quantities of the salts of Lime and Magnesia, as well as marked quantities of organic impurities. The grave-yards in many places are dug in the beds of streams, and the water is always "suspicious" and generally "bad." Nearly everyone complains of diarrhœa, and the number suffering from jaundice is remarkable. This jaundice, supposed to be due to catarrh of the bile ducts, is ushered in by vomiting

Diseases.

Water.

Jaundice.

and loss of appetite, which persists for days, and these symptoms only abate when the yellow discoloration appears. As to the extreme variations of temperature, it may be stated the Summer heat varies from 80° to 100° F. In winter the snow lies deep on the mountains and in the valley, and the mercury falls below the freezing point. Besides, there is a difference of 40° F. between the temperature of the day and that of the night. The rainy months are March, April, July, and August. The atmosphere is loaded with moisture during the Spring rains; and in the Autumn, which is the most unhealthy season, cold, bitter winds blow from the North, while the solar rays are still very powerful. The average highest temperature in July is 95°, while the average lowest temperature in December is 28°. Moreover, during the Summer the air is loaded with dust to such an extent that at times the sun is obscured. There are, as in England, four seasons, but here they are very rigorous. The writer was for some time sanitary officer of Quetta, and can bear testimony to the unsanitary construction of the buildings, bad water, and trying character of the climate. The important strategical position of Quetta, commanding, as it does, the lines of communication by road and railway, necessitates the proximate presence of a large garrison; and the injurious effects of the climate are, in a measure, mitigated for Europeans by the establishment in its

Meteorology

neighbourhood of Hill Sanitaria. At present there are two, the one before alluded to on the Zerghun is only 15 miles from Quetta, while the other, Gwashki is 63 miles distant. Gwashki is only 29 miles from Kach in Harnai, and when the railway is complete, Kach will be the station for this sanitarium. Most favourable accounts of the health of men sent to these sanitaria are published, and when houses and hut-barracks are built they are likely to be favourite resorts during the Summer and Autumn, and will permit the European Garrison to be frequently changed to the hills. Three batteries of Artillery and four companies of Infantry were this year accommodated at Gwashki, and two companies of Infantry and a battery at Nigandi. It has been suggested that native soldiers at Quetta should be allowed a meat ration, and there can be no doubt of the necessity of giving lime juice occasionally throughout these regions.

Sanitaria.

Lime Juice.

We will now follow the Harnai Route. The Harnai route was originally chosen for the construction of the Sind-Peshin Railway, and though longer than the Bolan route, it was expected the engineering difficulties would have been less; but the bridging, tunnelling, and cutting on the line has been found fearfully heavy, and the frequent floods have much retarded the work, so that, in all probability, the line up the Bolan will be com-

Harnai Route.

pleted first. At present the rail-head is at Kilat-i-Kila, and from there a good cart road ascends the valley of the Nari River, goes over the Bahdra plain, and through the Kuchali defiles. It traverses the long Harnai Valley, passes through the Chappar Rift to Kach, and on, through the gorge, to Gharkai in Peshin. At Gharkai it turns to the S. W. down the Kakar Lora Valley, passes Bostan and Kuchlak, and, going over the Marghi Pass, enters the Shál valley and on to Quetta. The distance from Kilat-i-kila to Gharkai is about 110 miles. The first part of the road, from Kilat-i-kila to Spintangi, is through the Mari country; the inhabitants are ill-disposed, and gave a lot of trouble after the investment of Kandahar. At Harnai the people are friendly, and supplies are procurable. Harnai is 2,600 feet; and the climate is tolerable throughout the year. A new road is now being built from Harnai to Singawi in Bori. At Sharg, two marches beyond Harnai, it is proposed to build a strong post. Water is plentiful and good, the valley is fertile, supplies are obtainable, and, being 3,800 feet above the sea, is a fairly cool climate; and in this respect resembles Mach in the Bolan. Sharg would be a good position for a large Rest Depôt or small General Hospital. At an elevation of about 5,000 feet, and between Dargi and

Harnai.

Sharg.

Mangi, we have the Chapper Rift. It is about 1¾ miles long, and is of eliptical shape, the ends or mouths being only a few yards broad. The cliffs at the entrance are about 300 feet, and rise to 1,000 feet in the centre. The rift is very subject to floods, sometimes rising to 30 feet. Kach Post is a strong defensive enclosure, containing quarters for a Native Infantry Regiment. There is a good encamping ground and water is abundant. Kach is connected with Quetta by a very important cart-road through the pass of Sharkhula. The elevation of Kach is 6,300 feet. The climate of the Harnai route resembles that of the Bolan. The heat in Summer is intense, and even in houses at an altitude of 4,000 feet, the thermometer, in August last, registered 98° F.; and Fever, Sun-stroke, and Cholera put a stop to the railway works recently. The Harnai route, as offering an alternative road to Peshin, is of great value, and when the twin railways are finished, our communications with the Peshin plateau will be comparatively complete.

Chapper.

Climate.

Twin Railways.

Allusion has previously been made to the routes leading from the Indus to Peshin and Kandahar, over the Suleiman mountains, and this portion of our frontier has of late attracted considerable attention, as it has been suggested an enemy from the North-west could

Yagistan.

take a straight road from Kandahar to Mooltan, either feigning to attack Quetta or avoiding it altogether. It is claimed for this route that it runs over an elevated table-land, everywhere habitable for Europeans, fertile, well-watered, rich in forage, sparsely populated, and belonging to neither Kelat nor Kabul. The climate is the climate of Simla, and it commands the Bolan and blocks the whole series of passes into the Derajat; and, finally, that its owner will command the gates of India. On the other hand, it is stated this Sewistan or Yagistan, or Independent territory, for the most part consists of an inhospitable wilderness, that the water is saline, and the climate, except in the higher valleys, detestable; that the routes through the country are so numerous it may be said to be open. With the exception of the Maris, it is admitted the people are inoffensive and peaceable, and it is conceded, also, good grass is obtainable on the plateaux; but that here the supplies end.

Peshin-Punjab Road

All the country east of the Khwaya Amran range was ceded to us by the treaty of Gandamak, Yagistan already belongs to us, and to improve our communications, a road is being constructed from Dera Ghazi Khan to Peshin. It will run north of the Harnai Railway, so as to provide covering movements of troops to guard the line from tribal attacks, and with this view a branch road will run north from Harnai to the Bori

valley. The main road will go to Fort Monro, at the foot of the Suleiman Mountains, and, crossing the range, will traverse the Rakni plain to Anambar, and thence, through the undulating plains of Bori valley, to Chingan. From Chingan the road will mount the Chari Momand (8,285 feet), which is the water—parting between Bori and Peshin, and thence, passing through grand scenery, lead to Yusaf Kach and Balozai in Peshin. The route, at either end, is very hilly; but the country is well under control. On the other hand, the Bori valley—38 miles long and 5 to 15 broad—is open; but opposition may be expected from the tribes. From the main track numerous roads pass over the mountains into Jhob on the north, and into Thal-Chotiali on the south. Of the former may be mentioned a gap through the hills called the Tokazai Kotal, which leads into Jhob and through the Vihowa Pass into the Punjab; and another from Chingan to Hindu Bagh in Jhob, and of the latter a road passes south-east from Chingan to Biani, Sinjawi to Duki, and thence to Thal and Chotiali. The general elevation of the route is over 5,000 feet, and it would be a great advantage if we could abandon some of our unhealthy stations on the right bank of the Indus, for strategical positions on these highlands.

Mithankot Road.

From Mithankot on the Indus, confronting the railway terminus at Chachar (where the Punjaub rivers become one), we have a very important road traversing Sewistan. It passes through Harand, over the Sham Plain to Quat Mandai and Harnai, and communicates with the Thal-Chotiali road.

Thal-Chotiali Road.

The Thal-Chotiali road goes north of this through Vitakai to Chotiali, Thal, and Duki, and thence on to Chingan on the Punjab-Peshin Road. It is intended to build a strong post at Thal.

Zhob or Jhob Valley.

The Punjab is also connected with Peshin and with Ghazni and Kandahar by means of the Jhob valley. This valley, lower than the Bori valley, stretches eastward from the Toba Highland, and is about 100 miles long and 20 broad. It communicates on the N. E. with the Ghumal Route, on the E. by the Darband and Vihowa passes, with Dera Ismail Khan ; S. with Chingan and Bori; on the S. W. with Balozai, in the Peshin district ; and on the N. W. by Gurdan and Maruf, whence there are roads to Kandahar and Ghazni. In the centre of Jhob there is a tract of tamarisk jungle, some 20 miles long, which affords forage for large herds. The climate of Jhob is intermediate between that of the Punjab and Peshin, and resembles that of

Harnai. The rainfall is greater than that of Peshin, and it is more fertile. The valley slopes gently to the east, the average elevation being about 3,500 feet. The inhabitants are contumacious and predatory.

Peshin.

To return to the Bolan-Kandahar road, we find the Ghazarband ridge, with a branch of the Brahuic hills, separates Shál from Peshin, or, in other words, Biluchistan from Afghanistan; and Peshin itself is separated, in its turn, from the valleys of Kadanai and Kandahar by the Khwaja Amran range, which is an offshoot from the Toba plateau. Peshin consists of two portions, a mountanious district and the plain of Peshin proper ; the latter is only about a quarter of the whole. The average elevation of the Peshin valley is about 5000 feet, and it is about three times as large and 500 feet lower than the Shál valley. The general elevation of the Khwaja Arman range, which bounds it on the North-west, is about 7,500 feet, and that of its highest peak is said to be over 8,800 feet. Of the hills separating Peshin from Shál, the Takatu rises to 11,000 feet.

Peshin Valley.

The valley may be described as a parallelogram between the two ranges above alluded to, and closed in on the North by the Toba plateau, while it is separated from Shorawak, on the South, by an extensive tract of low hills.

Peshin Lora River.

Its river system begins in the North, where the Barshor Nulla and Tor Margha stream join, some two miles north of Khushdil Khan, to form the Peshin Lora. This Peshin Lora, joined by the Dori Nulla and Surkab river, finally unites with the Kakar Lora at Shadizai, forming the Lora river, which is eventually lost in the sandy region south-west of Shorawak.

Kakar Lora River.

The Kakar Lora river is formed by two tributaries, one coming through the Gharkai Gorge, and another down the Gwal Valley, uniting some distance below Manzakai. The Kakar Lora passes out of its valley through the low red hills which separate it from Haidarzai; here the river has a deep bed, with perpendicular banks 20 feet high. At Haidarzai the Kakar Lora is joined by the Shál Lora, and the united streams continue north-westward to Shadizai, where they empty themselves into the Lora proper or Peshin Lora. The general slope of the valley is towards the Lora river. Peshin is very badly cultivated, but this is mainly due to the absence of irrigation, and it is now intended to supply this want by either having an inundation channel from the Kakar Lora, below Haidarzai, to the plain at Shebo, or to divert the flood water of the Barshor stream above Kushdil-Khan, and to store it in a reservoir below New Bazaar. In addition to the river

Irrigation Scheme.

system above described, there are numerous karezes and streams which run down from the mountains on all sides.

Climate.

The climate of Peshin is very relaxing, and somewhat similar to that of Shál; but it is warmer in summer and colder in winter. March and April are the cool months, but a strong wind from the S. W. rises an enormous amount of dust; the whole air is pervaded with it, and this sometimes occurs even at night. The dust very frequently takes the form of columns. In May, June, and July, in addition to the dust, the wind is hot and oppressive, and there is a regular plague of flies. When the writer was at Killa Abdulla, in August, 1880, the dust filled the air from about 9 a.m. to 5 p.m. No fires could be lighted without some protection against the wind; and the usual practice was to cook all the food in the morning, and heat it up again when wanted for dinner in the evening. In September and October the flies diminish in number, the dust only gives annoyance for a few hours in the day, and there is a sensible coolness in the weather. The winter is cold, bleak, and gloomy; the leaves fall from the trees, and even the grass disappears. On the whole the climate is trying to both Europeans and Indians.

Peshin is barren.

The inhabitants are friendly enough, but supplies and fire-wood are scarce. The chief crops are wheat, barley, rice, Indian corn, and lucerne. Apricots, plums, peaches, grapes, apples, figs, pomegranates, and walnuts are cultivated.

Strategical value of Peshin.

The chief value of Peshin is that here all the roads leading from Kelat, Shorawak, and the Indus meet those coming from Kandahar, Ghazni, and South-western Afghanistan; and that it makes an excellent *place d'armés* for an advance on Kandahar, and dominates the most of Southern Afghanistan. There are not, as yet, many good roads through the valley, and we will now notice a few of the principal ones.

Kandahar Road.

The main road up the Bolan is prolonged beyond Quetta, over the Khojak pass, to Chaman, and thence to Kandahar. The first march, to Mehtarzai, from Quetta is 9 miles; in this stage the Shál Lora is crossed. From Mehtarzai to Dinar Karez is 12 miles. The Salt Lora is crossed, and the Ghazarband defile is mounted and quitted. The water at Dinar Karez is brackish. From Dinar Karez to Segi, distance 9 miles. Just near Segi the Lora River is crossed; the banks are very high, and it is about 300 yards wide. The water in the river is saline, and at some distance from the camp. There is a direct road from Segi to Killa Abdulla of

about 15 miles. From Segi to Gulistan Karez is 10 miles. There is a pretty large fort at Gulistan, and its position, at the foot of the hills, is an important one, as it guards the entrance to the Gwajha Pass to the S. W., and the Roghani Pass on the N. W. The water at Gulistan is good and abundant. There are some trees and vegetation about; and it is, altogether, the prettiest place in the valley. From Gulistan the road leads along the outer spurs of the hills to the East of the range, and, joining with the direct road from Segi, passes into the small plain of Abdula Khan Kila. There is a large fort at Abdula Khan Kila, with Commissariat and Transport Depôts. The water comes from an irrigation channel, and is liable both to contamination and interruption. There is a village near the fort from which some supplies are procurable. In consequence of its being at the foot of the Khojak, the ground, when writer was there, was saturated, and the air impregnated with the decomposing bodies of transport animals. In fact, his chief work as sanitary officer was to personally see if his directions as to removing the carcases were carried out. At first, large fatigue parties dug huge graves, and it was a strange sight to watch three or four camels drawing a dead comrade by his hind legs to his last resting place. It was found, however, the sandy

Gulistan.

Abdula Kila or Killa Abdulla.

soil had not sufficient deodorising properties, and the carcases were subsequently burned. A little straw or brush-wood, soaked in Kerosine oil does the business. The entrals should, however, be first removed and buried. From Abdula Khan Kila to Chaman the Khojak Pass is crossed at 10 miles, and the distance between the two forts is 15 miles.

Khwaja Amran.

The Khwaja Amran range is about 50 miles long, and extends from Toba to Shorawak, and is pierced by numerous passes, *viz:* (from north to south) the Khojak, the Sanzal, the Roghni, the Largani, and the Gwajha.

Passes.

The Sanzal is practicable for cavalry; but the Azanga or Largani, as it is sometimes called, is a mere track. The Khojak and Gwajha are both practicable for artillery; but the Roghani is not. The Khwaja Amran range, like most of the mountains in this region, has, at its base on each side, a *daman* or skirt. It is formed of the *débris* of the mountains, and is the table-land sloping gently towards the plains; and extends, on the Kandahar side, 8 or 10 miles. It has been likened to the glacis of a fortress; but it is usually much cut up by mountain torrents. The *daman* on the Killa Abdulla side affords ample space for the encampment of 10,000 men.

The Khojak.

The road over the Khojak is a narrow zigzag, exceedingly precipitate, but fortunately very short. The road, in 1880, was fairly good for Artillery; but it must have fallen out of repair, as it recently took the siege-train on its way to Herat 10 days to cross it, after much labour and difficulty. The elevation of the Pass is 7,200 feet.

Chaman.

The fort of Chaman is on a low spur to the right of the road, whereas the camping ground is on the left. Water is obtained from Springs near the fort. In fact, springs are pretty abundant all along the western slopes of the range. In all probability an entrenched camp will be formed at Chaman and a strong force left in occupation, as the defence of the whole range depends, to a great extent, on its possession. There is a road (28 miles) along the *daman* on the western side, which joins Chaman with the opening of the Gwajha Pass on the Kandahar side. It covers the line of springs above alluded to. Chaman, our advanced post in this direction, is 80 miles from Kandahar and 451 from Herat. The marches from Chaman to Kandahar are: 1st, Gatai, 17 miles; 2nd, Dabrai, 9 miles; 3rd, Mel Karez, 12 miles; 4th, Abdul Rahman, 14 miles; 5th, Mandi Hissar, 15 miles; and 6th, Kandahar, 12 miles. There is no water between Chaman and Gatai, and no supplies are procurable until Mandi

Chaman-Kandahar Road.

Kandahar Valley Fertile.

Hissar is reached. There are ample means of feeding a large force around Kandahar, and it has been suggested that, in the event of complications beyond our frontier in this direction, it might be necessary,—in consequence of the barrenness of Peshin—to push on one or two Divisions to the vicinity of Kandahar for Commissariat purposes alone. There are two roads from Chaman to Kandahar; one called the Barghana road, divided into seven marches, is some two miles shorter than the high road, and is used as an alternative route; the other, over the Kussa Pass, is 86 miles.

Roads to Kandahar.

Gwaja Pass.

The road from Gulistan Karez to Kandahar, over the Gwaja Pass is 114 miles, divided into nine marches. The Gwajha Pass is much easier than Khojak, and was used for the 40-pounder Armstrongs and General Stewart's Division in the Winter of 1879. The great drawback to this route is the scarcity of water between the foot of the hills and Shah Pasand.

Roads in Peshin.

The old road from Quetta to Killa Abdulla is about 52 miles, or just a little longer than the road over the Ghazerband Pass. It is thus divided: Kucklak, 11½, Sayad Yaru Karez, 11½, Haikalzai, 9½, Asad Khan Camp, 10, Abdula Khan Kila 9½. It is a good road, and practicable for wheeled Artillery. The road to Ghazni from Quetta leaves the above at Sayad Yaru

Road to Ghazni.

Karez, goes through New Bazaar and Kushdil Khan—the total distance to Ghazni being 292 miles.

Harnai-Kojhak Road.

The road from Kilat-i-Killa, up through Harnai, as before stated, goes through the Gharkai defile. Here it sends a branch down the Kakar Lora valley, *viâ* Kuchlak to Quetta, and the main road goes across the valley to the Ishpezena Pass, crossing the Kakar Lora river, and then down the narrow valley of the Surkhab to Bagh China, 10½ miles. From Bagh China the road goes by New Bazaar, and thence to Haikalzai, distance 12 miles. From Haikalzai to Asad Khan is 10 miles—the Dori Nala and Peshin Lora are crossed in this march. FromAsad Khan to Killa Abdulla is 9½ miles. This is a good road in dry weather; but as the soil is clay, it is unsuitable for wheeled carriage, during the wet season. It is then usual to go round by Kushdil Khan, Alizai, and Badwan.

Distances in Peshin.

Among other distances in Peshin Valley may be mentioned: Quetta to Bostan, 20 miles; Bostan to Peshin, 18 miles; Peshin to Sayad Hamid, 15 miles; Sayad Hamid to Killa Abdulla, 12 miles; Killa Abdulla to Peshin, 26 miles; Bostan to Shibo, 10 miles; Peshin to Kanai, 12 miles.

Bostan.

Bostan is on the Kasim Kala-Gwal road, and is two miles from Kasim Kala, and half a mile from the

Kakar Lora river. It is of some importance strategically, as it covers the proposed railway and is the best defensible position in the Kakar Lora Valley.

Peshin.

Peshin.—In 1881 a large fort and cantonment were built at Peshin, which is in the South-east of the valley. It can accommodate a full native regiment and a squadron of cavalry. There is abundance of water; but it is much impregnated with saline matter and organic impurities. Peshin is strategically of value, as it commands the road from Harnai to the Khojak. The cantonment has been tastefully laid out, and there are large Commissariat and Transport Depôts formed there.

SayadHamid

Sayad Hamid on the Lora is midway between Gulistan and Peshin Fort, and more than half-way between Peshin and the Khojak. It is of importance as being the locality chosen for the site of the new entrenched camp, which will be a large fortified work, covering the railway. It is not quite settled whether a considerable force will permanently occupy it or not. It is considered the best plan would be to keep a small permanent force there, while the greater part of its intended garrison are accommodated on some of the neighbouring mountains, during the unhealthy season,

at all events. There are several positions on the Toba plateau, overlooking the Kandahar province, which could be utilized for this purpose.

Khushdil Khan.

Khushdil Khan Kila is a tolerably large fort, situated at the northern end of the valley, and its value consists in its position on the Quetta-Ghazni road, and the protection it affords against incursions from Jhob and Toba.

Sind-Peshin Railway.

The Sind-Peshin railway will follow the Harnai road through the Chapar Rift and Gharkai defile into Peshin. It will then turn down the Kakar Lora Valley to Kasim Kala, whence the branch line is to go to Quetta. The main line to follow the Kakar Lora northwestwards to Haidarzai, and thence, by the Kakar Lora Gap, into the plain of Peshin Proper. Turning westward at Shebo, the Lora will be crossed at Sayad Hamid; the line to lead straight on to Gulistan and thence to Killa Abdulla. The course, however, which the railway will take beyond Shebo, towards Kandahar, has not been definitely settled; but the following three schemes have met with support:—

Railway Schemes.

I.—As originally intended, by Gulistan and the Gwaja Pass, with a branch to Killa Abdulla.

Shebo.

II.—From Shebo straight on to the Khojak, with a bridge over the Lora, a tunnel through the Khojak, and strong post at the terminus at Chaman. Shebo is strategically well placed between the Lora and one of its tributaries, and the country is quite open between the Lora and the Khwaja Amran.

