REMARKS ON THE TREATMENT OF THE SICK AND WOUNDED IN WAR.

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THE present moment, when all minds are engrossed in the contemplation of the fearful drama passing through its weary stages on the other side of the channel, appears to me an appropriate occasion for comparing the modes of succouring the sick and wounded in military services during the present and recent wars, with those employed before science had made its several important changes in the conduct of warfare.

In this examination, we must consider in what way the modes of receiving and treating the sick and wounded in battle have been altered from the means employed during the wars of the last, and even of the commencement of the present, century. Frederick the Great, we are told, experienced such insuperable difficulties in the way of adequately providing for his wounded, that he suggested that all wounded should be recognised by belligerents as neutrals (such, indeed, was the agreement between Earl Stair, commanding the English forces, and the Duc de Noailles, on the French side, in 1743); or, failing this mutual concession, it would be not only a more convenient, but a more humane practice, to abandon the wounded on the field of battle; arguing that, with the means at command in those days, any care that could be bestowed on the sick and wounded rarely did more than stave off death for a time, and so uselessly prolong their sufferings.

But other views have prevailed. The physicians who attended the forces engaged in these very struggles, in the middle of the last century, laid down, and sufficiently defined, most of the main principles of military hygiene, which, nevertheless, did not until recently receive much attention. The military authorities of this country neither copied the improvements of other nations, nor, during the peace subsequent to Waterloo, did they profit by the experience gained in the wars against Napoleon. The true advance for this country in the practice of military hygiene began when the English nation learnt, through their press, the ravages that death and disease from preventable causes were inflicting on the fine troops sent to the Crimea. This discovery at once aroused the national sympathy, and created the determination to compel the authorities to make the necessary exertion; which, supplemented by an abundant supply from private means, quickly converted a miserable exhausted remnant of a gallant force into an army complete at all points, and in the highest state of health and efficiency.

The English expedition to the East landed in the Crimea almost entirely destitute of transport and hospital supplies. This destitution and the disastrous wrecks at Balaclava caused nearly ten thousand men to die from preventable disease in the first winter. In the second winter, on the contrary, the loss by death was but six hundred; scurvy, typhus, and other diseases originating in hardship and neglect, were unknown. Indeed, through the wise and successful exertions of the Government and of the nation, during the second winter, the health of the British forces in the Crimea was as good as, or even better than it is at home in time of peace. (*Medical and Surgical History of the British Army in Turkey and the Crimea in 1854-5-6*. Presented to Parliament, 1858. Vol. ii, p. 43.) On the other hand, the French army, through their preparations for war, imperfect though they were, suffered less from disease during the first winter, sending in that period, from sickness alone, 81,000 cases to hospital, with a mortality of 10,000; but in the second winter they sent 106,000, with a mortality of 21,000, or twice as large as that of the first winter.

Let us now consider the consequences of neglecting or observing one or two of the most important principles of army hygiene. One of the most incontestably proved principles of military hygiene is segregation, or avoidance of overcrowding, either of the sick or of the healthy. Still, this important condition of health was not ensured to our troops until the middle of the Crimean war, since which time it has been upheld in every campaign as of first-rate importance. For instance, Sir John Pringle, who described the campaign of the British forces in Germany, under George II, in 1742-43, and in Scotland and the North of

England in 1745-46, gives the plainest possible examples both of the effect of overcrowding in producing disease, and of isolation in arresting its progress when at its worst. He tells us that, after the battle of Dettingen, in 1743, which, you may remember, was the last occasion of an English king being present on the field of battle, nearly half the English forces, of about 16,000 men, fell sick of dysentery. The village of Feckenheim was employed as a hospital. In it 1500 sick were lodged; hospital fever soon broke out, and spread even to the doctors and attendants, causing great mortality throughout the army. At last the camp was raised, and the disease at once rapidly abated. But 3000 sick were left behind; of these, nearly half died, and with them the unfortunate inhabitants of the village were almost wholly destroyed. So, again, in the campaign against the rebellion of 1745, the sick of the army under the Duke of Cumberland suffered most severely from typhus, or "jail fever", as it was then called, through the sick men being crowded into the workhouse at Lichfield; yet Pringle says that, at all other places where there was no common hospital, and the sick could not be collected together, the jail fever was unknown. (Sir John Pringle, M.D., *Observations on Disease in the Army*, 5th ed. London: 1765; p. 41.)

Without attempting to write an essay on hospital construction, it may be useful to touch on certain points which determine the salubrity of such buildings. All large hospitals are necessary evils; necessary, because it is impossible to manage and attend to large numbers of sick or wounded without grouping them together; evils, because each patient is a copious source of poisonous emanations, which, if not rapidly and continuously cleared away, breed disease and death for those around him. This being admitted, it remains to be seen how far we understand the methods of diminishing the mischievous consequences of aggregation so that they shall not outweigh the advantages the sick receive from medical attendance and nursing. These evils so rapidly gain strength that, as it has been remarked by several of the earlier writers on military hygiene, a bad hospital system will destroy an army faster than the most energetic government can recruit it. (Fergusson's *Recollections of a Professional Life*.)