Our left Flank.

III.—It has even been proposed to avoid the Khwaja Amran range altogether, and go round by Nushki to Kandahar, or even to push on the rails to Seistan; so as to strengthed our left flank, which would naturally rest on the lower Helmund, near Lash-Jawain. Notwithstanding its length, this latter line could be constructed with ease, and it could be used to oppose any attempt on the part of an enemy in Herat trying to turn our left flank by a march across the desert from the Helmund *viâ* Shorarûd and Kilat.

Great Strategical Triangles.

There are two great strategical triangles in Afghanistan: one known as General Hamley's and the other as Lord Lytton's. The former has for its angles Herat, Balk, and Kandahar. The latter Ghazni, Kabul, and Jellalabad; and with a view to the occupation of one or both of these, it has been proposed to collect in Peshin a large quantity of railway material, and to have the earth-work finished and bridges made, not only between

Chaman and Kandahar; but between Kandahar and Kabul, *viâ* Ghazni, so that, in case of emergency, the rails could be readily put down; and by the occupation of Kandahar, with outposts on the Helmund, we could assist our ally, the Ameer, in repelling invasion from the direction of Herat; and, similarly, by the occupation of Kabul, Ghazni, and Jallalabad, we could help him to defend his kingdom from an enemy in possession of the passes of the Paropomissus.

A SKETCH

OF THE

MEDICAL ARRANGEMENTS

SUITABLE FOR

AN ARMY CORPS,

OPERATING IN

Beluchistan and Southern Afghanistan.

A Sketch of the Medical Arrangements

SUITABLE FOR

An Army Corps operating in Beluchistan and Southern Afghanistan.

The proportion of the different Arms, and the ratio of British to Native Troops in an Indian Army Corps, depends, in actual warfare, on the nature of the country, the service to be performed, and the enemy the force is likely to be pitted against.

Army Corps.

It can, therefore, be readily understood that in all operations in the above countries, the composition of an Army Corps would much depend on whether it was mobilized with an offensive or defensive object, and as to whether its opponent was an Oriental one, like the Ameer of Afghanistan, or a great military power such as Russia. In the former case the usual proportion of two natives to one British soldier would be amply sufficient, whereas, in the latter, the force would require to be well supplied with Artillery, and strong in the European element, and whatever enemy it was opposed to, it should be powerful in

cavalry ; as thus, only, could the movements of a foe, advancing from Kandahar across the Kadanai plain be watched from the numerous peaks of the Khwaja Amran range.

Medical arrangements subject to variation.

That the medical arrangements would also be modified by like considerations is very apparent, for the long-range ordnance and the modern perfected rifles of the Russians would very largely increase the number of men likely to be seriously wounded, thus necessitating a corresponding augmentation in the Hospital provision ; and the present arrangement, by which the Indian Field Hospitals, with their Bearer Columns or Companies are advanced, and established in the immediate vicinity of the scene of action, would have to be discontinued, and Bearer Companies should be maintained as a separate and distinct organization from Field Hospitals.

The rapidity of advance, and the celerity of the movements of such an opponent, the great magnitude of the actions likely to be fought, and the way victory on either side would be pushed home, all have important bearings on the medical arrangements to be made. But, for the better understanding the usual medical requirements, and in order to be in a position to readily modify

Normal Indian Army Corps.

the arrangements under all possible circumstances, it will be well to give the abstract organization of the normal or standard Indian Army Corps, and it is hoped the table over leaf may tend to elucidate the matter, and show, at a glance, the rationale of our Indian Field Hospital Regulations. An Indian Army Corps consists of three Divisions of Infantry, each with its own Divisional Troops ; a Cavalry Division ; and the Corps Artillery and Engineers, in all, consisting of 21 Regiments of Infantry, 9 Regiments of Cavalry, 15 Batteries of Artillery, and 8 Companies of Sappers.

The following table gives the detail, and from it, too, can be derived a synopsis or compendium of all possible field medical arrangements :—

PS.

	Total for Brigade.		Total for Division		Staff of Divisions.	Guns.
	B	N	B	N		
1st Division ...	928	1664	2360	4819	4	18
	928	1664			4	
	504	1491			12	

DETAIL of an INDIAN ARMY CORPS.

		Officers and Men.					Total for Brigade.		Total for Division		Staff of Divisions.	Guns.
		Officers.		Warrant Officers Rank and File.		Total of all Ranks						
		B	N	B	N		B	N	B	N		
1st Division ..	1st Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664	2360	4819	4	18
	1st Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	2nd Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664			4	
	2nd Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	Divisional Troops .. 3 Batteries of Artillery	15	..	471	..	486	504	1491			12	
	Divisional Troops .. 1 Regiment Native Cavalry	8	13	..	537	558						
	Divisional Troops .. 1 Regiment Pioneers	8	16	..	816	840						
	Divisional Troops .. 1 Company of Sappers	2	2	..	107	111						
2nd Division ..	1st Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664	2360	4819	4	18
	1st Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	2nd Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664			4	
	2nd Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	Divisional Troops .. 3 Batteries of Artillery	15	..	471	..	486	504	1491			12	
	Divisional Troops .. 1 Regiment Native Cavalry	8	13	..	537	558						
	Divisional Troops .. 1 Regiment Pioneers	8	16	..	816	840						
	Divisional Troops .. 1 Company of Sappers	2	2	..	107	111						
3rd Division ..	1st Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664	2360	4819	4	18
	1st Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	2nd Infantry Brigade .. 1 Regiment British Infantry	29	..	883	..	912	928	1664			4	
	2nd Infantry Brigade .. 2 Regiments Native Infantry	16	32	..	1632	1680						
	Divisional Troops .. 3 Batteries of Artillery	15	..	471	..	486	504	1491			12	
	Divisional Troops .. 1 Regiment Native Cavalry	8	13	..	537	558						
	Divisional Troops .. 1 Regiment Pioneers	8	16	..	816	840						
	Divisional Troops .. 1 Company of Sappers	2	2	..	107	111						
Cavalry Division ..	1st Cavalry Brigade .. 1 Battery R. H. A.	5	..	157	..	162	655	1100	1310	2200	12	6
	1st Cavalry Brigade .. 1 Regiment British Cavalry	24	..	453	..	477						
	1st Cavalry Brigade .. 2 Regiments Native Cavalry	16	26	..	1074	1116						
	2nd Cavalry Brigade .. 1 Battery R. H. A.	5	..	157	..	162	655	1100				6
	2nd Cavalry Brigade .. 1 Regiment British Cavalry	24	..	453	..	477						
	2nd Cavalry Brigade .. 2 Regiments Native Cavalry	16	26	.	1074	1116						
Corps Artillery ..	3 Batteries of R. H. A.	15	..	471	..	486	586	..	586	..	4	18
	1 Heavy Battery (Field)	5	..	95	..	100						6
Corps Engineers ..	5 Companies of Sappers	10	10	..	535	555	10	545	10	545	..	..
Staff of Corps ..		20	..	..	..	20	..	..	20	..	..	..
									9006	17202	76	90

Therefore Army Corps consists of 9006 plus 76 Europeans.
17202 Natives.

Total,.. 26,284

Strength of Army Corps.

From foregoing detail it appears a typical Indian Army Corps consists of 9,082 British and 17,202 Natives, or 26,284 of all ranks. It will be seen Staff Officers and the 192 British Officers with Natives Corps are all included in the 9,082 British, as they would be treated in the British Field and General Hospitals.

Hospital Provision.

The Hospital accommodation for such an Army Corps is calculated at 12 per cent. on the total strength of both British and Native Troops, and this would give 3,154 beds.

Ratio of Field to General Hospitals.

This 12 per cent. of accommodation is divided between Field Hospitals and General Hospitals, nearly in proportion of four-twelfths and eight-twelfths respectively, or to speak more correctly, of the 3,154 beds, 1,100 are given to Field Hospitals, and 2,054 to General Hospitals, being 34·88 per cent. of the total accommodation for Field Hospitals, and 65·12 per cent. for General Hospitals.

Field Hospitals.

Of the 1,100 beds allowed for Field Hospitals, the British Troops, including Staff and British Officers with Native Corps, get 400 beds, or 4 Field Hospitals; and the Natives 700 beds or 7 Field Hospitals. This, as will be seen by calculation, is not quite in proportion to the strengths above given; the British portion getting 20 beds in excess, and the Natives some 20 beds short.

This arises from the fact that the lowest Field Hospital unit is 25 beds.

General Hospitals.

Of the 2054 beds allowed to General Hospitals, 690 are allotted to the British, and 1,364 to Natives. This, also, is not in proportion to strength ; the British getting some 20 beds short, and the Natives 20 beds in excess. It will thus be seen that the proper number of beds, *viz.*, 1,100 is present in the Field Hospitals, and the full 2,064 beds are with the General Hospitals, but the 20 added to the British Field Hospitals (in consequence of the Field Hospital unit being 25 beds) is taken away from them in their General Hospitals, and *vice versa* for the Natives.

Beds for Followers.

Ratio.

The 35,033 followers of the conventional Army Corps are allowed Hospital accommodation at the rate of 3 per cent. on strength, or 1,051 beds in all. This 3 per cent. is divided into Field and General Hospitals, in the proportion of one-third and two-thirds respectively, or, to speak correctly, of the 1,051 beds allowed, 350 beds are allotted to Field Hospitals and 701 beds to General Hospitals (or 4-12 and 8-12).

Total Accommodation.

The Hospital accommodation, then for our Army Corps, calculated at 12 per cent. for troops and 3 per cent. of followers, would be as follows :—

Hospitals.	No.	No. of Beds.
Field Hospitals, British Troops	4	400
Field Hospitals, Native Troops	7	700
Field Hospitals, Followers	3½	350
General Hospitals, British Troops ..	..	690
General Hospitals, Native Troops ..	..	1,364
General Hospitals, Followers	..	701
Total for Army Corps	14½	4,205

The large number of followers, considerably more than one to every fighting man, has always been a problem for military men ; and it is now usual to cut down the number to one follower per soldier, and the beds allowed in above to followers in General Hospitals would thus be reduced to, say, 438 beds. The beds allowed to followers in Field Hospitals should not be interfered with, as so many of them, kahars, drivers, &c., have to go into action.

Russian Army.

In the Russian army there are no kahars, no grass cutters, no private servants, and in a conflict with it we, with our army of followers, all requiring to be guarded as well as fed, would be at a great disadvantage, and it is considered, by introducing the Home System of Bearer Companies, Medical Staff Corps, regimental bearers, and soldier servants, there would be a great saving in the number to be sustained from our Cis-Indus base, and in operations in barren countries, like

Beluchistan and Afghanistan, all such economy is desirable. As before stated, the proportion of British to Native Troops is liable to change, and again referring to the detail, it may be said the modifications would be chiefly in the Divisional Troops ; British Rifles or Light Infantry Battalions being substituted for pioneers ; European, for Native Cavalry ; and Mountain Batteries, European or Native, for Field Batteries. It must be remembered the native drivers with European Mountain Batteries are counted as fighting men.

Sick Provision liable to variation.

The sick provision of 12 per cent., and 3 per cent., for followers, though considered quite enough under ordinary circumstances, would have to be increased if the season was peculiarly unhealthy, or the number of battle-field wounds likely to be large, and it might require extension to 14 or even 18 per cent., as in Egypt, with a corresponding increase for followers.

In defensive warfare, the proportion of General to Field Hospitals would be much in favour of the former and *vice versa* in offensive operations; and the ratio 4-12 of Field to 8-12 General Hospitals, would also be liable to modification. For instance, when an Army Corps is marching *en l'air*, General Hospitals would be altogether an impossibility ; and it may be said, the less secure the lines of communication, the fewer the General Hospitals should be, and the great bulk of the sick and

wounded would be treated in Field Hospitals, in order to take advantage of the protection afforded by the Army. Similarly, if our opponent was a civilized power, like Russia, we might expect the Geneva Flag would be respected, and our unprotected General Hospitals to remain unmolested ; whereas, with a barbarous and fanatical foe, such as the Afghans, our General Hospitals should be kept within the range of our guns.

The Detail.

By the aid of the foregoing and Detail Table, we can readily calculate the amount of Hospital provision required for a Division, a Brigade, a Regiment, and even for a Battery, or for any combination of the three Arms of our Army Corps. The value of such a table to the Principal Medical Officer of the Typical Army Corps will be apparent when we consider how often, on Field service the General Officer in command issues orders for a force to be detached from the main body with some definite purpose. The detail of the column is generally given, but even if not, the P. M. O. has only to refer to his table, and he can see at a glance the amount of Hospital provision required, and can direct the P. M. O.'s of Divisions to prepare such Hospital accommodation as he sees is necessary, and with the Divisions.

British Field Hospitals for a Division.

For example, we want to find the number of Field Hospital beds required for the British Troops belonging to a Division. We say : If 9,006, the British Troops

belonging to the Army Corps, plus 76 Staff, are allowed 400 beds or 4 Field Hospitals, how many should be given to 2,360, the British Troops with a Division, plus 20 Divisional Staff Officers, and 5 of the Army Corps Staff who, it is presumed, would accompany the Division, or 2360 + 20 + 5 = 2385.

Thus :— 9082 : 2385 :: 400 = 105 beds F. H.

Similarly, for British Troops belonging to Brigade and Divisional Troops ; by adding the Brigade Staff, 4, to 928, the European Troops in a Brigade ; we get 932, and say.

9082 : 932 :: 400 = 41·04 beds F. H.

And for Divisional Troops: 504, the British Troops, plus 12 for Divisional Staff, and 5 Army Corps Officers presumed to be attached, or 504 + 17 = 521. Thus :

9082 : 521 :: 400 = 22·94 beds.

Or British Troops.

1st Infantry Brigade would require	41·04 Beds F. H.
2nd Infantry Brigade	41·04 „
Divisional Troops	22·94 „
Total for Division	105·02 Beds F. H.

which corresponds with what we found above, or 105 beds.

Native Field Hospitals for a Division.

In like manner can be derived the Field Hospital Beds for the Native Fighting Men of a Division :

17,202 : 4819 :: 700 = 196·04

Similarly for the Native Troops belonging to the Infantry Brigades and Divisional Troops.

For Brigades

17,202 : 1664 :: 700 = 67·70

For Divisional Troops

17,202 : 1491 :: 700 = 60·67

Or Native Troops

1st Infantry Brigade would require	67·70 F. H. Beds.
2nd Infantry Brigade	67·70 „
Divisional Troops	60·67 „
Total for Division .	196·07 Beds.

which agrees with what we found to be necessary for the native troops of the Division, *viz* : 196 beds.

Cavalry Division.

By a like calculation we will find the British portion of each of the Brigades of Cavalry would require 29·11 Field Hospital beds, and, taking the two Brigades together, they would require 58·22, and the native portion of each Cavalry Brigade 44·76 or the two Brigades together 89·52, while the Corps Artillery and Engineers would give 26·64 Field Hospital beds for British Troops, and 22·17 for natives.

Tabulating them, we find the number of Field Hospital beds required for an Army Corps to be

Army Corps.	Number of Field Hospital Beds.	
	British.	Native.
1st Division	105·02	196·07
2nd Division	105·02	196·07
3rd Division	105 02	196 07
Cavalry Division & Corps Troops	84·86	111·69
Total ...	399 92	699·90

or only a fractional point below that allowed, *viz*: 400 Field Hospital beds for British Troops, and 700 for natives, or, total for fighting men, 1,100.

It is unnecessary to say the proportion of beds for each Division &c. in General Hospitals, is also obtainable by calculation from the Table.

Sections of Field Hospitals.

Now, an Indian Field Hospital, British or Native, consists of 100 beds, and is separable into two divisions—Right and Left—each of 50 beds, and the Divisions can themselves be split each into two sections or four in all, named A. B. C. D. Each section contains 25 beds, and the section is the smallest unit of a Field Hospital. In order, then, to see how the Field Hospitals allowed should be distributed to the different branches of our Army Corps, we must bear in mind the lowest Field

Hospital unit is 25 beds, and allot 25 beds or a multiple of it, or none at all. The preceding table, by the addition of the Field Hospitals for followers is reconstructed thus:

Number of Field Hospitals with Army Corps.

Army Corps.	Number of Field Hospitals.			Total.
	British.	Native.	Followers	
1st Division	1	2	1	4
2nd Division	1	2	1	4
3rd Division	1	2	1	4
Corps Artillery and Sappers Cavalry Division	1	1	½	2½
Total	4	7	3½	14½

We can readily reckon from the Detail how many and what Field Hospitals or sections thereof should accompany any given force; but speaking generally, Field Hospitals attached to Divisions should be equally divided between the Infantry Brigades, and in any splitting up of Field Hospitals, it is well to remember sections A and B on the Right Division is better equipped than Left Division—Sections C and D, and that next to A, section C would be the most independent, then B, and D last. Section A should be always ths Head Quarters of the Field Hospital.

Followers treated in Native Field Hospitals.

There is no separate Medical or Hospital establishment allowed for Field Hospitals for followers. Their

requirements are met from, and they are treated in, the Native Field Hospitals.

The regulations regarding Field Hospitals, their establishment and equipment, their position in camp and on the line of march, will be found at paras 39—75, A Indian Army Circulars, 1884, Clause 82, and Clause 171, A. C. 1885, and their appendices.

It is contemplated in the regulations that British and Native Field Hospitals, or sections thereof might be combined or encamped together, and it may be remarked there is but little difference between British and Native Field Hospitals in respect to medicines, surgical instruments, appliances, books, necessaries, stationery, and furniture; whereas they differ considerably in regard to personnel, camp equipage, clothing, and dieting. Anyone acquainted with the habits and customs of the natives will know where to look for disagreements in scale, and in cases of emergency, many articles can be borrowed, and deficiencies made good.

Equipped for three months.

Field Hospitals are equipped only for three months, and all expenditure from the stores authorised for corps units, will be replenished from the Field Hospital stock.

The mode of packing equipment, transport, and weights of the different packages comprising British and Native Field Hospitals, will be found in the Report of the Field Hospital Committee, Calcutta, 23rd February, 1885.

Field Hospitals are intended for the treatment of the sick and wounded of the force to which they are attached. Beyond the first dressings applied by the Medical Officers with corps, and by the Bearer Column or Company, at the dressing station, all operations and other necessary treatment for the sick and wounded of the fighting line are carried out in the Field Hospitals, and here the wounded get, for the first time, comparative rest and comfort after the heat of action.

Field Hospitals must therefore be pre-eminently mobile and should conform with the general formation of the force, and only become stationary when, from the number of sick and wounded, or from want of transport, they cannot be moved, and as soon as these impediments can be rectified, must immediately join the force. Field Hospitals Mobile.

Unlike the arrangements for a purely British force, acting against a European power, there is no separate Bearer Company organization. The Indian Bearer Column or Company is merely a portion of the Field No Bearer Companies.

Hospital equipment and establishment, pushed forward to the fighting line for the purpose of succouring the wounded near or where they fall, and conducting them to the Field Hospital; an Indian Field Hospital itself performing most of the functions of the large dressing stations of European Armies. As soon as the Bearer Column brings in the wounded, it merges into its Field Hospital. Each Field Hospital should be able to equip two Bearer Columns. The regulations for Bearer Columns, the orders for the formation and position of dressing stations; together with detail of a Bearer Column are to be found at paras. 58—70, clause 82, and appendix A. C. 1884. Patients taken into Field Hospitals bring their arms, kits, accoutrements, bedding, clothing, diet utensils, and unexpended portion of their day's field ration with them.

Rations. While in Hospital, field rations will be drawn by the Medical Officer in charge, and will be cooked under Medical instructions. The field ration thus treated is supplemented by such medical comforts as may be necessary from the Field Hospital stock. See note, Appendix E, page 47, Field Hospital Regulations, on subject of diet for European and Native sick.

A small quantity of bedding, clothing, and diet utensils are allowed on the Field Hospital scale for special cases.

Bedding. Dandies are used for the sick and wounded to lie on, and when the number of dandies is insufficient, 12 lbs. of straw and a water-proof ground sheet is issued to each patient.

The slightly wounded, and those sufficiently recovered before the Field Hospital requires to be evacuated in anticipation of an action, will return to their corps; but the seriously and severely wounded, and those not likely to become effective within a reasonable time, should be sent to the base.

Patients in Field Hospitals being still in the immediate vicinity of their corps, all malingerers must be stopped here, as it is hopeless to expect to get them again to the front, once they have been passed to the rear.

Way-side Hospitals. To admit of the regular and systematic evacuation of sick from front to base, or from Field to General Hospitals, Rest-depôts or *etappen* Hospitals are established along the lines of communication, where the sick and wounded may rest and have their requirements attended to. They are also of great use to troops advancing to the front in rapid relief. These troops being supplied with but little ambulance, can drop those too sick to travel at the Rest-depôt, where they remain until they are sufficiently well to rejoin their corps, or be

returned to the base ; and the smaller the proportion of sick carriage in the possession of corps, the greater need for Rest-depôts along the line of route. Buildings, when practicable, should be used for Rest-depôts, and if not available, tents of the heavy camp equipment character should be issued.

Rest-Depots Distance.

The General Officer in command directs where the Rest-depôts should be formed ; but the usual Rest-depôt distance is about 20 to 30 miles apart by road, and—if no ambulance railway carriages are supplied—about 100 miles by rail. Regulations for Rest-depôts will be found in paras. 71-74, clause 82, A. C., 1884. It will thus appear Rest-depôts are stages, between the Field Hospitals at the front, and the General Hospitals at the base, and on the lines of communications.

General Hospitals.

As the Field Hospital aims at quickly putting the sick or wounded man in a place of safety and *comparative* comfort, the object of the General Hospital is to afford him every comfort, convenience, and aid to recovery which the circumstances of warfare will permit of. With this end in view, General are worked like Station Hospitals, having all the necessary appliances, surgical, medical, and dietetic. They are dieted Hospitals established at the base of operations or other suit-

able locality on the lines of communication, for receiving the sick and wounded from the front, and for replenishing the stores of Hospitals in the Field.

Military Depots.

Each General Hospital has a pack and accoutrement store, and a medical store attached to it, and depôts for British and Native Troops are established in its vicinity, to which discharged men can be sent, and from which necessaries for those in Hospital can be provided. As Field Hospitals are intended for the treatment of men of its own force, General Hospitals are for the treatment of men detached from their corps or division.

General Hospitals when Advanced.

Field Hospitals must be prepared to move at a moment's notice with their own force, whereas General Hospitals are for the most part stationery, and are only advanced as the whole or a great part of the Army Corps advances.

Whenever practicable, buildings should be utilized for General Hospitals, otherwise heavy camp equipment tents. General Hospitals are equipped for six months, and must replenish the Field Hospitals from their stores. All General Hospitals are based on the scale of 100 beds for Europeans and 100 beds for Natives. Officers, Warrant Officers, and Native Officers are admitted into

General and Field Hospitals, and are allowed separate accommodation. Orders for choosing sites for General Hospitals, and other regulations affecting them, will be found in paras. 1-14A and Appendix, Clause 82, A. C., but it may be stated General Hospitals, when practicable, should be in open spaces near towns, and not inside fortresses or fortifications; and small General Hospitals in very advanced positions would be, in reality, only large Rest-depôts or Etappen Hospitals, and the number required would depend on the length of the communication line.

It will be seen from above account the General Hospitals on Field Service in India answer the purpose of "Advanced Depôt of Medical Stores," "Stationary Hospitals on the lines of communication," "General Hospitals at the base with Military Depôt attached," and "Depôt of Medical Stores at the Base," of the Home Army. The great difference being, that in the Home Army the medical store depôts are not attached to Hospitals, but are under the P. M. Officers of the Base and Communication Line—independent organizations :—and that there is a Military Depôt attached to *each* General Hospital in India.

G. O. No. 30, 13th April, 1885, says the Military Depôt "Will accompany the hospital on active service "when and where it may be moved or established."

It is not quite clear why *every* General Hospital should have a Military Depôt with it.

Corps-units.

It now only remains to be said each corps-unit has a Medical Officer and Medical Subordinate attached, the equipment, together with rules for guidance, will be found at paras 28—38, clause 82, A. C. 1884. While the Medical Officers with corps-units should not allow sick or unfit men to remain with the corps and encumber the front, they should do what they can to prevent shamming and scheming, and no man should be sent to Hospital for treatment unless he requires it. With the field panniers now supplied most trivial cases can be dealt with. It should be remembered a picked strong mule must be given for the panniers, as they weigh a stone more than the usual mule load.

Shamming.

Surgical Assistance.

To recapitulate, then, a man falling severely wounded in battle is tended by the Medical Officer with his corps until the staff of the Bearer Column arrives. Field Dressings (Appendix D, clause 82, A. C. 1884) are issued to 10 per cent., of fighting men. These, with the other surgical materials at his disposal, are applied by the Medical Officer with corps, and in this he is assisted by Medical Officers attached to other corps of the same division, which are not engaged. When the staff of the Bearer Column arrives, the wounded man is

removed to the dressing-station, thence to the Field Hospital, which has been so placed as to preserve touch with the fighting line. The dressing station should be beyond the range of rifle fire, and the Field Hospital wide of Artillery distance. From the Field Hospital he is sent to the General Hospitals on the line of communication, thence to General Hospital at the base of operations, halting on his way, from time to time, at the Rest-Depôts.

Transport.

We now come to the all important subject of transport, and unless this is efficient, our Field Hospital Regulations are mere *Tabula rasa*. Two kinds of transport are allowed to the Hospital Service, *viz* :—Transport for material, and Ambulance or sick transport; oddly enough, and in curious contrast with what obtains at Home, neither kind of transport is under tho control of the Medical Officer ; but is administered and controlled by a distant Divisional or Brigade Transport Officer. This system is sure to lead to friction and consequent loss of efficiency in actual warfare. Even now, we have the confusion and ambiguity of the "Bearer Column" of the Transport Officer and the "Bearer Company" of the Medical Officer.

The whole aim of modern transport is to confide the necessary transport to commanders of corps-units, and to charge them with the responsibility for the mobility of

the corps. Why then should Field Hospitals, whose *raison d' être* altogether depends on mobility, be expected to succeed when failure seems unavoidable ?

The Medical Officer should command the Transport.

Whatever sophisms may be cited in favour of disuniting the Medical Officer in charge of a Field Hospital from his ordinary transport, he should, in common reason, have command and undisputed control of the Ambulance Transport, both animal and manual. Any one acquainted with the present plan, even in peace time, can see what little grip the Surgeon has over the ambulance, and, indeed, the same may be said of the absentee Transport Officer. The irregularity in payment of the men, and the confusion arising from so many possible masters is so deterrent, few good kahars can be induced to join, and those now entertained being chiefly employed in punkah-pulling, shifting Commissariat stores, tending Government gardens, and such like coolie work, have forgotten whatever they knew of sick bearer work. It may be said the "new hands" are not good, and the "good ones" are too old. The scheme for ambulance sanctioned (No. 1376, C $\frac{\text{Medical Department}}{\text{Ambulance.}}$) though complete enough in itself, is, in the writer's opinion, the play without Hamlet, and he thinks, no matter how elaborate and apparently perfect the plan may appear, if the Surgeon's authority is not paramount, the ambu-

lance will break down. He is convinced the system will snap and collapse when war is actually upon us; but fears it will be, unfortunately, then too late to improve it, and the shortcomings will be laid at the door of the Field Hospital arrangements; and Administrative and Executive Medical Officers will be blamed for a break-down which they foresee, but are powerless to prevent.

Ambulance.

Be this as it may, the field ambulance allowance is 5 per cent. on strength of Troops, and one per cent. on that of followers. This sick carriage is divided into dandie and animal carriage thus :—

Troops.		Followers.	
Dandie	3 per cent.	Dandie	½ per cent.
Animal	2 per cent.	Animal	½ per cent.

The camel.

The animal to be the one most suitable to the country, —the camel—has been chosen for Afghanistan. The camel is probably much inferior to mules, ponies, donkeys, or even pack-bullocks for sick-carriage, and any one who has seen a camel with his Kajawah carry a couple of sick men, must be struck by his stubborn ungainly gait, shaking the occupants with every step he takes, and making their giddy perch a most undesirable seat. When used they should be equipped with the

English cacolets and litters, and would be very useful on a desert march, such as an expedition through Nushki into Registan, to repel any attempt to turn our left flank by a march across the vast sandy plain extending from the Helmund towards Kelat.

Ambulance for Cavalry.

In modern warfare, Cavalry are frequently many days in advance of the main body of an army, and the question of ambulance for them, especially during forced marches, presents many difficulties. If the pace is slow, the dandie can keep up pretty well, but in rapid movements, such as those undertaken for the seizure of advantageous strategical positions, some speedier means must be adopted. As a rule, wounded troopers are brought on between two comrades, thus depriving the force of the services of two men in addition to the disabled one. Cacolets, carried by the galloway, known as the mounted infantry pattern, a strong, solid, little horse of about 14 hands, would, under ordinary circumstances, be able to keep pace with the cavalry, and if trained this class of animal could be used for litters. Usually the animal might be led by a man on foot, or, if greater speed was necessary, by a mounted man, or the driver could occupy the off cacolet or litter, only one patient being taken.

Camels could also be used in a similar manner for this service ; but their swinging gait would make the litter or cacolet far less comfortable travelling. The big mules in India are all taken up for Mountain Artillery and the small ones, 11 to 12 hands, would not be suitable for the English cacolet or litter. If, therefore, mules are to be used with mountain equipment in this country, a special class of animal is necessary.

Pad Animals

For Infantry, if carts cannot travel, the mule, the pony, the donkey, can be used as pad animals. Some of the donkeys about Quetta can carry as much as 16 or 17 stone : their small size, docility, and the readiness with which they find their own fodder render them very useful and suitable as sick carriage ; or litters of various kinds might be constructed, such as the one in use in Persia, which consists of a palanquin slung between two mules or ponies; a native charpoy with the legs up may be used across the back of a pad animal for conveying a man lying down.

Litters.

Carts.

However, there is a good cart-road all the way to Kandahar, and light service carts with mule transport, would be the best mode of conveyance for all but the seriously sick or wounded.

Dandie.

Broken limbs and serious cases will usually require carriage by hand, and the Lushai dandie with cover is

now authorised for Field Service. The usual number of bearers was four per dandie, but it is understood in future five will be supplied with each dandie in operations beyond the Indus. Two chagals are issued with each dandie, and it should be seen that they are filled with fresh water before starting ; and at the outset of a campaign it should be ascertained if they hold water. To make them effective, when new, they should be soaked in water and then greased. New puckal mussaks should be similarly treated.

The Carrier.

The wheeled carrier for the dandie would be of great service where the roads were tolerably good, and would, even over rough ground, be easier for sick men than dandies carried by inexpert bearers ; the carrier could only be used on the lines of communication, and should not follow a force into the field.

Kabul Kandahar March.

If possible, the transport, as well as the personnel and material of Field Hospitals should be kept together from the outset, and start by train as complete units. In his evidence before the Earl of Morley's Committee, Deputy Surgeon General Ekin, C.B., says :—"On the "march down from Kabul to Kandahar, we were much "more independent in this way : we had our Field "Hospitals equipped, we had our carriage entirely in the

"hands of our Medical Officers, and that carriage was "provided for us before we started." Thus equipped, they were able to provide ambulance transport, of some kind for the 800 or 900 sick brought into Kandahar.

At present the Hospital transport is not in the hands of the Medical Officers, and as it is feared, in view of the confusion, and on the plea of more pressing necessities elsewhere, it will be made up of all kinds of carriage, the following table gives their carrying powers—for Field Hospital purposes—expressed in lbs. and coolie loads.

Description of Carriage.	lbs.	Equivalent Expressed in Coolies.
Camel	320	As much as 8 coolies or 2 mules
Mule or Pony	160	As much as 4 coolies.
Pack Bullock	160	As much as 4 coolies.
Light Cart	480	As much as 12 coolies.
Army Transport Cart	960	As much as 24 coolies.
Donkey	120	As much as 3 coolies.
Coolie	40	

If a Field Hospital is supplied with different kinds of carriage, the mule would be the most moveable, coolies next, camels last. To ensure efficiency, all should be mules, and whatever description is issued, a per centage of spare animals should be sent, and it must be remembered mules and Banghy Burdars should be supplied for the field panniers and petarrahs, and the mules should be strong ones.

Spare Animals.

It is confidently hoped, 'ere long, the Hospital transport, both general and ambulance, will be as complete as that of a mountain battery—that it will be under the command and control of the Medical Officer, assisted by his Staff. The Medical Warrant Officer who takes the dandie parties into the field of action, would be the most appropriate man to have subordinate charge of the Kahars.

To apply, then, the foregoing principles to an Army Corps ordered to be mobilized for service in Beluchistan and Peshin. We have seen how the composition of the force may be altered ; and it may also be increased by the addition of a British Infantry Regiment to each Brigade, or six altogether, and by the addition or substitution of Mountain Artillery.

First Army Corps for Peshin warned last Spring.

The strength and composition of an Army Corps is settled by Government. For instance, the strength of the two Army Corps ordered to be mobilized last spring differed from one and other. The 1st Army Corps, which was evidently, from its composition, intended for an advance on Kandahar or farther, consisted of 27,841 Troops, *viz:* British, 12,425 ; and Native, 15,416 ; with 27,833 followers. The Hospital provision was 12 per cent. for fighting men, or 3,341 beds, and 3 per cent. for

followers ; and this accommodation, both for Troops and Followers, was divided into 5-12th Field and 7-12th General Hospitals. By calculations similar to those at page 4 we find 1392 beds were allotted to Field Hospitals, and 1948·9 for General Hospitals, but when we express the 1392 beds in Field Hospitals, we find there are 13 complete Field Hospitals and 92 beds over. As before stated, the lowest Field Hospital unit being 25 beds, this gives us then 13¾ Field Hospitals and 17 beds over, which, as in page 5 is added to the General Hospitals or 1965·9, or 1966, which was the actual General Hospital provision. So much for the Troops: now for the Followers. The 27,833 at 3 per cent. would give 834·9, they were allowed 835. This, divided into Field and General Hospitals in the proportion of 5-12th and 7-12th, would give 347·9 for Field, and 487·08 for General Hospitals. The 347·9 beds expressed in Field Hospitals would be 3 complete Field Hospitals and 47·9 beds over ; but as the lowest Field Hospital unit is 25 beds, the 47·9 beds are taken as 50, making 3½ Field Hospitals, and the two beds thus added are taken from the General Hospital beds, making the latter 485, or, all told, 17¼ Field Hospitals, or 1,725 beds, and 2,451 beds in General Hospitals for the 1st Army Corps.

In using the table at page 4, and referring to the Army Lists of the different Presidencies, the establishments of Corps will be found, and substitutions can be readily made ; but it must be borne in mind that native drivers of European Mountain Batteries are counted as fighting men, not followers.

From paras. 1, 2, and 42, Clause 82, A. C., 1884, it will be seen the whole hospital provision, as well as the proportion of Field to General Hospitals is, together with the position of the latter, settled by the responsible Officers of Government—for example, for the present war in Burma the Hospital provision was 10 per cent. on strength of troops, and 2 per cent. on strength of followers, and the proportion was 5-10th Field and 5-10th General Hospitals, and the General Hospitals to be established at Thayetmyo—enough has been said in the foregoing to indicate the different factors likely to be taken into account by them in fixing the composition of the force and Hospital provision.

Hospital Provision for Burma.

For the purposes of this paper we will suppose the Army Corps, whose strength and composition is given in page 4—and which in a measure may be taken as a prototype—has been ordered to be mobilized, that the hospital provision has been fixed at 12 per cent. for

Supposed Army Corps. Its Object.

Troops and 3 per cent. for followers, and that this accommodation has been divided into 4-12th Field and 8-12th General Hospitals, and the beds distributed as in page 7.

We will assume the object of the Force to be defensive generally, trusting to the Home Army making an attack on the Russian line by way of the Black Sea or elsewhere; and always being in a position not only to resist attack, but to meet the enemy when numbers and strategical stand-points were in its favor, and to follow him up when defeated:—we will further take it for granted the present Quetta force—but with its own hospital provision—would assist in keeping open the communications, and thus free as much of our Army Corps as would be sufficient to cling to the Khojak line with pertinacity, to offer a stubborn resistance to a Russian foe advancing from the Helmund through Kandahar, and to give battle in the open if necessary.

Appointments.

The Principal Medical Officer of such a force should be a strong and active man, and he should be consulted as to the appointments of the Principal Medical Officers of Divisions, and as far as practicable, the patronage of appointments to field and general hospitals should be placed in his hands, and his wishes as to Medical Staff appointments generally, complied with. Nothing is so

calculated to make the machine work evenly and smoothly as a thorough knowledge of all its component parts by the foreman. When Medical Officers know, and feel their advancement, their hopes of honors, and decorations and rewards depend on the word of the P. M. O., they are much more likely to render him that loyal and willing support without which success is unattainable.

General rules for administration will be found in paras. 22-27, Clause 82, A. C. 1884, and Appendix.

Paucity of Medical Officers.

A Principal Medical Officer for the Cavalry Division, as well as Administrative Staffs for the Base and Communication line would be most desirable, and it may be mentioned the number of Medical Officers in reserve in the Field Hospitals or on Field Service generally is inadequate, or so barely sufficient, that the least casualty causes men to be transferred from one kind of duty to another, just as they were becoming useful at their present posts, and it should be a golden rule of active service that no man should be moved from any hospital, post, or corps, unless for promotion, the good of the service, or at his own request.

Immediately the orders for mobilization are promulgated, all ranks and followers, both public and

Medical Examination.

private, should be medically examined, so that no man could accompany the force who is likely to fall sick and encumber the Army. The Medical Officer in charge of the Hospital where the men are treated, as well as the Medical Officer who will have permanent medical charge of the Corps, shonld be members of the Board, and it must be kept in mind that many healthy men are disinclined for service, and "weeds" frequently keen on going, but in neither case should their wishes be met.

Troops whence drawn.

The troops of our Army Corps would be drawn, for the most part, from Bengal, the Punjaub, and Frontier Force; but, doubtless, Bombay and Madras would send their quota.

14 and half Field Hospitals are ready for Service.

Now, there are in India exactly 14½ Field Hospitals already prepared for service, *viz.*, 4 British and 10½ Native, or the quantity required (page 13) for our Army Corps. Those on the Frontiers, 1 British and 3½ Native, are in every way complete for service; while the remainder, or those from Army Corps areas, have all the packages ready, and require only to be filled, and could, being on the lines of railway, be easily trained to Mach in the Bolan. With the exception of No. 3, British Left Division, at Rangoon, No. 11, Native, Eastern Frontier, and No. 13 Native, at Rangoon, all

the Field Hospitals would be at once available, and orders should be sent to Madras and Bombay for the despatch to Mach of their Field Hospitals.

Field Hospitals stored at Quetta.

The 2 Native and ½ British required to complete the 14½ Field Hospitals could be procured at Quetta, where it is understood 3 British and 3 Native Field Hospitals, got ready last May, are now stored, or these 6 Hospitals might be first requisitioned, the remaining 8½ being obtained from the Frontier and Army Corps areas. The Medical Officer in charge, assisted by the Warrant Officer in sub-charge, should at once take over the equipment, and, if possible, the transport, satisfying himself as to their completeness, reporting the same to the P. M. O. of the Army Corps.

No trouble about Field Hospitals.

There need, then, be no trouble or confusion in equipping our Army Corps with its 14½ Field Hospitals. Those required from the Quetta reserve should be pushed on to Chaman, where a strong force must be maintained, and one English and three Native Field Hospitals would be required there.

The Field Hospitals from India having been railed to Mach, should be moved on to Quetta, Peshin Fort, Sayad Hamid, Gulistan, and Killa Abdulla. Or, if the Troops derailed at Mach, were marched thence in

Brigades, the requisite complement of Field Hospitals should accompany them.

Similarly, if Troops marched up the Harnai route, by Brigades, the necessary Field Hospital accommodation for the Force, having been railed to Kilat-i-Kila, should march with its force to Peshin, by way of the Chappar Rift and Kach.

On the march, Field Hospitals, both British and Native should be close up to the column; and on no account must Regimental Baggage be permitted to forge ahead of them.

To train such an army corps to Mach would take some 30 days, and it would be well to have some way-side hospitals or Rest-depôts provided, and General Hospitals established before the arrival of the Army Corps. Unfortunately, the hot weather is the time of the year such an Army Corps would be put in motion, for the enemy could only begin his advance when the winter snows of Afghan-Turkistan had melted.

General Hospitals from the 3 Presidencies

The equipment for the General Hospitals required should be obtained from the three Presidencies, and it should be borne in mind that the scale is 100 beds European and 100 beds Natives, and that all General Hospitals, formed either at the base of operations, or in the field, or elsewhere must be equipped on this scale.

Indus River our Base.

The Indus line would be the natural base of such an Army Corps. All stores, munitions of war, men, materials, and food, should be derived from the east of this river, and in case of defeat it would be the position taken up by the Army for a further stand. From page 7 we saw the Army Corps should have 2,054 General Hospital beds for Troops and 701 for followers, or, if the followers be reduced to one per fighting man, 438 beds, or a total of 2,492 beds, and of this 2,492 beds, 690 would be reserved for British Troops, and the remaining 1,802 for Native Troops and Followers. The following table gives the position and number of beds of the different General Hospitals European and Native :—

General Hospitals.

The followers are treated in Sepoy's Hospitals.

	2,492 Beds.		
	B. 690	N. 1,364	F. 438
Lahore	150	250	100
Kurachi	100	150	50
Ruk Junction	..	200	100
Mach	50	100	..
Quetta	280	464	188
Kilat-i-Kila	..	100	..
Sharg	50	..	..
Sayad Hamid	60	100	..
Totals ...	690	1,364	438

Lahore Hospitals.

The Hospitals at Lahore would be used by the Bengal Troops and their followers, and from there,

British soldiers could be sent to the different sanitaria of the Himalayas—those belonging to the Punjaub being sent North to Murree, &c., and others to Dagshai, Kasauli, Landour, &c. The Sepoys despatched by rail to their depôts or homes, and the followers to their homes.

Kurachi Hospitals.

The hospitals at Kurachi would be available for British Troops invalided to England; and for British and Native Troops of the Madras and Bombay Armies.

Hospital at Ruk Junction.

The hospital at Ruk Junction would be for natives only, and here the Sepoys and followers of the Bengal Troops proceeding north to Lahore, could be separated from those of Madras and Bombay *via* Kurachi.

Hospitals at Mach.

The Hospitals at Mach would be for the convenience of Troops embarking or detraining there.

Quetta Hospitals.

The Quetta Hospitals would be for the reception of sick and wounded from the army of observation in Peshin. The Hospital at Kilat-i-Kila for natives only, would admit men going up and down the Harnai Line, and the British General Hospital at Sharg would do the same for Europeans.

Reinforcements in by Bolan. Sick out by Harnai.

If there was much press in the Bolan, in consequence of the hurrying up of reinforcements or supplies, the Harnai route could be used, for the sick returning

to the Indus, thus establishing an "in" and "out:" under such circumstances, the Hospitals at Sharg and Kilat-i-Kila would be very handy.

Hospitals for the Chaman Force.