In preventing the evils of overcrowding, the quantity of pure air deemed indispensable has undergone gradual augmentation, as special researches on hospital sanitation have successively increased the quantity, until at least a superficial area of 100 square feet and a cubic space of 2000 feet are now pronounced necessary for each patient. The air of this space must be renewed every hour, and for fever or pyæmic patients even twice in the hour. Indeed, for the latter, treatment almost in the open air appears to be most beneficial. The writers on the diseases of soldiers and sailors have again and again remarked that in fever epidemics, those patients who were the worst housed and the least protected from the weather recovered most rapidly and in greater numbers from those deadly diseases than others who were more commodiously quartered in regular hospitals, churches, or well-built houses. Dr. Parkes (*Practical Hygiene*, 3rd ed.) remarks that the effect of a great supply of air for some diseases is marvellous; he relates how the patients with spotted fever, in 1814, at Paris, were placed, with great reluctance, in consequence of the crowded state of the regular hospitals, in the abattoir of Montfaucon; and that, contrary to expectation, they recovered infinitely better in this structure than in the ill-ventilated wards of the regular hospitals. So, again, Donald Munro, writing his treatise one hundred years ago, which is replete with minute and practical directions for maintaining the health of troops, tells us (*Observations on the means of preserving the Health of Soldiers and of conducting Military Hospitals*, 2nd ed., 1780, Lond.) that, in 1755, some men-of-war carried out to North America a malignant jail fever brought by convicts impressed from prison to make up the strength of the crews, not an uncommon practice in those days. The fever continued to spread among the crews while the ships were at sea, but at Halifax the sick were lodged in huts or very old houses that admitted the air freely, and this change put a sudden and effectual stop to the disorder. The experience of former wars received so little attention in even recent wars that, for example, the overcrowding of the great French hospitals at Pera in the Crimean war, and at Genoa in the Italian war of 1859, was acknowledged to have greatly increased the mortality of the French sick (Chenu, *Statistique Médicale de la Campagne d'Italie en 1859 et 1860*, Paris, 1869; *Observations générales*, p. xxiv). During the Crimean war, the enormous loss by sickness in the French army was the consequence, we are told by Chenu, of the inability of the French *Intendance* to appreciate the importance of the most clearly recognised rules of sanitary science. In spite of the remonstrances of their chief medical officer, and of requests that quarters should be changed from time to time, the same field-hospitals for the immediate reception of the sick and wounded were employed throughout the war, with what disastrous consequences may be judged by contrasting the sickness and mortality of the three

successive periods of six months which the French army passed in the Crimea. In the first six months, 51,000 were sent to the tent- or field-hospitals, with a mortality of 4960; in the second, 85,000, with a mortality of 12,000; in the third, 61,000, with a mortality of 11,000. Similar testimony is borne by the results of treatment in the large general hospitals established by the French at Constantinople to receive their sick from the field-hospitals. The vast number of sick soon filled the accommodation the hospital originally provided, and the corridors were fitted up, in spite of the protest of the chief medical officer, M. Michel Lévy. Thus 2100 beds were installed in a single palace. The result was a mortality of 12 per cent. in the first six months, 18 per cent. in the second six months, and 27 per cent. in the third (Chenu, *loc. cit.*) This loss, in the third six months, was almost entirely from sickness, for active hostilities had almost ceased; only 300 wounded were treated. Again, Dr. Hammond, Surgeon-General to the Federal forces during the late American war (*Report of the American Sanitary Association*), in a report on the condition of the hospitals of Western Virginia and Maryland during an early stage of the war, states that in several of the hospitals 200 and 300 cubic feet, in one instance only 84 cubic feet per patient was the space afforded. It needs not further comment to lead us to believe that no time was lost by the Americans in changing this state of affairs and in producing the beautiful hospitals that served as receptacles for their sick and wounded in the later part of the war. To clinch the evidence of the enormous value of fresh air, and to show that it must be secured at any sacrifice, I quote the observation of Dr. Shrimpton, a surgeon-major in the French Algerian army (*The British Army and Miss Nightingale*, Paris, 1864, p. 52). In the second winter of the Crimean war the three armies of the English, French, and Sardinians were all huddled. But the huts of the English were alone constructed (thanks to the labours of English sanitarians, directed by the late Lord Herbert) with due regard to ventilation. As a consequence, the English army was that winter quite free from typhus and other fevers, while the French had 73,432 admissions to hospital, for "of ventilation there was none."

The undeniable evils that result from overcrowding in hospital, and the rapid improvement that takes place in even apparently hopeless cases, when either by accident or design they obtain a free supply of fresh air, has led to the opinion that sick persons should never be collected together; and that the obvious advantages, both to the sick themselves and to the cause of science, by housing them together in hospitals, are outweighed by the evils that they inevitably suffer from propinquity to each other. Dr. Farr (*Twenty-fourth Report of the Registrar-General*, pp. 229 *et seq.*) first attracted attention to this point by a series of statistics, which showed that in our large metropolitan hospitals the mortality was twice as great as that in similar but much smaller institutions situated in provincial towns or in country districts. He thus concluded that this difference was due to the unhealthy and overcrowded condition of our London hospitals. This important suggestion excited much discussion at the time; Dr. Guy, of King's College, suggested that possibly some part of this enormous difference should be ascribed to the difference in the kind of cases admitted to our London hospitals from those attended in provincial institutions. This suggestion of Dr. Guy was held to be the true explanation by Mr. Holmes and Dr. Bristowe, who were charged by the medical department of the Privy Council to visit the different hospitals of the United Kingdom, and to report upon their relative healthiness and upon the causes which determine the mortality in these institutions (*Appendix to the Sixth Report of the Medical Officers' Report to the Privy Council*). The large London and provincial hospitals admit a far greater proportion of acute medical cases, of which the mortality, wherever treated, is high. From these gentlemen's reports, it would appear also that those diseases which are chiefly met with where large numbers of wounded are collected together, diseases that are doubtless much increased by defective ventilation, such as erysipelas and pyæmia, form but a small percentage of the mortality of a London hospital, and are by no means unknown in the rural hospitals.