The small Hospitals at Sayad Hamid would afford rest, shelter, and comfort to the sick of the Chaman Force, after the trials of their return journey over the Khojak. They should, however, be passed quickly back to Quetta. The Quetta Hospitals should be in buildings, and, indeed, the same may be said of the others. When buildings are not available, hastily-constructed huts of sleepers, railway iron, and mud, would be preferable to E. P. tents.

Diets.

The Hospitals at Lahore and Kurachi could be fully dieted; but at the others there should be only two or three diets to choose from. Milk, Low, and Full would answer very well; any other articles required should be made up from Medical comforts or extras. An ample supply of peptonized cocoa and milk for cases of enteric fever, and dysentery should be available.

Rest-depots

Along the line of railway, the cantonment hospitals at Mooltan, Sukkur, and the like, should be utilized as Rest-depôts when required, and it would be well to organize sanitary trains for the accommodation of sick convoys. Similarly, Rest-depôts should be formed along

the Harnai and Bolan routes, and between Gharkai and Killa Abdulla ; and between the latter place and Quetta.

Sanitation.

General rules for sanitary guidance in the Field will be found in the Bengal Medical Regulations, Sec. 17, paras. 60-82. The Medical Officers with corps-units are sanitary officers to the corps, and one of the Medical Officers of each Brigade should be nominated for charge of the Brigade Staff, and be directed to look after the sanitation of the Brigade. The Staff Surgeon of each Division would, under the P. M. O. of the Division, act as sanitary officer ; and the P. M. O. of the Army Corps should be assisted in sanitary duties by a special Medical Officer ; but it must be understood, the P. M. O. of the Army Corps is himself the sanitary officer, and the others only his assistants ; and the rule is that the senior Medical Officer on the spot is the sanitary officer.

Scurvy.

In consequence of the barrenness of Afghanistan, and the scarcity of vegetables, scurvy is very common, and so is scorbutic dysentery. Lime Juice should be

Amchur.

issued to Europeans and Amchur to the natives. This latter, as its name implies, consists of peeled mangoes. The green mangoes are peeled, the stones removed, and the cut pulp is sun-dried. 67 grains of Amchur contains 10 grs. of Citric and Malic acids, and are therefore equal to one ounce of Lime Juice. The Amchur is

used as a condiment, and can be substituted for Lime Juice when scurvy is present. In the writer's opinion, either of these anti-scorbutics should form a part of the daily ration in the field. It is the only way to prevent scurvy, and it should be borne in mind the inception of this and its allied diseases is frequently very obscure.

It is usual to issue a meat ration at least once a week to Native soldiers and no doubt it is very beneficial. It may be added, too, that on Field Service, the native frequently sees the necessity of abandoning some of his prejudices about food, and under the name of medicine, will take anything, from rum to extractum carnis when sick.

Europeans and Natives were treated in No. 3 Field Hospital.

No. 3 Field Hospital, of which the writer had charge during the last war, was partly European and partly Native, and he found no difficulty in the management of them with regard to food. One precaution he would advise, *viz* : that great care should be taken to keep the arms and ammunition separate ; there is not much likelihood of there being a mistake about the arms, but the Boxer cartridges in paper are not unlike the Martini-Henry, and he has seen the substitution of one for the other. Rest-depôts should invariably accommodate Natives as well as Europeans. They can be kept a little apart; but a Medical Subordinate, and a Hospital

Ammunition

Assistant should be allotted to each ; then one Medical Officer could readily manage all.

Suakin Memoranda.

As the limits of this paper will not allow anything like a detailed description of the chief diseases likely to arise on Field Service in Beluchistan and Peshin ; nor yet the best mode of their prevention and cure, the writer takes the liberty of referring to the Director General, Sir Thomas Crawford's Memoranda for the Suakin Force, A. M. D. Report, 1883. It treats of antiseptics, sanitation, wounds, diseases, and disinfectants, and everything said in that article will, *mutatis mutandis*, apply with equal force to campaigning in Afghanistan.

In dealing with the Hospitals of an Indian Army Corps, it will be best, for a time, to altogether abstract, in the logical sense, the difference in race ; for, as far as hospital provision is concerned, they are alike, and thus viewed, there is but little difference between the Home and Indian regulations.

Tools for improvising.

With respect to Field Hospital equipment, the carpenter's tools should belong to the Hospital, and not to the carpenter. By the time the carpenter joins the hospital he has either lost or sold most of his tools. It would be easy to select suitable ones from the stock of any good native tradesman ; and such tools as tinker's

scissors, drills, triangular files, punch with matrix and wire cutter would be found very handy in improvising hospital appliances. Each Field Hospital should also be supplied with some native reaping hooks, called "Darati;" they would be very useful in clearing the ground for encampments and other purposes.

Kerosine Oil Can.

The empty kerosine oil tin, writer found most useful. It is only necessary to set fire to the few remaining drops of oil in it, wash it out, and it can be used for boiling water ; and being so thin it is peculiarly adapted for this purpose in a country where firewood is so scarce. A board with a hole in it, placed over the tin makes an excellent commode, which article is most necessary in a country where, in addition to camp diarrhœa, the drinking water is, in many cases, purgative.

The tin makes an excellent filter ; cut into strips can be used for splints ; opened along the length it makes a good water-trough for surgical cases ; in fact, it would be endless to enumerate all the uses it can be put to. No other can is so serviceable.

Broken bamboo poles of tents make good water pipes, rails and sleepers good huts, "boosa" good beds, and many other articles might be mentioned which

come in handy, and on this subject of "improvisation" reference should be made to Appendix VI., A. M. D. Report, 1883.

Returns.

No matter what efforts are made to keep down correspondence and returns, there will always be a considerable quantity of both. Unfortunately the writers supplied from Corps are usually very bad, and the Medical Officer has to do most of the office work himself. Junior Medical Subordinates, with a small Staff Salary, could do the work efficiently, in addition to their own; and a typograph for issuing orders, when several copies are required, would be very useful to Principal Medical Officers.

Having settled, then, the number, position, and sources of supply of our General Hospitals, it now only remains to be said where our Field Hospitals should be placed. As before stated, they must preserve touch with the Brigades or Divisions with which they are associated. Buildings, if available near the scene of action, should be utilized, especially when the Hospitals become immoveable, and in order to foresee where Field Hospitals are likely to be wanted, and be in a position to anticipate the possible hospital requirements of different developments; the Principal Medical Officers should have clear conceptions of the nature, scope, and object of the operations likely to be undertaken, and they

Importance of Strategic Knowledge.

should not only make themselves acquainted with the medical-topography of the country; but should also study it from a strategical point of view.

Their calculations and designs would be more perfect and intelligent by the knowledge: that for the defence of the Khwaja-Amran range it would be necessary to have a large force at Chaman; that the Khojak, the Roghani, and the Gwajha defiles would have to be guarded; that the main body of the Army Corps would be drawn up on the Gulistan-Killa Abdulla line for battle, and in the event of the enemy forcing the range, and on his emerging from "The dark shadow "yonder that marks the pass mouth," would be ready to fall on him in flank; that in case of defeat we would retreat on our supports at Quetta, by way of the main road over Ghazarband Pass, and that retirement would also be possible across the plain of Peshin to Kach and down the Harnai line; and that if the conflict at the foot of the mountains resulted in our favour; and the enemy thrown back on his stores, guns, and baggage, retreated in disorder on Kandahar, it would be our duty to follow him up with vigour and crown our victory.

SIR THOMAS LONGMORE

ON

AMBULANCE TRANSPORT.

SIR THOMAS LONGMORE

ON

AMBULANCE TRANSPORT.

[*Reprinted from* THE PIONEER *of 20th May* 1894]

THIS *Manual of Ambulance Transport*,* by the veteran Sir Thomas Longmore, is a most interesting book. In India it is customary with natives to date events as having happened so many years before, or after, the Mutiny, so we congratulate this eminent medical officer, who served through the Crimean War, in surviving to publish another edition of his important work thirty nine years after the beginning of that war.

He and his confrères, aided by Mr. Sidney Herbert, the Minister of War, and Miss Florence Nightingale, by their unwearied exertions induced the British public to take an interest in the sick and wounded in war, so that now ambulance classes are popular institutions all over the United Kingdom.

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* *A Manual of Ambulance Transport* By Surgeon General Sir Thomas Longmore, Honorary Surgeon to the Queen. Second edition, 1893, edited by Surgeon-Captain W. A. Morris, A. M. S., pp. 453, Library 8vo., with nearly 200 illustrations. Printed for H. M. Stationery Office by Harrison and Sons, St. Martin's Lane, London. (1st edition published in 1869.)

Sir Thomas exclaims against the misuse of the term "ambulance" by the English, who persist in bestowing this name upon any vehicle which carries an invalid, whereas on the Continent all other European nations understand an "ambulance" to mean a temporary hospital, with all its equipment, "both in *materiel* and *personnel*."

The first edition of this book was also the first attempt to give systematic information and instruction on field hospitals and invalid transport, so the author feels a pardonable pride in observing that all the Continental manuals on the subject have been obviously founded on his work. Many generations of students at Netley remember Surgeon-General Longmore's lectures, and though he is now enjoying his well-earned retirement, wearing the laurels of an "Honorary Surgeon to the Queen," he is still assiduously working for the benefit of the sick and wounded, wisely associating with himself in his beneficent undertaking all the assistants he can procure. These include the Director-General of the Army Medical Staff, Sir William Mackinnon, who is affectionately known as "Jock" by all his admirers, from the Commander-in Chief downwards, and who has obtained sanction for this book being published as an official manual; also several officers in the executive ranks of the Medical Staff, assisted by their wives, who very kindly contribute sixty new sketches, taken in various parts of the world,

which form, as the editor says, "an artistic and important feature in illustrating the text." And last, not least, important contributions are made by Mr. John Furley, of the St. John's Ambulance Association, whose great experience in duty with Red Cross Societies in peace and war gives authority to this work, yet without any inherent professional bias, since he is a civilian pure and simple, being neither a soldier nor a medical man. His chapter on the Geneva Convention is very interesting, and he is a most welcome ally of the hard-working doctors and soldiers, for, though a civilian volunteer, his concluding paragraphs insist on the paramount importance of subjecting all the Red Cross Societies, military hospitals and ambulances in time of war to military discipline. He even says it is better to have absolute obedience with inefficient means, than the greatest wealth of means without control.

This is a most important testimony in favour of the opinions of those medical officers who are continually urging the necessity of exercising the medical corps at the autumn manœuvres, with tents, wagons, horses, carts, stretchers, panniers, &c., as practice for the exigencies of field service. This practice is already ordered by the Continental Powers every year in the most business-like manner, ambulance depots being established in towns corresponding with the territorial divisions of the army. But while these Powers

encourage the Red Cross Societies, these amateurs are in war restricted to the lines of communications, only being allowed to send to the front delegates to distribute gifts, and to bring back the sick and wounded, rooms at railway stations being reserved for their use.

This is a tacit reproach to us, for both at home and in India the railway refreshment rooms and waiting-rooms are far inferior to those of the Continent, while the only reserved accommodation is for the police and the thieves whom they are expected to catch. Mr. Furley says—and those who remember the remarks in the papers during Lord Wolseley's campaign in Egypt against Arabi Pasha will recognise the justice of his remarks—"unwise and unfair criticism is made on the medical staff, angry letters appear in the papers, though it is impossible in war to make such perfect arrangements in a temporary hospital as will satisfy newspaper critics, but there is no limit to what may be done in this direction by proper and intelligent preparation and organisation in time of peace, when it is easy to define the position which a Red Cross Society should occupy in war, but experience has proved what a hopeless task this is during the turmoil and agony of a campaign, and to what waste and extravagance an absence of system inevitably leads."

Mr. Furley details how all the Red Cross Societies in Continental countries are affiliated to the

Central Committee in each nation, and says that besides this in Austria-Hungary two ancient orders of nobility devote their personal efforts and private wealth to the same organisation. The "Teutonic Order" provides for field service forty-three columns, corresponding with the territorial divisions of the army. Each column consists of three ambulance carriages, one cooking wagon, and one fourgon (van), all completely fitted for a campaign. The "Maltese Order" provides six complete railway hospital trains, each composed of sixteen carriages, fitted with every requisite and comfort. All these supplement the army equipment, and are ready to be despatched with the army at a moment's notice. In Russia the work of the Red Cross Society is "on a magnificent scale." In Italy the National Society has a "committee at each of the twelve towns occupied by the head-quarters of an army corps, and has adopted for its various sections the same territorial division as those of the army."

"Even in Turkey, where the Red Crescent has been substituted for the Geneva Badge, the latter has been recognised for all practical purposes, and in 1877-78 at least 30,000 sufferers felt the benefit of the protection.

"To be entitled to this protection an ambuance must provide beds for at least six patients;" but the Geneva Convention, Article 5, says "any wounded man entertained in a house shall be

considered as a protection thereto," and "any inhabitant who shall have entertained wounded men in his house shall be exempted from the quartering of troops, as well as from a part of the contributions of war which may be imposed."

Unfortunately the Geneva brassard, a white band round the arm, bearing a red cross, has had its privileges abused, and as the wearers are held by the Geneva Convention to be neutral in war, some unscrupulous people have worn it for purposes of trade, espionage and pillage, so that efforts should be made by all the Powers which signed the Convention to protect the badge from this pollution, or no doubt some States will withdraw from the treaty.

Great Britain is one of the worst offenders in this respect, for "in August 1870 the so-called Irish ambulance, composed of about 300 men, landed at Havre in a body, to the great astonishment of the inhabitants. When next heard of, these men were assisting at the defence of Châteaudun, having discarded the neutral badge."

"Surgical appliances, and all kinds of useful and useless things bear the same sign," and at the Brussels Exhibition of Hygiene in 1876 the writer felt quite ashamed of his country, for the British section was full of so-and-so's patent soap, patent corsets, patent toilet paper, &c.—No wonder we are called a nation of shop-keepers! The only thing connected with an ambulance was one wagon sent over in charge of a commissionaire who could not speak a word of any

language but English, and who neither knew nor cared anything about any hospital appliance. The worthy man said he was in charge of Government property, but only a month previously he had taken his pension, and he found the sudden change from being Sergeant-Major of the Carbiniers, to sentry over an old wagon without any horses, so trying that he yawned all day, and would be very glad when the show was over.

This exhibition was full of the most useful and ingenious inventions for saving life and relieving pain, from all countries, even from Norway, a poor nation with a sparse population. Austria and Prussia are not rich compared with the United Kingdom, yet each of these nations had provided an *annexe* as big as a good sized railway station, in which was a complete hospital train full of life-size dummy figures, showing how every conceivable injury could be treated. Each train had a kitchen-carriage, and a comfortable saloon-carriage for the medical staff, furnished with every professional necessary, even with books, and large coloured plates to refresh the memory with details of anatomy. Compare this organisation with our happy-go-lucky want of system at home. At page 375 the author says: "A carriage was made in 1870, like a saloon carriage, with eight bunks, which performed its work efficiently, and in 1885-6 a second carriage

was added, arranged in a similar manner, except that there was no stove or sanitary appliance." No mention is made anywhere of any subsequent addition to these two vehicles, so it seems that the wealthiest nation in the world is not ashamed of having accommodation for only sixteen sick soldiers on all its railways at home. The author mentions that the manager of the London and North-Western Railway says that "if ever the emergency should arise we should be found equal to it"—yes, after the "Battle of Dorking," we suppose.

The Russians and the Americans have had excellent ambulance trains for years, but we are not aware that either of these great nations is in any danger of an invasion. The author says the Russian General Zavodovsky has devised the best and cheapest system of conveying wounded soldiers by railway, their stretchers being suspended by ropes as shown in his diagrams Nos. 159 to 164, so it is satisfactory to know the Government of India have adopted it, on the report of General H. R. Browne's Committee, at Agra in January 1877, on railway transport for guns, stores and invalids. Quite recently, after the Railway Conference at Simla, in September 1893, the Director-General of Railways issued a circular to every Railway in India, with working drawings of Dr. Temple Wright's spring stretcher, so that the public, as well as the soldiers, may travel in safety and comfort in India. But Great

Britain is still incorrigibly indifferent to the comfort of its sick and wounded, for when an international competition was held at Rome in October and November 1893 for improved ambulance vehicles, she sent absolutely nothing, being content to be represented by contributions from India, sent by officers as private individuals. The *British Medical Journal*, of 2nd December 1893, p. 1246, said these were unnoticed by the Committee, as there was no one to look after them, though they had been used on service. As usual, "*les absents ont toujours tort.*" If she had condescended to compete, no doubt she could have sent something excellent, for Sir Thomas mentions that in the Franco-German war Government allowed the Red Cross Society to buy some ambulance wagons from its arsenals, and they were all shipped in pieces, but were all put together and despatched ready for work in five hours after landing in France. They were used there continually all through the severe winter 1870-71, and at the end of the war they returned to England in such good condition that Government bought some of them back again for its own use.

Transport of all sorts is universally admitted to be one of the most difficult subjects of military administration, especially for Indian wars, and it is very graphically described by Captain F. C. Carter, Northumberland Fusiliers, in the *Journal of the United Service Institution of India* for October

1893, in his diagram C, showing the system of transport by sections in the plains and hills. He assumes that stores, &c., will be sent by railway to the foot of the hills, then for section 1, over moderate hills, plains camels can be used; for section 2, a plateau, a light 2-feet railway ; for section 3, rugged hills, hill-bred camels, able to stand cold ; for section 4, another plateau, the light railway again, or a ropeway ; for section 5, more rugged hills, mules ; for section 6, khuds, coolies. All Captain Carter's sketches are most graphic, and we should like to see his net hammock stretcher tried, as it weighs only 3½lb., and a patient is not so liable to be rolled out of it as out of a dandy. The Government of India is evidently in earnest about improving its transport, for it has just spent £2,000 in prizes for improved transport carts, while its ambulance carts are now far better than they ever were before, the tonga having a wonderful faculty of being adapted to circumstances. Those who have seen the models of the new transport carts, however, do not consider them much better than those which we have in use at present, and if that is all that can be produced at a competition open to the whole world, they think Government might have got more for its money by trying experimentally, in full sized carts, all the improvements submitted to it by its own officials. We believe the first prize was won by an ordnance official, who knew what was really wanted in a cart to stand the wear and tear of field service.

The chief novelties seem to be (*a*) a wheel adaptable to either side of the cart ; and (*b*) a hook like a corkscrew for fastening the swingle-tree to the staple on the cart. A condition of the competition was that the cart should be made entirely of metal. We believe this to be a mistake, for in the extreme vicissitudes of temperature and climate for which Indian warfare is remarkable carts made entirely of iron are bound to be destroyed in many ways unexpected by those who have to use them, especially in the wheels. Moreover, wheels made entirely of iron make a most awful noise. Why not try celluloid, if the well-known sheeshum wood is to go out of fashion? Wheels and shafts are the weak points of all carts, and it is a mistake to try to make the poles of the new carts available both for mules and for bullocks—mules are so expensive that they must always be far fewer than bullocks, so the carts might be capable of having mule poles or bullock poles adapted, but we think if a pole is to be altered to serve sometimes for mules and sometimes for bullocks, it will be so full of jims as to be weakened, and to give way, so that it can be used for neither mules nor bullocks. Considering the amazing loads carried by ekkas in the Punjab, we think it strange that Government has never had any experiments tried with an improved Punjab ekka, warranted not to jingle. The dangerous zone of musketry has now so much increased

since the introduction of magazine rifles and more destructive bullets, that it seems highly desirable to have large numbers of light cheap vehicles to bring up ammunition to the front, and to carry off wounded men when they return for fresh cartridges. If the ekka pony were killed, he is only one animal, as the name implies, and though very hardy and strong, he is much cheaper than a mule.

The various arsenals are very interesting, and the officials in charge are very polite in explaining the specimens, but unfortunately they are widely scattered, so that it is difficult to visit them. Cawnpore is a very central station, through which great numbers of officers pass, either on the march, or on transfer. It already contains the harness factory, and the boot factory, both of them full of information for practical soldiers. Might we venture to suggest to Government that it would be well worth while to provide the harness factory with a godown to display specimens, models and drawings or photographs of all sorts of kit, gear, carts, doolies, &c., so that any one who thought of any improvement might easily see there if he had been anticipated, or not? Sir Thomas Longmore's Manual has numerous descriptions of doolies, carts, kajawahs, &c., which are said to be very good and better than those in vogue, but which have never been brought into use, though recommended by distinguished officers.

Gutta cavat lapidem non vi, sed sæpe cadendo and all Government officials are so over-worked that they have literally no time to attend to anything but the current work of each day. But it is impossible to ascertain what invention is fit for actual use until it is tried on field service, or at camps of exercise; if no active service is in progress, so inventors should keep on shouting to attract attention.

It seems curious that Sir Thomas Longmore should say nothing about the Afghan war of 1878—81, though the Army Medical Reports have plenty of interesting information about it. Nay, more, though Paris is so close to England he says nothing about the last French Surgical Congress, though this is fully described in the Army Medical Report for 1891, published in 1893, the same year as this edition of his Manual. The French are richer than the Russians, so they have contrived a system which may be briefly denoted the "tube and spring cage" system for transporting wounded soldiers more comfortably in goods wagons than by Zavodovsky's system. To understand how difficult it must have been to contrive this cage, which is built up piece-meal inside the goods wagons, it may be mentioned that no less than six people have put their names to it as its joint-inventors! To our mind this seems a strong reason for trying the experiment of the Military Service Museum above mentioned at Cawnpore—"the Manchester

of India"—where the most skilful workmen are already congregated. Dr. S. C. Amesbury, of Roorkee, Brigade-Surgeon-Lieutenant-Colonel, I. M. S., retired, has kindly allowed us to see the drawings of his patent dandy which he sent to Rome, and we do not wonder at the regrets expressed by the *British Medical Journal*. The invention is highly ingenious, and certainly ought to be tried. He does not mention the precise weight, but says a mule could easily carry four dandies complete, poles and all. He divides the pole in the middle, and holds the two parts together in a socket, just as we see in the case of a tent pole. The pole is provided with two springs from which a hammock dandy is suspended by clews. It is kept open at each end by these and by short rods, as shown in Captain Carter's sketch. In the hammock lies a strong water-proof canvas, which can be used as a *tente d'abri* for the patient, or as a wrapper in which dandy and poles can be strapped together. The springs can be adapted also to a tonga-pole or to an ordinary dooley or palki.

It is high time that some serious step should be taken for the comfort of the sick and wounded in war, especially mountain warfare on the frontier, in which the Indian army is so often engaged. Officers in India have shown how this can be done safely and economically, so it is the business of the press to remind the State of its duty towards its defenders. Sir Henry Holland,

the great physician who was renowned for his extensive travels every year in his autumn holiday, says in his *Recollections of Past Life*, that he saw the sick and wounded in Spain after the great battle of Vittoria, and remarks—"No spectacle is more painful than that of the carriage of the wounded, the sick, and the dying, in the midst of a campaign. It is the blackest page of war. The triumphs of the battlefield are all dimmed in looking at this inevitable sequel. It is needful to have seen it to comprehend it, for official despatches and history tell but little of the reality." There are plenty of officers in India who have seen this reality, and they can say that the sick-carriage in the Afghan war of 1878—81 was no better than in the Peninsular War thus related. Are British soldiers really to wait till after another big war for England to do her duty by them ?

This Review has been reprinted by the author on his retirement and distributed to Heads of Departments, &c., with the following letter to the Quarter-Master-General :—

[P. T. O.

FROM

BRIGADE-SURGEON-LIEUT.-COLONEL
R. TEMPLE WRIGHT, *M.D., F.R.C.S.*

To

MAJOR-GENERAL E. STEDMAN, *C. B.,*
Quarter-Master-General in India, Simla.

SHAHJAHANPUR, *N.-W. P.,*
31*st May*, 1894.

Sir,—In continuation of my letter to you of November 28th, 1893, I have the honour to submit herewith a reprint of a Review in the *Pioneer* of May 20th, 1894, which I wrote upon SIR THOMAS LONGMORE'S book on ambulance vehicles.

You will see by this that the most thoughtful officers in the service are always contriving improvements in transport, so I would respectfully press on your attention the suggestion to make a sort of museum at Cawnpore in the Government Harness Factory for their information and guidance.

I gratefully recognise the improvements which are being made in transport by Government, but as India is now suffering unprecedented calamities by the depreciation of silver, over which Government has no control whatever, it is the duty of all loyal subjects to report how these calamities may be mitigated.

The present ambulance-tonga is the best cart we have yet had for the sick and wounded, but it is expensive, costing Rs. 800, excluding the cost

of the bullocks, so I write now to invite your attention to a comfortable tonga which I discovered here, after writing the Review, and which costs only Rs. 100, while the bullocks in it cost only Rs. 100 the pair, and to assure you it would do remarkably well for the native army, as I have tried it myself, and with the sepoys of my jail guard, all of whom are old soldiers with medals, *i.e.*, who have had field service.

It was invented for his own use by a sporting zemindar here, named SYED KHURSHED ALI MIR, *of Mohalla Kukkra, Shahjahanpur*, and it is very comfortable, both on metalled roads and when going across country. The annexed photographs, size 5″ × 4,″ kindly taken by CAPTAIN E. L. MACALESTER, OF ROSA, in the Rohilkhand Rifle Volunteers, give a good idea of the general appearance of the tonga and bullocks, "*choti zat ki buddia*," *i.e.*, trotting bullocks, which go three miles an hour at a walk and six miles an hour at a trot.

The following are the weights and measures :—

Weight of cart = 9 maunds 5 seers.

Weight of two bullocks = 18 maunds.

Bullocks = 5 feet 8 inches long, and 4 feet 6 inches high.

Height of wheels = 4 feet 3 inches.

Track of do. = 4 feet 6 inches.

Height from ground to floor of cart=2 feet 6 inches.

Ditto to ridge-pole at rear of cart=7 feet.

Floor of cart=4 feet wide at rear, 3½ feet at front.

Do. =6½ feet long, and it is covered with a mattress of tât, containing bhoosa 6 inches thick.

Length of cart and pole=11 feet.

The local name for the cart is LEHROO, and it has a split pole on which the driver sits. Between the two halves is a box full of all sorts of convenient appliances.

If this is good enough for a SPORTING RAIS in peace, it is good enough for NATIVE SOLDIERS in war, and all my sepoys agreed with me that it is much better than anything we had in the Afghan war.

The top is much better made than in most country carts; and if you would like to have one tried experimentally, the SYED would be proud to get one made for you.

The whole vehicle is very simple, as the photographs show, but its details are better than in common country carts, yet it is quite capable of being fitted with the *Milver spring stretcher*, which, *I repeat*, is intended *only for bad cases*, and which is already in use for invalids on the Madras Railway.

You and I, Sir, know very well our army is absurdly small for the work which it has to do, so we cannot afford to lose a single man unnecessarily.

The British public will probably never discover this till after "the battle of Dorking," so we must do what we can to save life. I have already long ago reported officially that the sick and wounded are unduly depressed in spirits by the defective transport accommodation on field service beyond the reach of railways, and I feel morally certain that if they know they will have comfortable ambulance carts to convey them from the battle-field to the rail head, their spirits will be raised, and they will improve on every day's march, instead of dying at every stage, as they did in the Afghan war.

I am now about to retire on pension, and when I have left the service I will see if I can rouse the British public to a sense of its duty towards its patient and loyal defenders, whom it now neglects so shamefully in the matter of sick-transport, compared with other civilised nations.

I have, &c.,

R. TEMPLE WRIGHT,

Brigade-Surgeon-Lieutenant-Colonel.

PIONEER PRESS, ALLAHABAD
N.-W. P.—INDIA.

Library Table. From the Writer.

REMARKS ON THE MICRO-ORGANISMS PRESENT IN AIR.

BY

A. M. DAVIES, D.P.H. CAMB.,

ASSISTANT PROFESSOR OF HYGIENE, ARMY MEDICAL SCHOOL.

LEICESTER:

REPRINTED FROM THE "PROVINCIAL MEDICAL JOURNAL," JULY, 1891.

REMARKS ON THE MICRO-ORGANISMS PRESENT IN AIR.[1]

By A. M. Davies, D.P.H. Camb.,

ASSISTANT PROFESSOR OF HYGIENE, ARMY MEDICAL SCHOOL.

That the minute organisms, which we call by the general name of *bacteria*, are present to a greater or less extent in the air we habitually breathe, has been known now for many years. Pasteur, in France, and Angus Smith, in this country, were among the first to study the question; but the greatest impulse to successful research was afforded by Koch's invention of the method of cultivation in solid nutrient media, such as gelatine. By this method we have learnt a good deal as to the bacterial population of the atmosphere, although at present even the best informed admit that they are only touching the fringe of the subject.

The researches of Professor Tyndall demonstrated the presence of germs in the air of all ordinary situations. He was engaged in experiments on the decomposition of vapours by light, and it was necessary that "the space containing the vapours should embrace no visible thing—that no substance capable of scattering light in the slightest sensible degree should, at the outset of an experiment, be found in the wide 'experimental tube' in which the vapour was enclosed." For a long time he was troubled by the appearance there of floating matter, which, though invisible in diffused daylight, was at once revealed by a condensed beam of light. He found that air might be drawn through sulphuric acid and through a strong solution of caustic potash, being thereby deprived of its moisture and carbonic acid, and yet contain a considerable amount of suspended matter. He then caused the air to pass through a red-hot platinum tube, and across folds of red-hot platinum gauze, the result being that the air thus treated became, as he called it, *optically empty;* the floating matter had been burnt, and had totally disappeared, it was therefore organic.

The next point was to show that this floating dust in the atmosphere was not only organic, but was composed of, or at any rate contained, living germs. It is not necessary to

[1] Read before the Southampton Medical Society.

describe the laborious series of experiments conducted by him: it is sufficient to mention that he proved that various organic infusions, as of meat, turnip, hay and the like, when exposed to the air invariably became turbid, with a development of enormous numbers of living micro-organisms; but if the same infusions were exposed to air that had been rendered "optically empty," or had been efficiently filtered through cotton-wool, there would be no turbidity, no decomposition, no occurrence of bacterial growth.

The conclusion is that the ordinary dust of the air, invisible under ordinary circumstances, but rendered visible by a ray of sunlight, and still more by an electric beam, contains multitudes of organic particles, which are living, and capable of propagating themselves in enormous numbers when finding a suitable *nidus*.

The presence of bacteria has been demonstrated in all kinds of situations. The atmosphere at sea, in the middle of the ocean, may be conceived as being in the purest condition possible as regards freedom from organic and organised matter. And so it is with regard to bacteria; yet, in observations by Miquel at the Paris Observatory, on samples of air brought from Mid-Atlantic and the Mediterranean, from four to six germs have been found in ten cubic mètres, that is about 350 cubic feet. In air taken nearer to the coast, within 100 kilomètres (= sixty-two miles), from six to forty-five germs were found in each cubic mètre, according as the wind was blowing from the sea or from the shore. The almost absolute freedom of sea air from germs is, of course, easily explained: there is no source of supply, because they are not given off into the air from a moist or wet surface, and any that do get blown out to sea in course of time sink down and are swallowed up beneath its surface, never more to return into the air. An exception to this rule takes place in stormy weather, when the water is blown about in fine spray, and so distributes germs through the atmosphere.

Next to sea air, or even rivalling it in purity, is the air of great elevations. Yet here, also, some bacteria have been found to be present; about one per cubic mètre, according to Miquel, who examined samples from Swiss mountains, including the Eiger, the Schilthorn, the Aletsch Glacier, and others, at heights of from 6,000 to 12,000 feet.

The effect of elevation is to lessen the number of bacteria, even when the elevation is to a comparatively trifling extent. Thus, while Miquel found in the park at Montsouris 480 colonies of germs per cubic mètre, at the summit of the Pantheon not more than 200 were present, the height of the latter being 270 feet above the ground. In towns the numbers found have varied very greatly: in a cubic mètre of Berlin air in January Hesse found only 200; in the Rue de Rivoli in Paris Miquel found 3,500; while Frankland found 4,700 in St. Paul's Churchyard in November. In Dundee the average of a series of observations gave 800 per mètre.

The air of enclosed spaces would naturally be expected to contain more organisms than the air outside, and this has been shown to be the case in very many instances. In Paris, in a newly-built house, Miquel found 4,500 in a cubic metre; in an old house as many as 36,000; while in the Hôtel Dieu he found 40,000; and in another hospital 79,000 germs, or more than forty in every thirty cubic inches of air, the ordinary amount breathed in each inspiration. In Berlin, Hesse has made corresponding observations, finding 2,000 to 6,000 in dwelling rooms and 35,000 in a class room at the termination of a lecture. In this country the late Professor Carnelley and Messrs. Haldane and Anderson, at Dundee, have made a long series of experiments on the air of dwelling rooms and schools. They found an enormously larger number in old houses, crowded and occupied by the poor, than in houses of fairly good class, occupied by people in comfortable circumstances. Thus while in houses of four rooms and upwards the air contained, on an average, nine organisms per litre (or 9,000 per cubic metre), in one-roomed houses the average was sixty per litre. In schools ventilated by mechanical means the average was 16; in those only ventilated by natural means 150 per litre; in one case there were 600 organisms per litre (61 inches), or 300 in each thirty inches of tidal air breathed!

The number present in the air normally, if one may so say, or in fairly open spaces, is subject to variation, of which the laws are beginning to be made out. The influence of the season is marked, and a great part of this influence is probably due to change of temperature. They are most numerous in summer, in the autumn the numbers

decline, they become still lower during the winter, but with the commencement of spring begin to increase. During the day even a regular variation appears to exist. At eight in the morning and seven in the evening the numbers are greatest, and they are least at two in the morning and two in the afternoon. Rain washes the air free from bacteria; during a time of drought they are much more numerously present, being blown about by wind in dust, etc. Of all the influences that have hitherto been shown to act on their presence and multiplication in the air, cold appears to be the most powerfully hostile to them.

ORIGIN OF THE AERIAL BACTERIA.

From whence come these swarms of living particles? The answer may be gathered from what has been already stated as to their excessive rarity at sea and at high elevations. The great source of their origin is the soil. All varieties of soil possess a teeming population of microbes. As the upper surface becomes dried by exposure to the air particles become lifted up into the air and carried about by winds. On windy days in dry weather the air always contains more bacteria than at other times. Moreover, the lower layers of the air, those most in contact with, or nearer to, the soil contain more bacteria than the upper strata. And not only from soil or earth is the bacterial population of the atmosphere derived, but from all collections of dust, dirt, or mud, the ultimate origin of which may have been from most diverse sources. In dwelling rooms, or inhabited spaces of any kind, the air might derive its bacteria from (1) the ceiling, walls, and floor; (2) from the furniture; and (3) from the occupants. It is difficult to separate the first category from the second, and they may just as well be considered together. There is no doubt that the air-bacteria in rooms do principally come from these sources. Prof. Carnelley at Dundee made comparative determinations before and after the occupants arose from their beds; also before and after the beds were made in the wards of the infirmary, and found that the number of bacteria was increased to a very great extent after the disturbance of the room and furniture so caused. Dr. Tucker, of Boston, made similar observations in the hospital in that city, and found this to be invariably the case. *After* the bedmaking, the air was crowded with

germs, and as time went on and the ward became quiet, the germs were deposited and it became relatively pure by subsidence. These observations harmonise exactly with the earlier ones of Tyndall, who found that air that had been kept perfectly at rest for a lengthened period became absolutely sterilized and free from spores. Carnelley found the effect of disturbance to be exceedingly marked in a boys' school, in which the boys were told to stamp with their feet on the floor for a short time. "This they did with particular vigour and gusto, raising a cloud of dust which diffused itself throughout the room." A second determination was then made, which showed more than thirteen times the number of germs that were present before the stamping.

That the bacteria in air are largely derived from the walls, etc., and furniture is further shown by the very much greater number that are found in dirty rooms, in houses that are old, and in places where the ventilation is bad. The substance called "floor deafening," which is placed between the ceiling of a room and the floor of the room above, is probably a good nidus for the growth of bacteria, especially in old and dirty houses. Miss Johnston and Professor Carnelley analysed a number of samples from different kinds of houses, and found (*Proc. Roy. Soc.* 1888) that it contained 4.5 per cent. of combustible matter in four-roomed—*i.e.*, decent houses; whilst in one-roomed houses there was as much, on an average, as 12 per cent. This combustible matter is of course organic, and, therefore, a nutrient medium for bacteria. In good houses floor deafening is made of a mixture of mortar and ashes; in poor houses a good deal of ashpit refuse, and very questionable material, is often used. The washing of floors will wash dust through the joints of the boarding, and the drying will tend to lift particles upwards into the air of the room.

It might be supposed that bacteria would be derived from the persons of the occupants, and to a certain, but probably very limited extent, this is true as regards the skin and clothing of human beings; but the breath does not add bacteria to the air. On the contrary, expired air is practically filtered free from germs; the lungs and air passages act as a receptive and retentive surface for the bacteria that enter in the air breathed. Professor Carnelley

recently demonstrated this by cultivation experiments, which gave a negative result; thus harmonizing with Tyndall's previous demonstration, that the expired air, towards the end of a respiration, was absolutely dark when crossed by the luminous beam, that is, optically empty.

In the country, therefore, air bacteria are chiefly derived from the soil; in towns, from the dust and dried mud of the streets; and in rooms, from the walls and furniture.

In addition to these, what may be called *normal* bacteria of the air, pathogenic varieties may be present, due to some special cause. Thus in the air of a ward with phthisical patients, tubercle bacilli or their spores would undoubtedly be present, derived from dried particles of sputum, unless the most rigid and unremitting precautions be taken to receive, *and retain* all such sputa in properly constructed vessels containing some suitable disinfectant. Similarly the air of a room in which are scarlet fever or small-pox patients would in all probability contain the *contagium vivum* of these diseases; and of all the specific diseases it may be stated, that their contagia may be present, to a greater or less extent, in the air immediately surrounding a person suffering from the disease in its infectious phase.

FATE OF AERIAL GERMS.

Having alluded to the origin, we must now briefly mention the eventual fate of the atmospheric micro-organisms. Speaking broadly, probably the last resting-place of germs is in the ocean. They are blown about from place to place by air-currents, lifted up high into the atmosphere, brought down again to the earth's surface; if they fall upon the soil, upon housetops, or upon any *dry* surface, they will shortly be again wafted into the air; if the soil or surface is wet, after a longer or shorter interval it will become dry, and then the germs will recommence their travels. But if they fall on water they cannot rise into the air again unless the water be dried up. This may occur in a pond, but not under ordinary circumstances in a river; they are carried from one stream into another, and eventually into the sea, if they do not previously sink into the river's bed. But having once reached a permanently fluid surface or body they cannot be again disengaged into the air. Here of course exceptions must be made, as in the case of the

spray of waterfalls, or of the sea on a rocky coast in stormy weather.

One important point is to be noticed in regard to this inability of bacteria to escape from wet or moist surfaces; the air of sewers has been found, contrary to expectation, to be remarkably free from germs. Carnelley and Haldane examined the air of the sewers under the Houses of Parliament; also of various sewers in Dundee, and found in each situation that the number of micro-organisms was much less in the sewer air than in the atmosphere outside. On an average there were seven more per litre in the outside air. They considered, from a review of all the circumstances, that the few that were present in the sewers were derived from the outside air; one fact in support of this being that the proportions of bacteria and moulds were found to be nearly identical in both—viz., as nine to one in sewer air, and eight to one in outside air. The sewage being liquid does not give off germs to the air, unless it be subjected to disturbance and thrown into spray.

If this be universally true that sewer air is free from germs, the propagation of certain specific diseases, as enteric fever, cholera and diphtheria, which are admitted to be caused by a specific contagium, could not take place by the mere breathing of gaseous organic impurities, derived from sewage. But although this may be the rule, there may be exceptions; and many outbreaks of disease, enteric fever for instance, appear to have been satisfactorily traced to sewer gas poisoning.

Nevertheless, the principle holds good, that bacteria find their natural last resting place in water that is permanently water, not liable to evaporation, and, *par excellence*, in the ocean.

NATURE OF THE BACTERIA IN AIR.

The group of bacteria may be divided into the families of *coccaceæ*, or spherical bacteria, of which the two most important genera are *micrococcus and sarcina;* and *bacteriaceæ*, or rod-like bacteria, of which *bacillus* and *spirillum* are the most important genera. There is also another group, comprising *beggiatoa* and *crenothrix*, not so important nor so widely diffused.

As regards their action they may be divided into those

species that cause putrefaction, those that cause fermentation, those that are pathogenic, *i.e.*, capable of producing disease, either in man or animals, and those that are chromogenic, that is, pigment producing. Some species are also phosphorescent, or photogenic. Broadly, from a pathological or hygienic standpoint, they may be considered either as pathogenic, that is to say, hurtful to man, or non-pathogenic, that is, which have, so far as is known at present, no prejudicial action on the human body: it is important to bear in mind this proviso—"so far as is known at present."

By far the larger number of species known belong to this latter category, most of them being termed *saprophytes*, that is, plants which live at the expense of dead and decaying organic matters. Of the forms found to exist in the air naturally the greater number belong to this group.

According to Miquel, micrococci are much more numerous in the air than bacilli: according to Fodor the reverse is the case. Professor Percy Frankland has found and described ten species of cocci and twelve species of bacilli in air taken in various situations. Some of these do, others do not liquefy the nutrient gelatine; some produce a white, others a coloured growth, various shades of yellow and orange, red and pink being most usual. Up to the present time very little is really known regarding these organisms. P. F. Frankland says:—"It is not unnatural that the brilliant discoveries in connection with the etiology of infectious diseases should have absorbed the lion's share of the attention of investigators in the field of bacteriology, and that the non-pathogenic organisms should have come to be regarded as comparatively uninteresting by the side of their more formidable brethren. It must, however, be remembered that the functions of the non-pathogenic organisms in the economy of nature are as yet but very imperfectly understood, and that as far as these functions have been investigated they do not yield in point of importance to those of the most virulent pathogenic forms.

"Thus the conversion of sugar into alcohol, the decomposition of nitrogenous organic matter with elimination of ammonia, the oxidation of ammonia to nitrous and nitric acids, besides many other natural transformations which are effected through the agency of such organisms, are certainly not second in importance to the results, terrible

as they often are, achieved by the pathogenic forms. The organisms producing the above-mentioned changes are known to be present in the air, and there can be little doubt that the numerous other aërial varieties will in the future be found to discharge important duties in the laboratory of nature."

The endeavour to isolate those germs that are known to be *pathogenic* from air has not hitherto been successful, except to a very slight extent. Miquel states that he has never succeeded in isolating any with an evident pathogenic action. From hospital air, however, some cultivations have produced a purulent infection in guinea pigs, and Hartmann and Emmerich have found the micrococcus of erysipelas in the air of a *post-mortem* room, as well as the micrococcus of pneumonia (so-called) of Friedländer in the dust at the prison of Amberg. Cornet also has succeeded in rendering animals tuberculous by inoculation of the dust from phthisical wards. Notwithstanding this small success in demonstrating the presence of pathogenic bacteria or their spores in the atmosphere, it cannot be doubted that they are frequently there. It is by means of aërial infection that many of the specific diseases are commonly spread, and notably so in the case of measles, scarlatina, and whooping-cough. Tuberculosis also is certainly spread by inhaling air that contains the specific bacillus or its spores. So are anthrax and the malignant œdema due to the septic bacillus, or *vibrion septique* of Pasteur. With regard to enteric fever, it is commonly supposed to be spread through air as well as by water; the *bacillus typhi abdominalis* might be swallowed, and so reach the intestinal tract. Cholera is not so likely to be spread in this way, inasmuch as the cholera spirillum has a very feeble power of resistance to desiccation, and cannot therefore retain its vitality long, if suspended in the air.