The late Sir James Simpson, who turned his energetic mind to solving the question of mortality in hospitals, arrived at the conclusion that it is impossible to prevent a high mortality if more than a very few patients be placed together under one roof; and that the advantages of hospital treatment, without preponderating evil, can be afforded to the sick only by treating them in a series of small detached buildings. Sir James showed that of 2008 amputations in private practice, 226 died; and of 2089 amputations in hospital practice, 825 died. This gives a surplus of 629 deaths in hospital practice; and, taking St. Bartholomew's to represent a large well-managed London hospital, he showed that, whereas 1 in 9 of the rural amputations died, 1 in 2½ died of those performed in that hospital. Moreover, Sir James pointed out a fact that to my mind is most cogent; namely, that the difference

in mortality was greatest, not in amputations of the thigh (which operation, it has been suggested, is resorted to in the country for less severe injuries than in town, and would thus show a larger percentage of recoveries), but that the mortality after amputations of the forearm is 15 times greater in St. Bartholomew's than in private practice in the country.

Ultimately, Sir James Simpson put forward this table of the results of 6000 cases of limb-amputations.

In Parisian hospitals	1 died in 1½
In British hospitals, over 300 beds	1 " 2½
" " from 300 to 180 beds	1 " 4
" " from 120 to 50 beds	1 " 5
In cottage hospitals	1 " 7
In private practice	1 " 9
Ditto of frequent operators	1 " 12

Against this, at first sight, most striking series of statistical facts, it has been advanced, with much truth, that, while we know pretty accurately what were the conditions of patients operated on in the hospitals, and can estimate how far their previous conditions influenced their recovery from operations, we have no means of doing the same by those operated on in private practice; hence the comparison lacks a condition essential for accuracy; and until these data are supplied the question is not ripe for discussion. In the meantime, Mr. Callender (*BRITISH MEDICAL JOURNAL*, October 1869) has introduced a fact that goes far to exonerate the hygienic condition of large town-hospitals from increasing the mortality after operation. He showed that the mortality of a small series of amputations on persons sent to St. Bartholomew's Hospital from the country, and therefore presumably in a constitutional state similar to those operated on in the country, was 1 in 5½, or almost identical with that set down for rural hospitals by Sir James Simpson. Nevertheless, until the question is settled, it is open to presumption that some part of the enormous difference in the relative mortality of town and country hospitals is caused by faulty hygiene; and it may fairly be expected that the experiment on that subject now being carried out will give us some valuable results for elucidating the question.

Having adverted to the enormous loss that attends overcrowding and neglect of hygiene, it is very reassuring to mark how nearly all arrangements for treating the sick and wounded in the present war have been subordinated to the principle of segregation. Our own Government has, since the Crimean war, made most important steps in this direction, though leaving still something to be done before all that past experience indicates as necessary is adopted. The unsuitableness of dwelling-houses, churches, and other ill-ventilated buildings, has been very extensively recognised; and a great portion of the hospital-accommodation prepared for the wounded consists of hut-hospitals either erected for the purpose, or contrived from open sheds in which the necessary free ventilation can be satisfactorily obtained. Let me, then, for a moment occupy your attention with a brief sketch of the arrangements of the hut-hospitals called Barack-Lazarethen in Germany. The most successful military hospitals of modern times have been constructed on the plan first devised in the Crimea by Mr. Brunel. Under the instruction of the sanitary officers, the hut-hospitals have proved that certainly hospital-fever and hospital-gangrene, and probably pyæmia (diseases which have destroyed so many of the wounded in former wars), can be entirely prevented in military hospitals.

In construction they are extremely simple, and can be erected from the commonest materials in a very short time. A short description of the hut-hospital at Saarbrück — one of the best in point of sanitary excellence I saw during my recent visit to Germany — will serve to explain their mode of construction. In an open garden clear of the town, the series of single-roomed huts which formed the hospital were arranged in a double row, each hut being separated from its neighbours by a space equal to its own height. Light and air can thus penetrate freely around. The ground was well drained to carry off rain-fall water, and a distinct system of pipe-sewers carried away the excreta and refuse of the hospital. Water, laid on from a neighbouring mountain rivulet, was present in any quantity. The huts, built of rough weather boarding, were raised on stages two feet above the ground, so that air penetrated freely between the planks of the walls, the floor, and the roof. Besides this, at the floor-level, apertures were purposely left for the entry of fresh air, while the ridge of the roof was lifted above the rest to a height of eight inches along the whole length of the hut, in order to afford an easy exit for the heated air of the interior. The windows consisted partly of glass, but chiefly of light shutters, that could be raised or lowered at pleasure, being fixed above on hinges and free before. Each hut contained about fifteen beds. At the time of my visit almost all were occupied. The kitchen and other offices and abode of the surgeons, nurses, and attendants, were constructed in additional huts of a more complex and permanent kind; but the sick

were entirely housed in isolated batches of fifteen, in domiciles through which the wind blew freely in and out on all sides. The atmosphere of the interior was as fresh as the air outside. This absence of anything like a sick-room smell I noticed only in the hut-hospitals: in buildings of every other kind it was easy to detect that peculiar smell so universal in continental hospital wards, and not unknown in even our better managed English hospitals. In all the hut-hospitals which I visited, the condition of the patients was most satisfactory, and not a single case of pyæmia had occurred. In the houses and other buildings converted into hospitals, in too many instances hospital diseases have begun to appear. For example, I visited at Saarbrück a large building, the school-house of the town, which had been occupied as a hospital about six weeks. I found that one ward had been entirely emptied for purification; four patients had died of pyæmia in the few days before my visit; and other cases of pyæmia and hospital gangrene had previously occurred; yet the building was apparently well adapted for its new use, being situated in the outskirts of the town, and, consisting of lofty rooms, with wide easily-opened windows, reached by a wide airy staircase. So again in the hospital for wounded in the Bessunger Orangeriehaus at Darmstadt, in which Her Royal Highness the Princess Alice takes so constant an interest. This beautiful hospital, situated in a fine garden, was built by the Grand Duke of Hesse Darmstadt. It consists of a series of huts built on the plan I have described, the gifts of various charitable persons, and of three houses used in winter for storing the orange-trees, which in summer decorate the garden. These orange-houses at first sight appear well suited for hospital use: they are wide, lofty rooms, with windows on the sunny southern side, reaching from ceiling to floor, and opening freely. But the absence of doors or windows on the other sides renders thorough ventilation extremely difficult; and in these orange-houses several cases of pyæmia and one of extensive gangrene have already occurred; the latter, however, ceased to spread directly the patient was removed from the orangery to a small tent of which the sides were open all round. My visit to the hospital, in managing which the Princess Alice takes an active part, was extremely interesting. The surgeons there carry out the newest methods of conservative surgery with great zeal and assiduity; and are thoroughly impressed with the unfitness of the orangeries for the reception of wounded men. They are very anxious to get huts to receive all the 240 patients under their charge, but their funds are nearly exhausted, and the £200 necessary for the construction of two more huts is a great difficulty. In towns smaller than Darmstadt and Saarbrück, single hut-hospitals have also been prepared. In large cities like Berlin, hut-hospitals have been prepared on the enormous scale found so successful and economical in America during the late war. Such an one, to receive 1300 patients, is now preparing in an open space near Berlin under the superintendence of Professor Virchow. It is in its main features a reproduction of the great hospitals at Philadelphia and other large cities of the United States. The plan which hangs before you represents the Mower General Hospital of Philadelphia, which consists, as you see, of a series of one-storied huts disposed round an interior area, in which the offices and abodes of the administration are situated. The site was a high and airy plateau, on which fifty huts afforded accommodation for five thousand patients. These huts were arranged like spokes of a wheel, around a central corridor open freely to the air, and warmed in winter by stoves; and this afforded at all seasons a pleasant lounge for the convalescent patients. A tramroad ran round the corridors, on which waggons brought the food and supplies to the end of each hut-ward without delay. A telegraph connected the huts and the kitchen with the director's office and other parts of the administration. A branch from the railroad permitted the railway cars, in which the patients had been laid near the battle-field, to discharge their freight at the door of the hospital: thus the patients suffered only one change, from the railway to their beds. Among other arrangements, there was a printing establishment on the premises which printed a newspaper, edited by one of the chaplains, and filled with news and articles written by the patients and medical officers. The journal was distributed gratis to all the patients, its cost being defrayed by the sum received for the slush from the hospital kitchen. A telegraph and post-office completed the communication of the vast sick asylum with the outside world.

Transport.—Having described the receptacles for sick and wounded, which have been constructed on the principles of segregation, and which, it must be recollected, have been prepared on a greater or less extent in every town of Germany, with the double object of preventing too great an agglomeration of the sick, and of distributing the burden of their care and maintenance equally over the community, I next proceed to the question of transport. This, since the American war, has attained, through the addition of voluntary aid, marvellous progress in its organisation.

As lately as the wars of the first French republic, the only means of

transport for the sick and wounded were the baggage-carts and the services of soldiers from the ranks where they could be spared. The first Baron Larrey, while attending the republican armies on the Rhine, devised a system of special carts with sick-bearers to convey the wounded from the front; for, at that time, the moveable field-hospitals were one league in rear of the attack, consequently twenty-four hours always elapsed before the wounded were brought into hospital. This was the commencement of the system of ambulances which is now employed by the French army, and has, with many modifications, been adopted by all other military nations. It will, perhaps, be as well to explain the different meanings attached to the word "ambulance". Abroad, it signifies a *moving hospital*, i.e., a corps of surgeons, attendants, stores, waggons, horses, etc. In England, the term is frequently, but erroneously, applied to the waggons for conveying the sick from place to place. I shall always use it in the continental signification. In the hands of the French the ambulance system frequently breaks down. The direction and supply of the material, waggons, horses, stores, etc., are entrusted to the *Intendance*, a department that manages commissariat, transport of supplies of all kinds, even the convoy of ammunition; and, consequently, has far too much to do to allow it to meet sudden emergencies in the Medical requirements of the army. Again, an invariable consequence of this centralisation is a general break-down when the army to which it is attached suffers defeat, as in the present war. The French *Intendance* has been utterly unable to assist in the conveyance of their wounded, who have been left to the Germans and to the few volunteer French and foreign ambulances that have been able to get to the battle fields. Nay, even when the army is in a friendly country or victorious in a hostile one, the *Intendance* has been unable to meet even a trifling demand when of an unexpected character. The Emperor Napoleon III, at the outset of the Italian campaign of 1859, decreed that the baggage of the officers should be carried for them by the *Intendance*. This could only be done by taking for that purpose the cattle which were attached to the hospital field-waggons. (Chenu, *loc. cit.*, p. 6.) It is, therefore, not surprising that, a few days later than the date of this decree, we learn that for four days after the battle of Montebello, 20th May, 1859, 800 wounded were fed entirely by the charity of the inhabitants of that town. The *Intendance* had failed to bring supplies, and still more, surgical necessities of all kinds were badly wanted. (Chenu, *loc. cit.*, p. 30.) In short, had the French been fighting in a thinly inhabited or hostile country in 1859, their loss from sickness even great as it was (for the enormous number of 193,186 men were sent to hospital during the short stay of the French army in Italy), would have been largely increased. But far more disastrous than this was the condition of the English army in the beginning of the Crimean war, and of the American army at the beginning of their last war. The English army landed in the Crimea with a means of transport of one pony and ten canvas stretchers per regiment. Notwithstanding that the principal medical officer of the Crimean army had before the campaign, as he states in evidence before the Sanitary Commission, asked for 42 waggons, 336 canvas stretchers, and 672 men for his hospital corps, he received, in return, three waggons without horses, harness, or drivers. (*Official History of the British Army in Turkey and the Crimea*, vol. ii, p. 253.) This neglect delayed our army two days after the battle of the Alma, collecting the wounded; and many lives would have been lost had not the French lent their litters and mules to transport our sick and wounded to the shore, where the crews of the men-of-war conveyed them to the hospital ships. Again, after the battle of Inkermann, the French lent us 500 mules to bring in the wounded, and in great measure to their aid we owe it that the English wounded on that occasion were in bed and attended to by ten o'clock of the evening after the battle. Indeed, it is reported (Shrimpton, *loc. cit.*, p. 19) that from December 1st, 1854, to January 20th, 1855 (seven weeks), 8000 sick belonging to the British army were borne on mule-litters and cacolets lent by the French, from our camp to Balaklava, where they were embarked for Scutari, a voyage of seven or eight days. These miserable creatures were often so crowded together that it was impossible for the attendants to get near enough to them to supply their wants. A large number died on the voyage and were thrown overboard. Of these no account could be taken; but when those who survived these miseries arrived at Scutari, they were without their kits, and almost without clothing, numbers of them in a dying condition—unable to tell either their own names or the regiments to which they belonged.