We are bound to believe then, that these specific pathogenic bacteria must under certain circumstances be present in the atmosphere, even although bacteriology has failed to demonstrate the fact, except in rare instances. There are several reasons why they are not, and are not likely to be, found in any great abundance. First, the atmosphere is not their natural habitat, and therefore they do not find in it the conditions that are favourable to their continued existence or reproduction: they do not thrive, therefore they perish in time.

Secondly, they meet with very active hostile conditions. Of these desiccation is very powerful. Many species are killed simply by this and nothing more. But probably the influences of light, and of oxygen, are more powerful still in attenuating and finally destroying hurtful forms. It has been suggested that this is the reason that cultivations of aërial bacteria have so frequently proved inert, their characteristic properties having been destroyed.

The organisms, which at the present time are generally allowed to be the actual causes of specific diseases, are those of anthrax, leprosy, tuberculosis, glanders and malignant œdema, which are all *bacilli;* the *micrococci* of erysipelas, gonorrhœa, and pus; the *spirillum* of relapsing fever; and *actinomyces*, which produces actinomycosis. Two others, the bacillus of enteric fever, and the spirillum of cholera, though not absolutely proved to be the causes of these diseases, will, in all probability, be accepted as such on further investigation. There are about another half dozen whose connection with particular diseases is extremely probable on the evidence which has, up to the present, been furnished.

Of the ways by which these poisons gain access to the body, whether by inoculation into the blood directly, by inhalation into the lungs, or by swallowing into the pharynx and stomach (which may either be swallowing of food, of drink, or of air), probably drinking water and air are the most usual and important; and there can be no question of the immense help to the prevention of disease that would be afforded, if it were possible to determine the presence in air or in water of these minute but deadly particles. It would not be difficult to kill them if we did but know they were present. But there lies the difficulty; and for the present we must be content to observe and wait.

SANITARY INDICATIONS.

Leaving on one side the question of the determination or diagnosis of the particular species present in the air of any place, there may still be some useful object gained by finding out approximately the total number of micro-organisms as compared with the number present in reasonably pure outside air.

The Dundee observers already referred to, Professor Carnelley (whose recent death has been such a loss to

science) and Messrs. Haldane and Anderson, came to the conclusion that the air of a dwelling house should not contain more than twenty micro-organisms per litre in excess of the outside air, and that the ratio of bacteria to moulds should not exceed thirty to one. The purer the air the more nearly do the numbers of bacteria and moulds equal each other, although bacteria in almost all cases are more numerous than moulds. In the outside air in quiet places in Dundee the bacteria were found to be as 2.5 to every one mould; in the street during dry dusty weather the ratio was as fifteen to one. The more the air becomes vitiated the more do the bacteria increase, but not the moulds, because moulds come from the outside air while bacteria come from the walls, etc. of rooms, especially when dirty and ill-ventilated.

The standard of purity just given—viz., that the air should not contain more than twenty germs per litre more than the air outside, was adopted after observing that in the great majority of fairly well ventilated houses and schoolrooms there were *less* than this number, while, conversely, in those houses and schools which were regarded as ill-ventilated in most cases *more* than this number of germs were found.

The amount of carbonic acid in air, due to respiratory impurity, that is, over and above the amount in the air outside, should not exceed 0.6 vols. per 1000 in dwelling houses, aud 0.9 vols. per 1000 in schools. These quantities are much higher than those laid down as affording a standard of ventilation by the late Prof. de Chaumont, who taught that the CO_2 should not exceed 0.2 vols. per 1000 in excess of that in the outside air. The standard of the Dundee observers cannot, at any rate, be considered as requiring too high a degree of purity of air.

It is, of course, understood that the number of micro-organisms mentioned is merely an empirical standard, based on a considerable number of experiments, and that the *quality*, that is, the harmlessness or the virulence of the germs does not enter into the question. Of course half-a-dozen diphtheria bacilli may be of much more consequence than a million *sarcina lutea*, or *bacillus subtilis*.

MUTABILITY OF BACTERIA? AN IMPORTANT QUESTION.

A question arises in connection with this, which is of the greatest importance, but the answer to which cannot, I

think, be given in the present state of our knowledge. There are a few organisms—about a dozen—which are almost universally believed to be the actual causes of certain diseases: there is a vast multitude of other organisms which are not known to have any hurtful effect on the health, and which are therefore considered as quite harmless. Is it possible that any of these so-called harmless bacteria can in any way develop into, and become, *pathogenic* bacteria?

Let us take the case of anthrax, the bacillus of which is the best known of all bacteria; it appears to be quite distinct from all others, and undoubtedly causes splenic fever: it always produces the same result, and this result is produced by no other bacillus. Therefore it is supposed by all to be a distinct species.

The micrococcus of gonorrhœa, Neisser's gonococcus, is allowed to be the cause of gonorrhœa; other organisms may also be present in the pus, but this particular organism is the one that brings about the specific affection, Now is it not possible that some of these non-specific organisms, if placed under favourable conditions, may develop increased powers, and eventually grow into a real gonococcus? I mean that an organism which is, in the first instance merely *present* in a purulent or mucopurulent discharge, may, if cultivated in that discharge, conceivably become itself capable of reproducing a similar discharge from another mucous membrane.

Or, take the case of diphtheria. In the false membranes of diphtheria are found several organisms; amongst these two are especially noticeable, a micrococcus and a bacillus. After considerable investigation the bacillus has definitely been decided on as the cause, Loeffler's *Bacillus diphtheriæ*.[2] Now the origin of outbreaks of diphtheria has for long been one of the most puzzling of ætiological problems; its spread after the introduction of a first case is easily to be accounted for, but the origin of the first case is often a

[2] The researches of Dr. Klein, quite recently (March) published (Local Government Board Report for 1889), seem to show that this statement requires qualification; according to Klein the specific bacillus grows especially well in milk. The importance of this fact in regard to the spread of the disease can hardly be over-estimated. See a paper by the present writer on "The Connection between Milk Supply and Disease," PROVINCIAL MEDICAL JOURNAL, July, 1889.

mystery. During the last few years it has gradually appeared to be probable that many outbreaks owe their origin to infection from domestic animals, especially cats and fowls. The bacillus has been demonstrated in false membrane in the pharynx of fowls.

There is also a widespread, though rather vague, belief in a connection between dampness and impurity of soil and prevalence of diphtheria. Now if we imagine that some coccus or bacillus existing in the air, water or soil, finds itself lodged in a heap of organic refuse, manure, decaying vegetable matter, or other putrefying substance, and that the conditions of temperature and moisture are favourable to its growth and reproduction in a very high degree; is it not conceivable that this organism may become modified morphologically and physiologically, in its form and in its function? Then imagine it entering into the throat of a fowl, where it will meet with a new set of conditions. These conditions may be favourable or they may be adverse. If the latter, the organism will die, and there will be an end of it. But if the temperature and moisture of the fowl's mucous membrane are favourable to the growth and development of the organism, so that its reproductive powers are increased, is it not quite conceivable that the individuals reproduced under these favourable conditions will gradually *themselves* undergo change, and develop into a something different from the ancestral germ that first entered the fowl's throat? For when saying "gradually," it must be remembered that what is "gradually" with us is not the same in point of time when looked at from the point of view of the bacterium. We can conceive a good deal of change and development taking place in—say, ten generations, if the climate and food of a race be altered in a favourable direction, that is during 300 years; still more if thirty generations, or about 1,000 years elapse. But a bacterium will get through all that between this evening and tomorrow night. An average healthy bacterium will produce sixteen millions of offspring in twenty-four hours, and (if one likes to indulge in figures) 4,772 billions in three days, according to Cohn. Confining ourselves to twenty-four hours, I think that the bacteria coming into existence at the end of that time may quite reasonably be conceived as differing in their properties from the original bacterium

that entered the fowl's throat. I cannot think that there is anything illogical or irrational in the supposition: it is of the commonest occurrence in the vegetable kingdom, where alterations of the greatest magnitude are produced by altering the surroundings of a plant. One need only mention the increase in size, alteration in colour, development of scent, exhibited in a hundred garden flowers under cultivation; if the specially favourable surroundings are removed the plant returns to its former condition. The *species* is not altered certainly, but the modifications of *individuals* are very great.

It must be remembered that bacteria do not possess specific characters in quite the same way as higher plants. The characters which distinguish one sort or kind from another are derived from their behaviour in different cultivating media—how one liquefies gelatine and another does not; how one produces a yellow pigment, another a red, and so on. The distinguishing characters are not derived from morphological differences.

Therefore I cannot see that it is inconceivable, or an irrational conception, to suppose that an organism under ordinary circumstances quiescent, or neutral, as regards man or animals, might under favouring conditions develop into a state of activity; and further that this state of activity might be increased, one may say, to the N^{th} power, by cultivation, so as even to produce a cholera epidemic over a whole continent.

A better example than has been just mentioned would be afforded in the case of the specific contagium of enteric fever, though not so connected with the subject of bacteria in air. As everyone knows, there are two chief theories as to the cause of enteric fever: one party holds that it can never originate without the ingestion of the specific cause, this only arising from a previous case of the same disease; the other party holds that, while such is the case undoubtedly in many instances, there *are* instances in which the disease arises without contagion from any pre-existing case. This latter theory, of which the late Dr. Murchison was the most powerful exponent, is called the *pythogenic* theory, the idea being that the disease is generated from filth. Of late years nearly all authorities have been against this theory, and in favour of the necessity of a specific introduction. Since the discovery of the bacillus

of Eberth, the *Bacillus typhi abdominalis*, which is now generally accepted, though not absolutely proved, this specific theory has been much strengthened. Still there have always been a number of observers in India and elsewhere abroad who have been unable to satisfy themselves that the disease did not sometimes originate *de novo*, from pythogenic, or filth-generating conditions, as maintained by Murchison. A strong argument against this view has been the old one, never to be lost sight of, that it is difficult to prove a negative: in this case, that it is impossible to prove that the specific poison was *not* introduced, even if the most careful examination fail to discover it. It cannot be denied that this has great weight. At the present time I believe every text-book on medicine in this country (except Roberts') teaches that specific contagion is necessary to cause the outbreak of the disease.[3] And yet numerous observers, in India and the colonies rather than at home, do not find that facts, as they read them, harmonise with this theory.

Now, what is there irrational in supposing that some putrefactive bacillus, ordinarily harmless, if it, instead of growing and multiplying in fairly clean water, should find itself in water to which a large quantity of organic matter has been added (or it may be a *small* quantity of some particular form of organic matter, say fæces, has been added) that this bacillus should find its surroundings so much improved that it would become, as it were, a hot-house variety, and in the course of, say, a hundred generations, should take on fresh characters, and eventually become such an irritant that, if swallowed, it will cause ulceration of Peyer's patches and a severe attack of fever —in fact, become a typhoid bacillus? It is quite true that this is all assumption; but will anyone say that it is impossible? Is it not rather what we should naturally expect to happen if we believe, as we all do, in evolution?[4]

[3] A passage in Fagge's "Text-book of Medicine" may be quoted in this connection (vol. i., p. 172): "What is more likely than that a living organism, if it constitutes the exciting cause of enteric fever, should sometimes remain for years in a dormant state, multiplying itself just sufficiently to escape extinction, and then, that under the accidental supervention of more favourable conditions, it should suddenly undergo an immense development?"

[4] As an example may be quoted a recent outbreak of enteric fever at Arundel (see *British Medical Journal*, November 22nd, 1890, p. 1204). The water supply was deficient, and recourse was had to a pump in the

If the hypothesis be granted, an immediate explanation is afforded of those outbreaks of enteric fever, hitherto inexplicable, where no specific cause could be ascertained for the first case. I would say that the cause *was* specific, but that it *developed* its specific character from the conditions of its environment, not that it came directly and immediately from a pre-existing case.

There is no need to mention other examples: the same reasoning, good or bad, would apply to all the specific poisons, and, I think, affords the best explanation of their ultimate origin. For, after all, there must have been a first case sometime or other. There must have been a time when pathogenic organisms were non-pathogenic: it can hardly be maintained that saprophytic organisms have been derived from pathogenic, but the converse is by no means improbable. The point is, or rather the points are, can this transference from harmless to disease-producing properties take place now? and what are the factors that bring it about, if such be the case?

I must add that this is not by any means the teaching of bacteriologists, who consider that there are as distinct species of bacteria as there are of beetles, and that there is no mutability of species, at any rate, at the present time.

Nevertheless, no one believes in the absolute permanence of species, even of the highest animals, and if a thousand generations, or ten thousand generations, with favourable environment, can produce variation in one case (and what believer in evolution will deny the possibility of this?), why should not a thousand or ten thousand generations produce variations in the other, even if these generations take place in ten days instead of ten thousand years?

To return to my text, the bacteria in atmospheric air, the view I would suggest is, that amongst the forms that are commonly present, and that are generally regarded as harmless, there may be some which, under certain conditions, may develop into pathogenic forms with disease-producing properties.

market square. In August and September there was much prevalence of diarrhœa; September and October were comparatively dry months; in November the outbreak commenced. May not the enteric fever of November have been developed from the diarrhœa of September? See also remarks by Dr. W. N. Thursfield, *British Medical Journal*, August 30th, 1890, p. 494.

CEREBRAL TUMOUR:

HISTORY AND DIAGNOSIS.

By Prof. T. McCALL ANDERSON, M.D.

OPERATION FOR ITS REMOVAL.

By Prof. GEORGE BUCHANAN, M.A., M.D., LL.D.

PATHOLOGY.

By Dr. JOSEPH COATS.

Read before the Glasgow Medico-Chirurgical Society.

Reprinted for the Authors from the British Medical Journal, Mar. 14, 1891.

PRINTED AT THE OFFICE OF
THE BRITISH MEDICAL ASSOCIATION, 429, STRAND, W.C.

I.—DIAGNOSIS AND LOCALISATION FROM THE NERVE SYMPTOMS.

By T. McCALL ANDERSON, M.D.,
Professor of Clinical Medicine in the University of Glasgow.

GENTLEMEN,—I have to request your careful attention to the details of the history of this case, because it is mainly from them that the diagnosis of the seat and nature of the disease was made.

A. K.,[1] aged 16, engineer's apprentice, was admitted to Ward 2 of the Western Infirmary on August 14th, 1890, complaining of fits and of paresis of the left arm and leg. No definite neurotic tendency can be traced in the family beyond the fact that his mother suffers frequently from headache, and that for a number of years he himself has been similarly affected, apparently as part of "bilious attacks." There is no history nor are there evidences of syphilis or tuberculosis. There is an indefinite history of slight discharge from the ears during infancy, but all traces of this have been absent for a number of years.

About four years and a half ago, without previous warning, and while in the act of lacing his boots, his left forearm was suddenly flexed, and, uttering a cry, he fell down in a semi-insensible condition, conscious, to a certain extent, of what was going on around him, but unable to speak or move. Ever since this fit he has complained at times of slight pain, numbness and weakness in the left hand, and within the last year or so this had been more frequent and severe. The pain and its accompanying numbness are usually experienced in the left thumb and forefinger, and, only when severe, extend to the rest of the hand and forearm.

No recurrence of fits took place till a year and a half ago, when, on May 10th, 1889, a second occurred. This was preceded by lateral oscillation of the head for about two hours. Pain and numbness were then complained of in the left thumb and forefinger, which gradually extended upwards through the left hand and forearm to the arm, finally affecting

[1] Reported by the resident medical officer, Mr. L. R. Sutherland, M.B., C.M.

the left side of the face, including the left half of the tongue. He remembers uttering a cry and falling, and a quarter of an hour later he woke up, unconscious of what had happened, and complaining of headache and nausea. A third fit occurred on the following day, and fourteen days later a fourth. These all began in much the same manner, and had much the same character and duration.

Alarmed about this state of matters, he sought admission to hospital on June 11th, 1889, and was under treatment by mixed bromides, gr. v, increased to gr. xv t.i.d. till August 3rd, 1889, when he was dismissed much improved. While under observation on this first occasion he had only two fits. These were ushered in by pain in the left thumb and forefinger, extending up the arm towards the head. The actual fit was apparently a generalised convulsion, said to have been attended by sobbing and profuse perspiration.

A fortnight after leaving hospital the fits returned, and have since continued to recur. At times intervals of from eight to sixteen weeks elapse, at others they occur daily, even though he may be under the influence of bromides. The fits, since he left hospital, have differed from the previous ones in so far as there has been no loss of consciousness. The aura has continued as before.

For a month before his readmission the numbness and pain in the left hand and forearm have been becoming rapidly worse, and partial paralysis of the left arm, gradually extending to the leg, has developed.

During the ten weeks he was under observation in hospital for the second time eighty-nine fits occurred. From August 21st to September 17th there were no fewer than eighty-seven, on an average three daily. Under the influence of treatment they gradually became less frequent, and finally ceased. For three weeks no fits occurred. On October 10th, and again on the 26th, a slight recurrence took place, all treatment having been suspended on the 21st.

Examination.—The limbs of the affected side are somewhat flabby and cold. There is very decided paresis of the left arm and hand, the dynamometer registering on the right 50 kilos, on the left *nil*. Quite distinct, but less decided, paresis can be made out in the left leg on resisting movement. There is exaggeration of the left knee and wrist jerks, slight left ankle clonus, and the superficial reflexes are active. Tactile sensation is perfect. A feeling of numbness is experienced all over the left side, particularly in the arm and leg, and to a less extent in the left side of face and left half of the tongue, but this is not constant. There is slight facial paralysis as estimated by the usual tests. There is slight deviation of the uvula to the left, and the tongue on protrusion is slightly deflected to the affected side. Pain, at times very acute, is complained of behind and above the right ear and in the right frontal region, and, at a point 2 inches above and behind the ear, an area of distinct tenderness is discovered on percussion.

The following are the results of the examination of the eyes, ears, and urine:—

Dr. Hinshelwood's Report on the Condition of the Eyes (September 11th, 1890).—"Well-marked optic neuritis present in both eyes, but all the changes are most marked in the right. The papillæ are swollen, and the normal cupping of the discs entirely obliterated. The edges of both discs are obscured, so that it is impossible to make out where the retina begins and the disc ends. The papillæ are of a deep greyish-red colour, but towards the outer part are surrounded by a palish halo. The veins are dilated, and the arteries are smaller than normal. The retinæ, for a considerable distance round the optic discs, have lost their transparency, and have an opaque greyish appearance, which gives a very dull fundus reflex on ophthalmoscopic examination."

Dr. Barr's Report on the Condition of the Ears (October 29th, 1890).—"Right ear. Hearing power slightly under the normal; tympanic membrane fairly normal; no perforation, cicatrix, or any evidence of present or past purulent disease. Bone conduction good. The tinnitus is probably connected with some form of irritation at the auditory centre in the brain. Left ear: Pear-shaped cicatrix in tympanic membrane; rest of membrane opaque. There are indications of a past purulent disease of the middle ear. Hearing power more impaired than on the right side."

Dr. W. F. Somerville's Report on the Urine (October 30th, 1890).—"A. K.; amount of urine examined, 1.2 lite in 24 hours; colour, palish amber; odour, urinous; reaction, neutral; specific gravity, 1022.

	In per Mille.	Grmms. in 24 hours.	
Water	948.8	1148.5	
Dry residue	51.2	61.4	
Organic material	33.5	40.2	rel. abs.
Ash	17.7	20.2	+ n.
Extractive material	7.3	8.7	sl. + sl. +
Urea	25.2	30.2	— —
Chlorides	11.1	13.3	+ +
Sulphates	3.0	3.6	— —
Phosphates	3.67	4.4	n. sl. —
Uric Acid	—		
Pigments	n.		
Albumen	none		
Sugar	"		
Ammon. carb.	+		
Alkali phosphates	2.46	2.95	sl. — sl. —
Alkaline earth phosphates	1.21	1.44	+ +

Note. + = increased; − = decreased; rel. = relatively to dry residue; abs. = absolutely in twenty-four hours; sl. = slightly; n. = normal.

"*Result.*—I have neither seen the patient, nor do I know any clinical particulars of the case. From the examination of the urine according to the method recommended by Mr. A. E. Haswell, pathological chemist, Vienna, I find evidences of brain irritation, as shown by the increased excretion, relatively and absolutely, of the earthy phosphates, caused, perhaps, by the presence of a tumour, or by the pressure of bone on the brain-substance; or possibly, though not likely, by a very old encapsuled abscess. From the light colour of the urine, the specific gravity, the amount of urine voided in twenty-four hours, the relatively decreased urea, and the increased chlorides, the possibility of any suppurative process, as one would find in a case of abscess or of meningitis, can be quite excluded."

The following is the substance of my remarks to my clinical class prior to the operation: In reference to diagnosis, the points which we have specially to consider are two; first, the seat; and secondly, the nature of the lesion.

1. *The Seat of the Lesion.*—The disease is manifestly cerebral, and implicates the right side of the brain, as the resulting manifestations are almost exclusively on the left side of the body, while the paralytic phenomena indicate implication of the motor tract. But what part of the motor tract is the seat of the mischief? The symptoms point, I think, very positively to the cortex cerebri. For it must be borne in mind that in cortical lesions convulsions are very common, are frequently limited, at least at their onset, to the part whose centre is irritated, and consciousness is often retained, factors which are all present in our patient. In such cases, too, a sensory aura often precedes the epileptiform seizures, and in this instance the fits set in with numbness and pain in the left thumb and forefinger.