It is extremely gratifying that in the second winter, when we were well housed, efforts were made by the British commanders to assist the French—on whom, by the way, lay the chief burden of preventing the Russians from escaping from Sebastopol after active hostilities had ceased. Dr. Baudens (Chenu, *loc. cit.*, p. civ) tells us that Sir Henry Storks offered to construct and maintain accommodation for 1000 sick

in the French camp, saying, "Whatever we do, we cannot repay what the French did for us last year." So also may we rejoice that, during the present unhappy crisis in France, the English have another opportunity of returning to the French sick and wounded some of the aid which our distressed countrymen received from their army in the Crimea.

But the want of a prearranged system of transport and machinery for receiving the sick and wounded was most grievously felt in the early battles of the American war. Dr. Hammond, afterwards the American Surgeon-General (official letter to United States' Secretary at War, quoted by Longmore, *The Transport of Sick and Wounded*, p. 16), writing eight days after the first battle of Bull Run, tells his superior that 600 wounded then remained on the battle-field, where many poor fellows had already died of starvation. So also, after the battle of Manassas Gap, September 7th, 1862, 2000 wounded lay from Saturday to Wednesday on the field without food or water. The surgeons even were starving with their wretched patients. Again, Dr. Agnew (Longmore, *loc. cit.*, p. 17), a member of the American Sanitary Commission, estimated that 500 lives were lost after the battle of Antietam, September 17th, 1862, for want of proper transport. The news of these and similar horrible mischances acted upon the Americans of the Northern States as thoroughly as that of our own Crimean disasters did on us. A volunteer association was formed, endowed by the Government with large inspectional powers, and furnished with abundant means for the succour of their sick and wounded soldiers, from the contributions of all classes of their fellow-countrymen. From the foundation of the leading volunteer association and its satellites, order and plenty were quickly provided for the soldiers and the sick and wounded. The volunteer aid and transport was so perfectly organised that on many occasions—notably on that of the battle of Fredericksburg, December 13th, 1862—the carts and agents of the volunteer aid societies were under fire on the field of battle several hours before the ambulance carts of the regular forces reached the scene of action. These volunteers carried off the wounded as they fell, to hospital-tents, where their injuries were dressed and their wants supplied; and again at Gettysburg, July 1863, one of the battles which decided the war, where 20,000 Federals fell in the three days of the battle, and at least as many Confederates, the agents of the Sanitary Commission were again so close to the moving columns with their supplies and assistants, that by the day after the fighting ended every wounded man was in hospital, his wounds dressed, and his clothes changed.

The transport and aid for the sick and wounded was developed to a higher perfection by the Americans in their war than by any other nation. In the present war, many of their expedients have been copied—notably that of the arrangement of hospitals for receiving the wounded away from the scene of war; and, again, that of the hospital-trains, etc., which form part of the means of transport immediately to be described.

The German system of transport is in two parts—one organised by the Military Department, the other the volunteer transport; which last, though recognised and aided by the Government, is entirely dependent for its funds on the contributions of individuals.

The Military System of Transport.—In the Prussian service, each army-corps of 30,000 men is considered a complete army, and is supplied with equipments of every kind to enable it to act independently, if advisable. There, each army-corps has its medical staff of twenty head-surgeons, with a proper proportion of assistants, dressers, carriers for the wounded (*Krankenträger*), drivers, horses, litters, stores, waggon, some to convey the wounded, and others to convey surgical stores, water, etc., on going into action. Certain of the surgeons, with the sick-bearers, litters, and waggons, are detailed to follow the *corps d'armée* closely; the remainder post themselves in the neighbourhood, to form the field-hospitals. To these, the surgeons of the detachment with the forces engaged in action despatch the wounded as fast as they are gathered by the sick-carriers from the field of battle. The wounded receive attention to their most urgent wants without delay. Each soldier carries on his person a bandage and a piece of lint, which the sick-bearers are taught to apply, as well as to put in force means of stopping loss of blood, should that be necessary, before the wounded man is raised from the ground. The sick-bearers are likewise instructed in the best way of carrying the man, according to the nature of his wound. With these precautions, the wounded are taken to the surgeon, who is close to the scene of action. He examines the wound; applies splints or what dressing is necessary to enable the man to reach the field-hospital; and inscribes on a slip of paper provided for that purpose the nature of the injury and what has been done to relieve it. Thus, when the man reaches hospital, needless examinations are saved. All these officials are, in time of peace, carefully drilled in their duties, and have as their sole charge the collection and attendance of the wounded in battle, or the sick who fall out on the march. Thus the com-

batants not only fight with better heart, knowing that, if disabled, a body of skilled bearers will come at once to their rescue, but they have no excuse to leave their ranks at a critical moment of the fight to carry a wounded comrade to the rear.