This last circumstance, coupled with the fact that the paralysis began in the left arm, points to a lesion having its centre about the junction of the middle with the lower third of the ascending parietal convolution. This conclusion is somewhat supported by the pain which was complained of, and by the tenderness on percussion above and behind the right ear, although it must be remembered that the seat of pain does not necessarily correspond with the seat of the disease.

2. *The Nature of the Lesion.*—The history of suppurative disease of the middle ear naturally leads to the suspicion that there might be a cerebral abscess; but this suppuration occurred on the *left* side, and in early life, a good many years before there were any symptoms of cerebral irritation; while Dr. Barr's report furnishes evidence of prolonged absence of active disease of the middle ear. So that we may almost certainly exclude the hypothesis of abscess of the brain, more especially as Dr. Somerville's report on the urine is decidedly against such a view.

That being so, we can come to no other conclusion than that we have to deal with a tumour of some kind. The most common forms of cerebral growth are tuberculous or syphilitic in their nature, and which might possibly be influenced by

the inoculation of Koch's fluid on the one hand, and anti-syphilitic treatment on the other. But there is no history of a hereditary tendency to tuberculous disease, nor is there any indication of a delicacy of constitution in the patient himself. And, as regards syphilis, there is no history or symptom of hereditary transmission of the taint, nor is there any suspicion of the disease having been acquired, not to speak of the age of the patient which, of itself, almost excludes it. A cancerous growth is out of the question, as the patient presents none of the characteristics of malignant disease, nor does there appear to be a family predisposition thereto.

If, then, we are right in our view that the tumour is neither tuberculous, syphilitic, nor cancerous, all that we can say further is that the intracranial growths which are most commonly met with are glioma or sarcoma; and the only way of getting rid of them is by operative interference.

II.—OPERATION FOR ITS REMOVAL: RECOVERY.

By GEORGE BUCHANAN, M.A., M.D., LL.D.,
Professor of Clinical Surgery in the University of Glasgow.

CEREBRAL surgery at the present day is in much the same position as abdominal surgery was thirty years ago. In April, 1864, I performed the first successful operation of ovariotomy in Glasgow or the West of Scotland. Not very many years before that, the leading surgeon in Scotland had openly declared his opinion that ovariotomy was unjustifiable, and that a surgeon who undertook that operation with a fatal result, laid himself open to a charge of culpable homicide. At the present time, owing to improved methods of operating and after-treatment, abdominal section is performed with impunity almost daily.

Cranial or cerebral surgery is now on its trial. Horsley, Macewen, Park, Bergmann, and others have clearly established that operations on the cranium for the relief of abscess and removal of morbid deposits and new growths, evidenced by certain well-ascertained nerve symptoms, can be undertaken with success. But as yet the opportunities for performing these operations have fallen into very few hands, so that it is the duty of every surgeon who can add to the limited experience to do so.

Trephining has frequently been performed in cases where there are scars on the scalp or depressions of bone indicating former injury, to which nerve symptoms, such as paralysis, convulsions, or neuralgia, etc., might be traced. A very striking example of this I published in the BRITISH MEDICAL JOURNAL, December 14th, 1889, p. 1318.

But the interest in the cerebral surgery of the present day is centred in those cases where the abnormal condition of the

brain is diagnosed and localised by the nature and situation of the nervous affection, as first pointed out by Ferrier.

I have not for myself collected the published cases for the last two years, but the results of operations up to 1888 have been summarised in a paper by Dr. Park in the *Transactions* of the Congress of American Physicians and Surgeons at Washington, published in 1889. The table includes those only in which the operation was performed according to the principles of cerebral localisation, without reference to scars or surface markings. The table contains 63 cases; the deaths were 17; 15 of the cases were abscesses, subdural or subcortical; in 11 the lesion was a tumour, exclusive of tuberculous nodules; there were 12 cysts; the other 25 were of a miscellaneous nature, such as the fibrination of a clot, gumma, tubercle, and pressure from confined and altered serous or other fluid.

These statistics, like most others, are probably defective. Additional cases may have been recorded and escaped the notice of the compiler; others may have been done and not published. No doubt every successful case has been recorded; not so with some the result of which has been negative or fatal. Still, the table is valuable, as the compilation, so far as could be achieved, of cases of the operation referred to, during the early years of its introduction.

The following remarkable case comes under the category of those included in Dr. Park's table:—

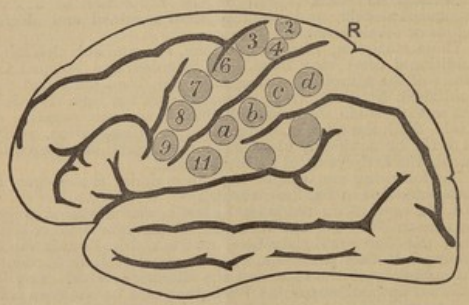
A. K., aged 17, an engineer by trade, was admitted under my care to Ward 3 of the Western Infirmary on October 30th, 1890. He had previously been in the medical wards under Professor McCall Anderson, who has given a detailed account of the history of the case and the diagnosis, which may be summed up in a few words: For three years he has been subject to epileptic attacks, which have gradually increased in frequency and severity. They always begin and sometimes are limited to the thumb and forefinger of the left hand, but frequently involve the whole limb, and sometimes the leg of the same side. Of late, the left arm has become partially paralysed, and to a slighter degree the left leg.

These symptoms seemed to a point to a gradually developing lesion, probably a tumour, in the cerebral centres presiding over the movements of the thumb, fingers, and wrist, which are very distinctly marked out in Ferrier's map of the cerebral convolutions, at the junction of the middle and lower third of the post-Rolando convolution.

Accordingly, after careful consideration, Dr. Anderson and I decided that an exploratory operation should be performed on the region referred to. In the preparation of the patient, the steps of the operation, and the after-treatment, I followed rigidly the plan described by Victor Horsley, and had every reason to be satisfied with the result.

Three days before the operation the head was shaved, to allow me to study the topography of the cranium. The point at which I proposed to open the cranium was fixed on

by the following measurements: the distance between the root of the nose and occipital protuberance was divided into two equal parts; half an inch behind the centre point, indicating the upper end of the fissure of Rolando, was marked. From this point a line was drawn downwards and forwards at an angle of 65°; this indicates the direction of Rolando's fissure. Three inches down, just behind this line, are situated the convolutions indicated in Dr. Ferrier's plan as those presiding over the movements of the thumb and finger. These spots and lines were marked with a blue pencil. The scalp was then thoroughly cleansed, and a wet compress of carbolic solution kept on continuously.



2, 3, 4, centres for the movements of arms and legs; 6, centre for supination of hand and flexion of forearm; *a*, *b*, *c*, *d*, centres for hand and wrist; 11, *a*, *b*, *c*, *d*, are on the ascending parietal convolution behind the fissure of Rolando R. The tumour was situated under *a*.

On October 30th, the day preceding the operation, the bowels were cleared out with castor oil, the head was again shaved, cleansed, and kept moistened with carbolic acid solution.

The operation was performed on October 31st, at 9.30 A.M. Immediately before this he had a quarter of a grain of morphine subcutaneously, which is believed to have some effect in controlling hæmorrhage from small vessels of the brain.

The patient having been put under chloroform, I made a semilunar flap of the scalp, including the aponeurosis, the upper part of which was near the vertex, the base about 3 inches wide, across the lower part of the fissure of Rolando, that is, just on a level with the top of the pinna. One or two small arteries were ligatured. The pericranium was turned aside from part of the skull, where a trephine was applied, just at the spot previously determined by the surface marking. The trephine was rather larger than a shilling. The button of skull which was removed was placed between folds of lint moistened with carbolic solution, and kept warm. The dura mater exposed by the trephine and the convolutions beneath seemed to be perfectly normal, and presented no evidence of any tumour or lesion. Thinking that the diseased area might be further up, behind the fissure, on the centre indicated for the arm, I applied the trephine 2 inches above and behind the former situation, and removed a similar disc of bone. I then applied a Hey's saw on each side in a line touching the outside of both circles, and with a lever removed the intervening bridge of bone. All the pieces were kept moist in warm carbolic solution. I now clipped the dura mater for four-fifths of the circumference of the oval aperture, about a sixth of an inch from the edge of the bone, and so exposed the cerebral surface. At no part was there indication of any abnormal condition, nor on pressing it with the point of the forefinger was there any evidence of either fluctuation or undue resistance. But at the lower part, just in the centre of the first trephine hole, the cerebral convolution seemed to bulge a little, and while feeling it with the smooth end of a director it suddenly burst asunder, and a dark red or brownish body resembling an Orleans plum emerged from below, and pushing aside the cerebral substance, which seemed to have been extended over it, occupied the lower part of the opening. With my finger and thumb I found I could move it in the brain, and with the spoon-like end of a large director I lifted it out of its place, without tearing anything and without any hæmorrhage. It was regular and nearly globular, smooth on the surface as if enclosed in a thin capsule, and was about the size of a walnut. It was evidently removed entire without any breaking or bruising, as the cavity from which it came contained no *débris*, and it closed at once by resiliency of the surrounding substance.

After washing the wound with a stream of antiseptic fluid, I sewed the dura mater into its place with stitches of fine silk. It came together edge to edge, except at a small part where it had been torn. I now replaced the discs of bone in their situation, and filled up the space between them with pieces of the intervening bridge of bone, which I had cut into four or five portions. The semilunar flap was then put into position, and retained with fine silver wire stitches, a little opening, into which I put a drainage tube, being left at the posterior angle. A dressing of alembroth gauze and Gamgee cotton was applied with a very slight pressure. The patient stood the operation well, and his progress to recovery was almost uninterrupted.

It is unnecessary to give daily reports, but the after-treatment and course of the case have been summarised by Mr. Munro Kerr, M.B., C.M., my house-surgeon.

Urine was drawn off only on two occasions, once on the afternoon of the operation, and once again on November 5th.

Opiates.—One-sixth of a grain of morphine was given hypo-

dermically on two occasions for headache—at 1 A.M. on November 3rd and 5th.

Delirium.—Only on one occasion did the patient seem somewhat confused, and that only to a slight extent on the evening of November 3rd.

Headache.—A good deal of frontal headache till November 7th, which was relieved by a small dose of antipyrin.

Bowels inclined to be constipated, which was obviated first by soap and water enemata, and subsequently by gentle laxatives.

Food.—Only a little milk and soda water was allowed till November 5th, then a little toast, afterwards milk and biscuits, of which he was very fond, and gradually to more generous diet.

Dressings changed for the first time on the fourth day. Edges of the wound for the most part united, except where the drainage tube emerged, and one or two points where there were a few granulations. Tube removed.

November 13th. Dressing changed a second time; a little discharge on the dressing. Some projection of the flap, which made an elastic swelling. No pulsation.

November 18th. The bulging of the flap distinctly less; a little discharge and granulation at site of exit of tube. After this the progress of the wound to recovery was uninterrupted.

The tumour was a spindle-celled sarcoma, as reported by Dr. Coats, pathologist.

Nervous Symptoms and Fits.—On November 10th, at 11 A.M., he became unconscious for about two minutes, the arm and mouth twitched, and the head was thrown to one side.

On November 18th, in the evening, he had an attack similar to the above.

On November 19th, during most of this day he felt uncomfortable, with occasional twitchings in the limbs.

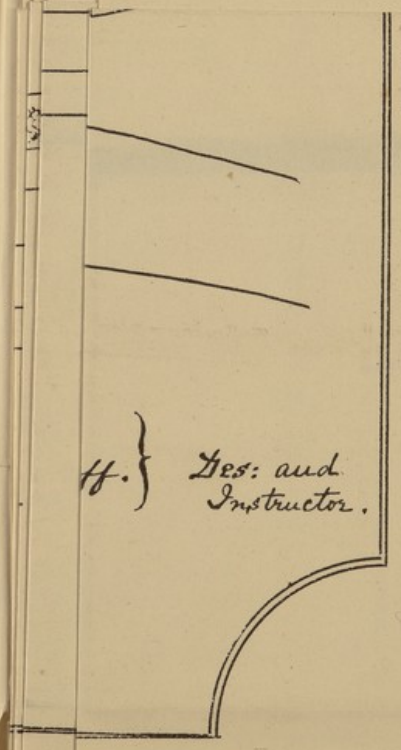
On November 25th he had a very slight attack.

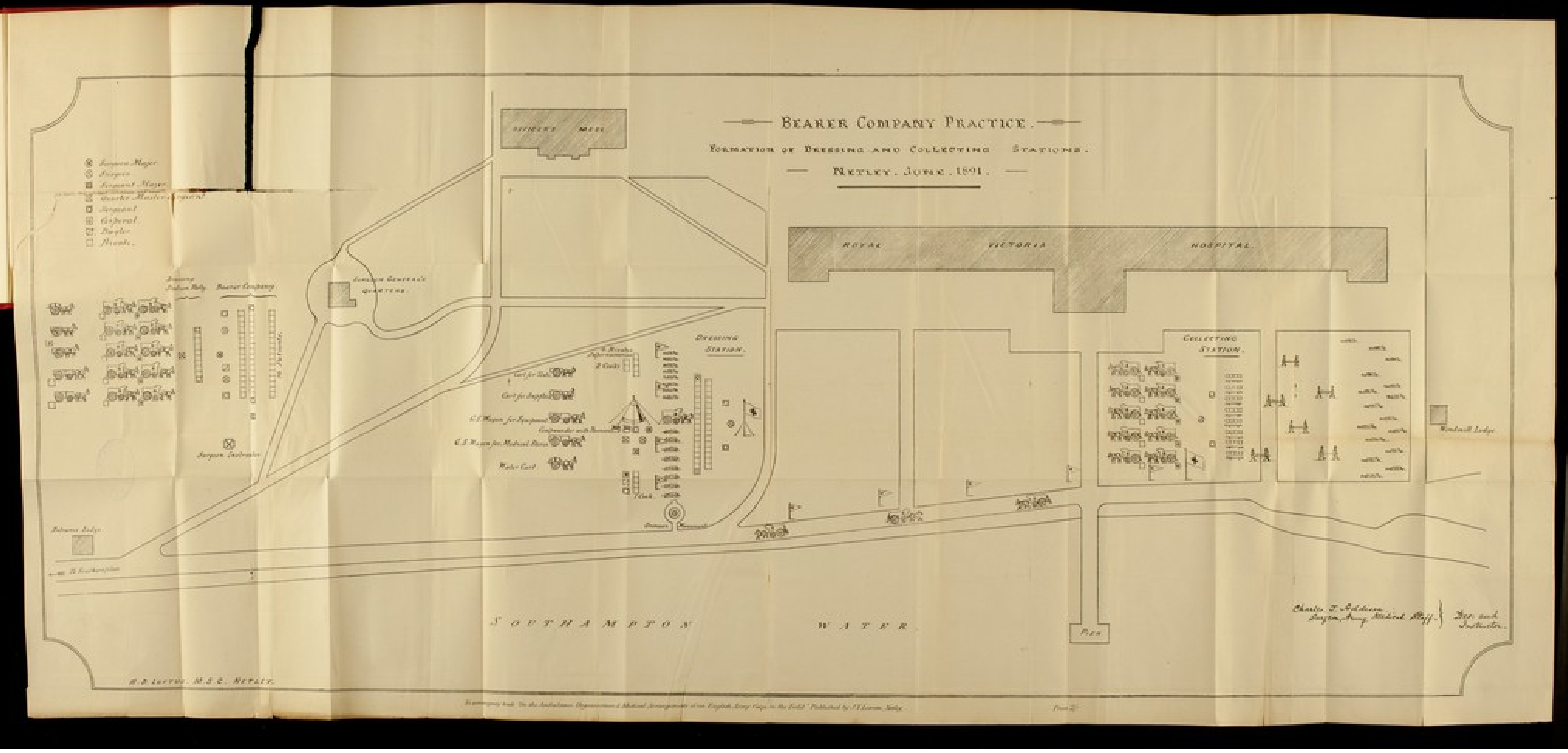
After this he was very well in every way till December 22nd, when he lost consciousness for a minute and had some twitchings on the arm, but not head or leg.

Since that date he has had no return of any of these symptoms, and is very much better in every way; cheerful, taking his food well and sleeping without any disturbance.

On January 13th, 1891, he got up out of bed for the first time and daily since.

Present Condition, February 18th, 1891.—The flap of scalp, which had been dissected off to expose the bone, is now completely adherent. It is raised above the level of the surrounding scalp about half an inch. Underneath this can be felt the pieces of skull, which had been replaced and are now firmly united to each other and to the adjoining edges of the aperture, so that there is now a complete closure of the opening, except over a small space of about three-quarters of an inch in diameter, where I had left the dura mater uncovered with pieces of bone, to allow of some little discharge. Here, however, the scalp is so thick and firm that the gap is




BEARER COMPANY PRACTICE.
FORMATION OF DRESSING AND COLLECTING STATIONS.
NETLEY. JUNE. 1891.
OFFICERS' MESS
ROYAL VICTORIA HOSPITAL.
SURGEON GENERAL'S QUARTERS
Surgeon Major.
Surgeon
Serjeant Major.
Serjeant
Corporal
Bugler
Private.
Bearer Company.
Surgeon Instructor
DRESSING STATION.
COLLECTING STATION.
Cart for Supplies
G.S. Waggon for Equipment
G.S. Waggon for Medical Stores
Water Cart
2 Cooks
Entrance Lodge
Windmill Lodge
SOUTHAMPTON WATER.
Pier
Charles T. Robinson Surgeon Army Medical Staff.
H. D. LUTTUG. M.S.C. NETLEY.

practically closed. So far as the operation is concerned the result is perfect. The patient's general health and condition are most satisfactory. He has not had any epileptic attack, nor even a partial twitching, since December 22nd, a period of eight weeks, so that that part of the nerve ailment may be considered as cured.

The left arm, which before the operation was paralysed to the extent that it lay powerless by his side, at least could not be raised or moved without the assistance of his other hand, can now be raised and moved about voluntarily. There is, however, when he moves to any great extent, a spastic contraction of the muscles of the fingers, wrist, and elbow, which tends to keep the limb more or less rigid; so that the cerebral convolutions over the region from which the tumour was removed have not regained entirely their normal functions. This, however, is daily improving.

POSTSCRIPT.

March 10th, 1891.—The foregoing paper was read at a meeting of the Glasgow Medico-Chirurgical Society on February 20th. That evening the patient was sitting by the fire, waiting for the cab in which he was to be taken to be shown at the meeting. Without warning, he was seized with an epileptiform fit, affecting, as formerly, only the left hand and arm, and slightly the leg. It lasted about two minutes and a half, and there was no loss of consciousness. He remembers all about it. It came on suddenly without any premonitory sensation or aura, and passed off leaving him very much as he was before. He told me all about it next day, and he said he believed it had been brought on by the partial excitement he had been in all day, at the prospect of being taken to the Society and shown to so many medical men. I think that probably he was right and that it was a transient attack, and might be explained by the long time the cerebral substance had been pressed upon and altered by the growth of the tumour, so that it had acquired a habit which had not yet passed off, though it had manifested itself at very long intervals. I suppose we may still expect some slight attacks to recur before the brain tissue is restored to it normal functions.

III.—REPORT ON ITS PATHOLOGY.

BY JOSEPH COATS, M.D.,
Lecturer on Pathology in the University of Glasgow.

THE following note was made when the tissue was fresh, immediately after the operation:—

The specimen is a soft, fleshy piece of tissue of a reddish colour; its surface is irregular, having a granular appearance, which on closer inspection looks almost papillary; at least there are a number of regular flat elevations of very small

size. The tumour is a flat mass of a generally triangular shape, having somewhat the outline as well as the size of the suprarenal body. Its longest diameter is 1½ inch; its other diameter 1 inch, and its thickness ½ inch. The tissue is very friable, and there is no defining capsule.

A portion removed by scissors from the surface shows the tissue to be very vascular, numerous capillary vessels forming a reticulated network. At the surface the vessels show what looks like papillary projections. Between the vessels, and to some extent clothing them, are large quantities of cells which are of considerable size, and contain large oval nuclei.

A portion of the tumour was hardened in absolute alcohol imbedded in celloidin, and sections made with the microtome. The sections stained readily with logwood, alum carmine, Bismarck brown, etc.

The tissue contains numerous vessels, and each vessel is surrounded by a mantle of translucent tissue sparsely provided with cells. This tissue in specimens mounted in Canada balsam is homogeneous and structureless in appearance, but in glycerine it is seen to have a finely fibrillated character. The thickness of this mantle varies considerably, in some places equalling the diameter of the vessel, in other places much less.

The tissue generally consists of cells mostly oval or spindle-shaped. Between the cells there is the merest trace of intercellular substance consisting of reticulated fibres. The papilliform appearance noted in the fresh state is not borne out in hardened specimens; and it was due, doubtless, to the fact that at the torn edge of the tissue, the vessels with their mantle presented themselves individually.

From the character of the tumour, it may be regarded as a spindle-celled sarcoma, but taking into consideration the mantle around the vessels, it belongs to the group Plexiform Sarcoma.

ON THE

Ambulance Organization

AND

MEDICAL ARRANGEMENTS

OF AN

ENGLISH ARMY CORPS IN THE FIELD

TOGETHER WITH A

DESCRIPTION AND PLAN OF

"BEARER COMPANY" PRACTICE

AS CARRIED OUT AT NETLEY.

BY

SURGEON-CAPTAIN C. J. ADDISON,

ARMY MEDICAL STAFF.

Netley:

PRINTED AND PUBLISHED BY J. T. LEMON.

PREFACE.