The wounded or sick being safely disposed of in the field-hospital, the next step is to restore them to such a condition that they can be despatched to the permanent hospitals in Germany which are ready to receive them. This is always most advisable, because the field-hospitals are rarely, if ever, supplied with the best means of repairing injuries; nor are they salubrious abodes. It is also necessary to clear out these primary hospitals, to make room for fresh cases constantly coming from the front. Indeed, the heavy slaughter of the recent battles was far greater than the field-hospitals could meet; and thus the neighbourhoods of the battles have been crowded with wounded and dying, in a condition, as far as they are concerned, almost as bad as if no provision whatever had been made beforehand. Again, the necessities of the campaign require the staff of the surgeons, with their assistants, to leave their wounded, and to follow the marching columns, to be ready for the next engagement. In these emergencies, the *Volunteer Aid* associations have rendered important services. Their organisation enabled them to undertake the conveyance of the wounded already sufficiently restored to bear locomotion to their permanent abodes, to take charge of those not yet ready to move, and even to go to the scene of battle and aid the regular medical staff in applying dressings to the wounded.

The transport of the sick is accomplished in the following manner. Trains of ambulance waggons, and of country carts, when, as has often happened, the former do not suffice, are organised to travel to the nearest station on a railway open to the Germans. To this station is sent a service of trains, composed partly of the long American cars used on the Würtemberg lines, and partly of luggage-vans. These carriages are fitted up with one or two tiers of cots, supported on elliptical springs fastened to the floors. In each train, travel a surgeon, attendants, and nurses, with provisions and supply of medicines for use *en route*. When all is ready for evacuating the field-ambulance, the patients are fed, their wounds dressed, and their wants supplied as well as the resources they are about to quit will allow, and they are placed in carts—too often, alas! of the rudest description—in which they travel, whatever may be the weather, to the railway station. Here a corps of the Volunteer Association is ready to receive them; to lift each man from his waggon, carry him to the sheds, where the surgeons quickly change his dressings (often sorely in need of it), feed him, and change his clothing before he is deposited in his cot in the train. When all of the convoy is removed from the carts, the latter return to the field hospital for a fresh detachment, and this process is repeated day after day.

The train starts on its journey, halting two or three times every day at towns *en route*, which receive a telegram announcing the approach of the convoy, in order that when the train arrives everything may be ready for dressing their wounds, and giving the sick a hot meal. The surgeons and dressers prepare their stores of lint, bandages, clean clothes, etc., and, by the time the train is due, the number of clerks, lads from shops and elsewhere, volunteers who have enrolled themselves for this purpose, appear on the platform ready to convey their patients to the dressing-places. If the train arrive after dark, the well lighted platform becomes, as the cars cease to move, a scene of picturesque activity. Carriage after carriage is quickly entered, the sick borne out, and their wants supplied. If they have not, as often happens, changed their clothes since the battle, they are re-clothed from head to foot. Having received a good meal, cigars or tobacco, and, if they can write, having delivered their letters to a clerk, who undertakes to post them, they are carried back to the train, which, as soon as all its occupants have been refreshed, resumes its journey. The lamps are then extinguished, the bearers, dressers, and cooks disappear, and stillness reigns where, a quarter of an hour before, all was bustle without disorder. A striking feature of this scene was the contrast between the panic-stricken and hungry, though patient, countenances of the wounded, and the fresh, cheerful—I may even say merry—faces of their attendants, who work with such hearty good will, that for a moment the idea suggested itself that these young lads must be relatives of the wounded soldiers on whom they waited with such tender devotion. When the train has deposited its burden in the destined hospital, it returns to the gathering place for a fresh convoy. In this way, enormous numbers of wounded and sick have reached the Fatherland, and even their native towns. As many as 40,000 patients have passed through Mayence alone since the first battle of the war; indeed, they still come in crowds, 13,700 having been attended to at the halting place of Mayence during the eight days preceding my visit. Besides railway hospitals, sixteen Rhine steamers have been fitted up, and have conveyed many thousands

down the river to the cities on its banks in the easiest possible manner.

By these means, the sick, at first hastily collected into churches, houses, and hovels, their wounds treated as well as the means at hand would allow, have been rapidly deported into permanent and properly prepared hospitals. The Germans have been taken into Germany, whither also the slightly wounded French have gone as prisoners of war, as soon as their recovery was sufficiently advanced. The French who were severely wounded in the battles near the frontier are passed into Belgium, where they have been received into hospitals prepared in every large town, and treated with extreme assiduity and skill, under the immediate supervision of the King and Queen, who, as is well known, are ever active in the cause of benevolence. Belgium, by allowing her railways to be used for the heavy traffic of the thousands of German wounded, and by receiving any German wounded who chose to stay in her hospitable cities, besides providing for thousands of luckless French, has not only suffered inconvenience, but also serious loss, by the war. She will, I trust, be well repaid by the lasting gratitude of both France and Germany.

Having thus depicted but very imperfectly the manner in which the Volunteer Aid societies of Germany perform a small portion of their self-imposed duties, namely their share of the transport of the sick and wounded, I may detain you a few minutes with a word on the organisation of those societies.