THIS little Book, which is the outcome of a paper read by me in the Section of "Naval and Military Hygiene," at the International Congress of Hygiene and Demography, held in London during August, 1891, is issued in the hope that it may be of assistance to those who have not made Military Ambulance Organization a study, and also with the idea that it may be a guide and help to the Members of the Militia and Volunteer Medical Staff Corps, in their various Ambulance Drills.

CHARLES J. ADDISON,
Surgeon-Captain,
Army Medical Staff.

Netley,
September, 1891.

AMBULANCE ORGANIZATION.

In this book I intend to give a sketch of the Ambulance Organization and medical arrangements of an English Army Corps in the field. I purpose to treat this highly interesting subject in such a way, that those who have not made it their study may be able to realize what ambulance aid in the field consists of.

Ambulance Organization, equipment, and transport means the general arrangements by which "First Aid" and proper transport is given to the soldier, whether wounded in action, or suffering from sickness, or accident, until his arrival at a "Base" or some other general hospital.

It may not be out of place here, to consider the conditions under which the severely wounded soldier is found after having been struck down in the fighting line, as enumerated by Surgeon-Major G. J. H. Evatt, M.D., Army Medical Staff.

1.—Falls wounded. Dressed by the Battalion Surgeon.
2.—Collected to "Dressing Station" by "Bearer Company."
3.—Conveyed to "Field Hospital."
4.—Handed over to "Stationary Hospital."
5.—Proceeds by convoy to the "Base Hospital."
6. - Transferred to "Hospital Ship."
7.—Conveyed to England, landed, and placed in "Military Hospital" at Netley, or elsewhere.

It is my intention to treat consecutively the various points into which this subject is divided.

Military Ambulance Organization appears to have been first taken up, and elaborated, by Drs. Larrey and Percy, both prominent medical officers of the French Army, who had considerable war experience at the time of the French Revolution and during the severe fighting that took place under the great Napoleon.

To Dr. Percy is accredited the formation of a Corps of "Stretcher Bearers," whose duty it was to collect the wounded from the fighting line, and to remove them to "Dressing Stations" out of the zone of fire; whilst to Dr. Larrey belongs the idea of originating the provision of carriage transport, for the rapid removal of wounded soldiers from the "Dressing Stations" to the "Field Hospitals."

Practically this system is in vogue now, but more perfectly and clearly organized, and the German Medical Service has since completely developed it, so that it is the model on which most of the European standing Armies base their medical arrangements. This would seem to be the result of their great experience during the past twenty years.

In short, the course pursued is, to relieve the fighting line of wounded, and transfer the seriously injured to the hospitals on the lines of communication, or at the base of operations.

It must be understood that the highest unit of our military organization is that of an Army Corps, and a great Army would be composed of several such Army

Corps; if, therefore, the detail of a single Army Corps be perfectly understood, then the arrangements necessary to a large Army can be readily grasped.

Normally, the total strength of an English Army Corps, with "attached Cavalry Division," is about 41,500 men, 16,500 horses, 90 guns, 420 carts, and 1,153 waggons, with eight Bearer Companies, and thirteen Field Hospitals, the whole of which are under the command of a General Officer, on whose Staff is a Surgeon-Major-General, responsible for the efficient performance of the medical services. This Surgeon-Major-General has a Surgeon-Captain appointed on his Staff, who acts as his "Orderly Medical Officer;" he is mounted, and carries the Surgeon-Major-General's orders to the various medical units—he is, in fact, a Staff Officer, and practically an *Aide-de-Camp* of the Surgeon-Major-General. By the latest regulations, this Surgeon-Major-General, who is the Principal Medical Officer with an Army in the field, is now no longer at the front with the General Officer commanding the force. His place is now on the lines of communication. If these are extended to any great length, he is assisted by a Surgeon-Colonel.

It will serve as a guide if I here roughly state the approximate number of Officers of the Medical Staff and Warrant Officers, Non-Commissioned Officers, and men of the Medical Staff Corps present with an Army Corps in the field. It is as follows:—

188 Medical Officers and Quarter-Masters.
1,284 Warrant Officers, Non-Commissioned Officers, and men of Medical Staff Corps.

This total does not include the Regimental Stretcher Bearers, or the medical establishments on the lines of communication and at the base.

An Army Corps in the field consists of three "Divisions," comprising all arms of the Service, also an attached "Cavalry Division," and a Reserve of Royal Artillery and Royal Engineers, the two latter called, as a body, the "Corps Troops."

The organization of a "Division of Infantry in the field" is as follows:—

DIVISIONAL STAFF.

2 Brigades of Infantry
1 Divisional Squadron of Cavalry
3 Batteries of Field Artillery.

DIVISIONAL DETAILS.

1 Divisional Reserve Ammunition Column
1 Field Company Royal Engineers
1 Company Army Service Corps
1 Field Hospital (in reserve)

and that of a "Brigade of Infantry:—

BRIGADE STAFF.

4 Battalions of Infantry
2 Machine Guns
1 Company Army Service Corps
1 Bearer Company
1 Field Hospital

The organization of a Division of Cavalry in the field being:—

DIVISIONAL STAFF.

2 Brigades of Cavalry
1 Field Hospital, and 1 Bearer Company with each.

DIVISIONAL TROOPS.

2 Batteries of Horse Artillery
2 Machine Guns
Mounted Detachment Royal Engineers
1 Battalion of Mounted Infantry
Divisional Reserve Ammunition Column
1 Company Army Service Corps
1 Field Hospital (in reserve)

Practically, to each Battalion and Battery of Royal Artillery is attached a Medical Officer; but the Regulations only really allow one Medical Officer with every three Batteries of Horse and Field Artillery, which in this case are regarded as one military unit. This Medical Officer has placed under his command two soldiers per Company, who have with them stretchers, surgical havresacks, and water bottles. These give "First Aid" to the regimental wounded in the fighting line, and are known as the "Regimental Ambulance Detachment." These men must not be confounded with the "Divisional Bearer Companies," which I shall mention subsequently. The Medical Officer has at his disposal "Field Medical and Surgical Panniers," which are carried on a mule, and a "Field Companion" and

water bottle, surgical havresack, and circular tent. With smaller bodies of troops he has only a "Field Companion," water bottle, and surgical havresack. He is attached to the regiment, battery, or company throughout the campaign, and is the adviser on sanitary matters, and a Staff Officer of the Commander of the unit.

After the Battalion Medical Officer has given "First Aid" to the wounded in the fighting line, they are conveyed to the "Collecting Station" by his "Regimental Stretcher Bearers," and there handed over to the "Brigade Bearer Company." These men do not go beyond the "Collecting Station," but, after completing their duty, return again to the fighting line.

Two "Bearer Companies," a separate organization as subsequently detailed, are attached to each of the three divisions of an Army Corps. These are in reality Divisional Medical Units, commanded by the General and Principal Medical Officer of the Division, who is a Surgeon-Colonel; two "Bearer Companies" are also attached to the "Cavalry Division." This makes a total of eight "Bearer Companies" in an Army Corps. The "Bearer Companies" constitute the first line of medical assistance in the field.

Each "Bearer Company" consists of three Medical Officers, viz.:—1 Surgeon-Major and 2 Surgeons-Captain; 1 Officer and 40 Non-Commissioned Officers and men, attached from Army Service Corps, with 63 horses and 16 waggons all told; and 61 Non-Commissioned Officers and men of the Medical Staff Corps. These Non-Commissioned Officers and men of the Medical

Staff Corps are trained in Stretcher Drill and First Aid, also in the formation of "Dressing" and "Collecting" Stations.

Each Company has a total of 16 waggons and carts, viz.:—

10 Ambulance Waggons
1 General Service Waggon for Equipment
1 General Service Waggon for Stores
1 General Service Waggon for Army Service Corps details
1 Cart for Forage Supplies
1 Cart for Tents
1 Water Cart

A Surgery Waggon, when ordered for Service, contains medical stores, and is fitted up with boxes and baskets in which are surgical dressings, appliances, and instruments, cooking utensils, and medical comforts for the wounded. It also contains an operating table, and tent for surgical service at the "Dressing Station."

These "Bearer Companies" take post immediately in rear of the fighting line, and having formed a "Dressing Station," and there left a Staff, consisting of:—

1 Surgeon-Major, in command
1 Surgeon-Captain
1 Sergeant-Major
1 Compounder
1 Sergeant
1 Corporal
1 Bugler
4 Privates, one of whom is a cook,

and the remainder, that is, the Quarter-Master-Sergeant in charge of the baggage and supplies, with two privates employed as cooks for the Company, the Officers' servants, and one supernumerary, who remains in rear of the "Dressing Station," they move still further forward, and form a "Collecting Station," if possible just without the zone of infantry fire, where a Sergeant is posted with a "Field Companion" in his charge, and where the Ambulance waggons are left, to which are attached five Corporals and five Privates. Here the "Stretcher Bearers" are pushed forward in two sections under one Surgeon-Captain, each section consisting of one Sergeant and sixteen Privates; these give "First Aid" and "Dressings" to the wounded, arrest hæmorrhage, give stimulants, water, &c.; they collect the wounded, and carry them back to the "Collecting Station," where they are loaded into the Ambulance waggons. The "Regimental Stretcher Bearers" take part in this duty.

The wounded are then conveyed in the Ambulance waggons to the "Dressing Station." Here a more thorough examination of each case is made, and a classification of the various wounds and injuries taken, food, &c., being given. The Medical Officer then affixes to the clothes of the wounded man, a diagnosis "tally," on which is specified his regiment, number, rank, and name, with the nature of his injury, the treatment adopted, and any precautions required as to his transport; the man's name and nature of wound is also entered on the counterfoil of the "Tally Book."

From the "Dressing Station" the wounded are sent back to the "Field Hospitals" of the division which are situated still further in the rear; and at this juncture appears a weak point in our Ambulance Organization, from the fact that no supplementary transport is provided from the "Dressing Station" to the "Field Hospitals." This very heavy duty has to be undertaken by the Ambulance waggons of the "Bearer Company," as a "Field Hospital" has no Ambulance waggons, six of the ten waggons belonging to the "Bearer Company" being usually taken up for this service. It sometimes happens that the "Field Hospitals" are much delayed, owing to blocks on the lines of communication, in reaching the rear of the Army. Under these circumstances the "Dressing Station" becomes for the time being a very advanced "Field Hospital," where the wounded are temporarily attended, until the nearer approach of the "Field Hospitals" to the battle field permits of their removal.

And here it will not be out of place to consider what would be the "Ideal" position for a "Dressing Station," as set forth by Captain J. M. Grierson, R.A., in his work, *Staff Duties in the Field*, after the German of Major Cardinal Von Widdern. At page 130 he says:—

"An ideal position for a Dressing Station is from 1,000 "to 2,000 yards in rear of the fighting troops, at a point "not exposed to fire, and communicating with the front "by a good road.

"It should be established, if possible, in a building "with large and well-lighted rooms, in sufficient number

"to hold several hundred wounded lying down, and "there should be shade in its vicinity, and a plentiful "supply of water for drinking, and for washing and "bathing wounded men, and also, if possible, of straw "for bedding."

Captain Grierson goes on to state that "It is of the "highest importance that the first position of a Dressing "Station should be carefully chosen, as a change in the "position of a Dressing Station during the day on "which an action is fought is not advisable, and indeed "hardly possible. It would be impossible to close it "while numerous wounded were waiting to be attended "to, and, besides, it would take a long time to collect "and pack up all the material; and the return of the "greater part of the Stretcher Bearers would have to be "awaited before the Company could march off. Thus, "in packing up, marching to the next destination, and "establishing the 'Dressing Station' again, a great "deal of time would be taken up, and this time would "be lost for attending to the needs of the wounded."

Let us now deal with the "Field Hospitals" which constitute the second line of medical assistance in the field.

These hospitals are mobile, the tents and equipment are packed in waggons, and there are 13 such hospitals with an Army Corps in the field, viz.:—3 with each Division of Infantry, 3 with the attached Cavalry Division, and 1 with the "Corps Troops," and each has a Staff of 2 Surgeons-Major, and 2 Surgeons-Captain, 1 Quarter-Master Medical Staff, and 40 Non-Commissioned Officers and men of the Medical Staff Corps, with 26 Non-Commissioned Officers and men attached from the Army Service Corps, with 39 horses, and a total of 11 waggons and carts, all told, viz.:—

6 General Service Waggons for baggage equipment and reserve rations
1 General Service Waggon for Army Service Corps details
1 Forage Cart for supplies
1 Forage Cart for tents
2 Water Carts

Each of these hospitals will accommodate 100 wounded, and they may be divided into halves, should occasion require.

In the field, all medical establishments are distinguished during daytime by a red cross flag, and during the night by a red lamp between two white ones. Directing red cross flags are placed between the "Collecting" and "Dressing" Stations, and between the latter and the "Field Hospital," to mark the road.

The "Stationary Hospitals" on the lines of communication, of which there are three or more, constitute the third line of medical assistance. These will each give shelter to 200 wounded, and in addition to these, there are two "General Hospitals," both of which are capable of receiving 500 wounded.

One of these "General Hospitals" is situated at the base of operations, and is called the "Base Hospital," usually at a sea port.

Should it be impracticable to form this "Base Hospital" on shore, a ship may be utilised for the purpose.

From this place to England, "Hospital Ships," which are specially fitted and equipped for the proper transport of the sick and wounded, are running.

During our late wars in Egypt, some of the great Steamship Companies provided vessels for this purpose.

In the foregoing I have only dealt with the medical arrangements of an Army Corps in the field, but it is also necessary to consider the duties that devolve on an Army with regard to the disposal of their dead after a battle. This being essentially a sanitary matter, must be under the immediate supervision of the Medical Officers of an Army. In an Appendix will be found the German method, which the late Professor Parkes, who occupied the chair of Military Hygiene in the Army Medical School, Netley, alludes to in his Manual of *Practical Hygiene*.

Much of what I have here stated is the outcome of the training it was my privilege to undergo, whilst serving under Surgeon-Major G. J. H. Evatt, M.D., Army Medical Staff, at Quetta, and I have availed myself largely of his experience in the compilation of this book.

CHARLES J. ADDISON,
Surgeon-Captain,
Army Medical Staff.

Royal Victoria Hospital,
Netley, August, 1891.

Description of Plan on "Bearer Company" Practice, and of formation of "Dressing" and "Collecting Stations" as carried out at Netley for purposes of instruction.

On the left of the Plan, the "Bearer Company" is shown ready formed up with a party of men in front who are to represent the wounded, and the "Dressing Station" party behind, with the Ambulance and other waggons in rear. The position of the Officers, Warrant Officer, Non-Commissioned Officers and Men are shown.

The "Bearer Company" will be ordered to march off in Column of Route. The Medical Staff Corps in fours, party of wounded in front, and "Dressing Station" party in rear, followed by the Ambulance waggons, each of which is in charge of a Corporal or Private M.S.C., and with the remaining waggons also following in rear of the Ambulance waggons,—and here it may be as well to give the "Personnel" of a "Bearer Company."

War Establishment of a "Bearer Company," as given in Appendix 56, Regulations for Medical Services, Part I., 1890:—

MEDICAL STAFF.

1 Surgeon-Major
2 Surgeons-Captain

MEDICAL STAFF CORPS.

1	Warrant Officer	
1	Quarter-Master-Sergeant	
1	Compounder	
4	Sergeants	
1	Bugler	
6	Corporals	
8	Privates	
3	,,	Cooks
32	,,	Bearers
3	,,	Servants
1	,,	Supernumerary
Total 64		

Transport attached from Army Service Corps :—

OFFICERS.

1 Subaltern
1 Sergeant

ARTIFICERS.

1 Collar Maker
1 Farrier
1 Bugler

RANK AND FILE.

1	Corporal	
1	2nd Corporal	
29	Privates,	Drivers
1	,,	Batman
1	,,	Cook
1	,,	Supernumerary
Grand Total 105		

CARTS.

1 Forage for supplies
1 for tents
1 water

WAGGONS.

10 Ambulance
1 General Service, for equipment
1 for Medical Stores
1 for A.S.C. details

Total 16

On reaching the ground near the Monument, shown on the Plan, the Halt is ordered to be sounded by the bugler, the "Dressing Station" party is directed to fall out and form "Dressing Station," on which order the Non-Commissioned Officer detailed for the purpose, marches his men clear of the main body and the line of waggons.

The following is the detail of Officers, Warrant Officers, Non-Commissioned Officers, and men left at the "Dressing Station" :—

1 Surgeon-Major, to command
1 Surgeon-Captain
1 Sergeant-Major
1 Compounder
1 Sergeant
1 Corporal
1 Bugler
4 Privates, M.S.C. (one a cook)

The remainder, *i.e.*, the Quarter-Master in charge of the baggage and supplies, with two privates, M.S.C., employed as cooks for the Company, the Officers' servants, and one supernumerary are in rear of the "Dressing Station."

The waggons which are intended to be left at the "Dressing Station" will now be ordered to wheel to the left (or right), take ground to the left (or right), and form line at close interval; the horses' heads will then be facing the rear.

The Operating Tent is now taken out of the General Service Waggon by the "Dressing Station" party, and pitched opposite the centre of the line of waggons, fifteen paces in front of the line, door facing the front. A pair of Field Panniers is now placed in it, and two directing flags are placed in the ground, ten paces in front of the doorway, and ten paces from each other; and the two others in line with these, at points marking the flanks of the line of waggons.

As each Ambulance waggon arrives from the front, it will be made to halt and reverse opposite the space between the two flags in front of the tent. The "Dressing Station" party, assisted by the waggon Corporal, then unloads it. The "slightly wounded" fall in between the two flags on the left, the "severely wounded" are carried on the stretchers to the space between the two flags on the right, where the wounded will be lifted and laid on the ground. In both instances the accoutrements of each man are laid on the ground at his feet. The stretchers are then replaced in the waggon, which

immediately returns to the "Collecting Station" for a fresh load of wounded.

The wounded having been all brought in and distributed in this way into two groups, the Ambulance waggons will be retired in rear of the "Dressing Station." The "Dressing Station" party falls in two deep in front of the tent; and the "Bearer Company," on its return from the front and "Collecting Station," is halted ten paces in front of the "directing flags," and directed to stand at ease. The Surgeon-Major in command at the "Dressing Station" then examines the wounded, explaining to the men any mistakes that may have been made. The dressings are then removed, the "Dressing Station" party strikes the tent, the stretchers, tent, surgical havresacks, and water bottles are put away in the waggons, and the Company is formed up preparatory to being marched off.

Previous to this, and immediately after the order to "Form Dressing Station" has been given, the "Advance" is ordered to be sounded by the bugler, when the "Bearer Company" will resume its march further to the front, to a spot about opposite the Pier. Here a "Collecting Station" is formed, the "Bearer Company" being halted, and the Ambulance waggons reversed about ten paces in rear of the Company. When this has been done, the waggon Corporals prepare the waggons for the reception of the wounded, serve out the surgical havresacks and water bottles, required by the Company, for immediate use, and lay the spare stretchers on one side.

The party of men selected to represent the wounded are now marched to the front, about 200 yards, and directed to lie down in various positions; a specification tally is attached to the clothing of each wounded man, indicating the nature of his supposed injury. These tallies are numbered, and the Non-Commissioned Officer in charge of the "Collecting Station" will enter in a note book, as each wounded man is brought in, the number of the tally and the name of the number 4 of the stretcher detachment, so as to trace by whom the dressing was applied.

The Company is now formed up as for stretcher exercise—the guides march the numbers 3 and 4 to the waggons for the stretchers, surgical havresacks, and water bottles—on receiving which the men are marched back to the Company—the stretchers are lifted, and an advance ordered in the direction of the wounded. As soon as a stretcher detachment reaches a man, who, from the nature of his injury is unable to walk, the detachment will halt, place the stretcher by his side, and numbers 1 and 3 will at once prepare the stretcher, numbers 2 and 4 meanwhile attending to the wounded man. The dressings having been applied, the stretcher will be lifted and the patient carried on it to the rear, numbers 2 and 4 carrying his accoutrements, the prescribed words of command being given in every instance by the number 4. The Ambulance waggons will be loaded in the usual manner, and as soon as it is full will leave immediately for the "Dressing Station. The waggon Corporal accompanies the waggon back to the "Dressing Station"

and assists in unloading it there, returning again with it when empty to the front. When all the wounded have been removed, the "Bearer Company" will fall in, and be marched back to the "Dressing Station" in front of which they will be halted.

APPENDIX.

It is necessary to consider, and it may as well be considered here, the duties that devolve on an army as regards the disposal of their dead; this duty in the German Army is performed under the orders of the Principal Medical Officers of Divisions, who employ the inhabitants of the villages in the vicinity, who, while doing this duty are superintended and looked after by the Military Police of the Division.

The late Professor Parkes, who occupied the chair of Military Hygiene in the Army Medical School, Netley, in his Manual of Practical Hygiene at page 380, says: "At Metz in 1870, the following plan was adopted:— "A pit of about 17 feet in depth was filled with dead, "disposed as follows:—A row of bodies was laid side "by side; above this a second row was placed, with the "heads laid against the feet of the first row; the third "row was placed across, and the fourth row in the same "way, but with the heads to the feet of the former; the "the fifth row was placed as No. 1, and so on.— "Between each layer of bodies about an inch of lime, "in powder, was placed.—From 90 to 100 bodies were "thus arranged on a length of 6½ feet, and reached to "about 6 feet from the surface; the pit was then filled "with earth, and though 8400 bodies were put in that "pit, there were no perceptible emanations at any time; "it may be noted that whenever practicable the ground "should be sewn with oats, barley, or grass, and the "hillocks formed by the graves planted with trees."— Patrols are usually sent into the field after an action to prevent plundering.

PAMPHLETS

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