That their work is of the highest value has, I trust, become clear from the earlier part of this paper, where, from the greatness of the emergency, regular medical staff and hospital corps must fail to supply adequate attendance to the masses of wounded men who, in the battles of the present day, are suddenly rendered helpless. This want can only be met by volunteers, who must supplement the action of the regular medical staff in every way. This fact has long been apparent, and has from time immemorial called forth the charity of individuals, and has in later times, here and there, even set on foot some slight organisation for the aid of the sick and wounded. The earliest with which I am acquainted is the Ladies' Union (*Frauenverein*) of Frankfort, which was formed in 1813 by three ladies of that city, to succour the wounded in the great struggle which led to the discomfiture of Napoleon I. In 1847, the short war of the Sonderbund called forth a society at Zurich, which, however, came to an end with the termination of hostilities. This was unfortunately the fate, also, of the aid-societies formed in Austria for the wars of 1859 and 1864, so that in the war of 1866 these useful associations had to be constituted afresh. The Crimean struggle was the occasion for the noble efforts of this country and the generous devotion of Miss Nightingale; but no organised society sprang up in the national crisis, and, the need for volunteer aid having passed away, the nation no longer interested itself in the matter. In the late struggle in the United States, a volunteer aid association—the American Sanitary Commission—grew up, which had a career of the utmost success. In the three years of its existence, it collected no less than 2½ millions sterling, and saved, it is said, 100,000 lives.

The German aid societies (*Hilfsvereine*) have had a very similar organisation. Many independent associations exist, working in the districts in which they have been established. Most of the larger ones are represented by a delegate to a central committee in Berlin, which receives contributions from the smaller societies, and disburses them both directly through its agents at the seat of war, and among the hospitals in Germany, and sends subsidies to the various societies whose resources are drained by extraordinary demands. One of the principal of these individual societies is the Knights of St. John, which ancient corporation has, in its new field of action, begun again its useful labour. Its regular members are mainly drawn from the aristocracy, many of them soldiers, taking active share in the campaign, who eagerly devote any leave or leisure they may obtain in aiding their brethren who are continuously engaged in the good work. Under the direction of this order, which, owing to its importance, enjoys a position recognised by the German Government, and possess many privileges, bands of volunteer assistants are enrolled and held ready to be despatched for service whenever they are most required.

It is said that over 13,000 volunteers are employed in various capacities in the present war, in succouring the sick, wounded, and distressed soldiery. The carrying out of these arrangements of this and other societies has been greatly facilitated by the Geneva Convention, by which all wounded and their attendants are treated as neutrals and their supplies are not liable to capture. This is the first war in which this convention has operated throughout.

The Surgery of the War.—The progress of surgery during the last twenty-five years has not been without effect in modifying the treatment of injuries received in warfare. In this period most important changes in the art and practice of surgery have been established. The general

use of anæsthetics is, perhaps, the most striking change. When the Crimean war commenced, the opinion of military surgeons was divided on the expediency of using it in very severe injuries, it being supposed by some that chloroform diminished the chance of recovery when the patient was prostrated by the shock of a severe injury; while, on the other hand, the sharp agony of the amputating knife was deemed useful to arouse the wounded sufferer from his exhausted condition. This belief was rapidly exploded, and, in the English camp at least, the use of chloroform became universal in all operations of any magnitude. In the present war the bounteous supplies contributed by charitable persons have also enabled the use of chloroform to be very general, and the cases where it was not used are very few.

Luckily, the nervous condition of soldiers, while excited by the struggle, prevents them from feeling painful operations nearly so acutely as do civilians when injured under ordinary circumstances. It is difficult to believe, yet it is perfectly true, that a young soldier, immediately after undergoing amputation of the arm, declined to stay in the bed where he had been placed, and, with a cigar in his mouth, returned to the operating room, to watch with lively interest a similar amputation performed upon a comrade.

Besides chloroform, the subcutaneous injection of morphia, and the new narcotic, chloral hydrate, are being employed with enormous benefit to those with severe suppurating wounds and extensive laceration of the flesh. Nitrous oxide is also to be tried largely; but how far it will practically be of use we do not yet know.

Of far greater importance is the substitution of resection of injured joints for amputation of the limbs. The experience of English, American, and German surgeons has demonstrated that, in cases of injury to the shoulder, the elbow, and perhaps the wrist, the limb left after resection of the joint in the majority of cases becomes more useful than any artificial appendage to a stump. Some very remarkable instances of the serviceableness of a limb so crippled have occurred in the surgical practice of the New Zealand war. Of eight cases operated on in New Zealand, which, on their arrival at Netley, were examined by Professor Longmore (*Army Medical Reports* for 1863 and 1864), considerable usefulness had been regained in most of the injured limbs, in some to a remarkable degree. A sergeant, whose shoulder had been resected for gun-shot injuries, had recovered so well that he was able to load and shoot off his rifle, and to lift considerable weights with the injured limb.

Similarly good accounts are given of the resections for injured joints of the upper limb in the German wars of 1864 and 1866; though it must be admitted that recently Hannover (*Medizinische Jahrbücher*, 18 Bd, 1869, p. 109), describing the condition of certain Danish soldiers who had been treated by resection in the German military hospitals during the war of 1864, throws considerable doubt on the ultimate usefulness of limbs of which the joints have been resected. In many cases, he says, the limb is an incumbrance, capable of very little use and a source of constant anxiety, lest it should receive injury. This intelligence, which must be accepted with some reserve, clearly shews both that the advantages of resection over amputation, in some cases of undoubted reality, and the rules for selecting either operation, are not yet fairly set down in surgical practice. We may, however, confidently look forward to the results of the present war making a considerable advance in this respect.

But from the observations that I was able to make in the hospitals and houses where the wounded were being treated during my recent visit to the scene of war, I am convinced that before niceties of conservative surgery can have fair trial, much more must be done in the provision of hospital and surgical accommodation. How greatly are the chances of recovery cut down in a case of compound fracture if the patient lies in a damp hovel on straw, half-starved, without anodynes to soothe his pain, without splint or apparatus to fix the injured parts at rest; or even supposing the patient is fairly cared for, is immediately lodged in dry and not overcrowded quarters, has an appropriate splint, how severe the ordeal of fifteen or twenty miles in a springless waggon, over rough roads, in drenching rain, and then three hundred miles in a railway-truck on straw—such has been the fate of hundreds—until the patient at length reaches the proper habitation, and receives the assiduous care that he needed a fortnight before when first wounded.

The consequence of this want of rest of all kinds has been to cause matter to collect along the track of the bullet, to excite general fever, and not unfrequently blood-poisoning, in which case the patient's only chance for life is amputation. This is not surgery as we understand it, nor as it is practised in all decent hospitals. Until these adverse conditions are removed it will be impossible to determine, scientifically, the various modes of treatment to practise in gun-shot injuries. Many limbs are now lopped off that undoubtedly, in better conditions of hygiene, might be saved. And to these limbs, so amputated, a fair chance

is not given by a long railway journey. The attachments of the healing surfaces are shaken asunder, so that conical stumps and protruding bones were by no means unfrequent in the hospitals where the primary amputations had been received.

In face of the enormous pressure, the preparations fell far short of the requirements of the occasion and of the utmost efforts of the surgeons, who were rarely able to carry out the most approved practice of modern surgery. The application of the plaster of Paris splints to compound fractures, though generally approved, was, where I went, the exception, not the rule, simply because the means were not at hand for employing them. Of Lister's method of treating wounds by carbolic acid I did not see a single instance. Carbolic acid is much used, it is true, but as a wash, or as an oily solution spread on a handful of charpie secured by a bandage. Doubtless, the carefully considered instructions published by Professor Lister for the use of military surgeons will be followed in several of the hospitals in Germany itself; but the colossal scale of the war, and the enormous difficulties that over-taxed the energies and resources of the surgeons at the seat of war, have prevented anything like a general application of the best surgery of the present day, though here and there, no doubt, the perseverance of our comrades has enabled them to put the best methods of treatment in operation.

This lecture has already taxed your patience most severely; I had intended to include an outline of the means this country should adopt in preparations for the medical treatment of our soldiers in war, should that unhappily be forced upon us. It has, however, been abundantly manifest to all who have watched the progress of the present war in the public prints, that no Government can adequately meet the exigencies of actual warfare; that, while enlarging the medical staff and supplying it with every appliance for the collection and treatment of the sick and wounded, it must enlist the services of a staff of volunteer assistants, by encouraging the establishment of societies in time of peace, by assisting them with its advice and experience, and by promoting the drill and equipment of those who undertake at the outset of war to put themselves at the disposal of the military authorities.

It must now conclude, only let me congratulate you, who to-day enter our noble profession, on the auspicious moment you have chosen. Never was the value of the physician or of the surgeon more generally acknowledged, or his opportunity better for rendering the great services that our professional training enables us to lavish on the unfortunate victims of a misused civilisation.

I assure you that many a time did I feel a glow of pride, though only a bystander, in belonging to a profession whose skill and devotion were bringing ease of mind and body to hundreds of miserable fellow creatures, starving and dying in agony. Prepare yourselves: your opportunity will come, I trust in not so bloody an epoch as this; but in occasions less exciting, and, therefore, conferring the more credit on you who undertake the often tedious duties of our sacred calling. Your vocation will not lead you to the highest offices of the state, or to the renown attainable by the soldier or the lawyer, but of true glory and of the noble satisfaction that rewards a well spent life, you can attain your just share. May you begin to-day a prosperous career!

ON SOME RARE FORMS OF OPACITY OF THE CORNEA.*

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THE cases which I desire to bring before the Association are all examples of opacity of the cornea; but they belong to two distinct classes, and each class is sufficiently rare and sufficiently important to make it worthy of the attention of the Section.

The first case is one of *congenital leucoma*—a very uncommon affection, and one which gives rise to many interesting questions. The others are cases of "symmetrical opacity of both corneæ"—a disease which is far from frequent, and the pathology of which is involved in great obscurity.

These two subjects I shall take in order. I shall first relate a well-marked case of congenital leucoma, and offer some remarks upon it; and then I shall proceed to give the details of three cases of "symmetrical opacity" which have lately come under my care, and, by comparing these with published cases, I shall hope to be able to give a clear account of the nature and progress of the disease, even if I am

unable to throw much light upon its causation or upon the means by which it may be cured.

And first of congenital leucoma. (Case —.) John Thomas Day, an infant five weeks old, was brought to Mr. Bowman at the Royal London Ophthalmic Hospital on account of "a skin over its sight". As I had the good fortune to be clinical assistant to Mr. Bowman, I had an opportunity of observing the case and taking notes of it. In the left eye there was a leucoma, which occupied nearly a quarter of the cornea. It was situated on the inner side, and extended almost from the circumference to the middle line, covering just half the pupil. It was observed within an hour after birth, and it had the same appearance then that it has now. There has never been any perceptible inflammation or discharge. The pupil was adherent, but not displaced. The surface of the leucoma was perfectly smooth, regular, and polished: it was of a dense texture and of a brilliant white colour.

This case suggests some interesting considerations. How could such a white mark as this be formed upon the cornea? If the pathology of a congenital leucoma is the same as that of one coming on after birth, then we must suppose that a very unusual series of changes have taken place *in utero*. We must suppose that after the cornea was developed a large and deep ulcer has been formed in it either spontaneously or as the consequence of injury; that this ulcer has perforated the cornea, so that the iris has become adherent; and that subsequently the ulcerative process has ceased, repair has commenced, lymph has been poured out, the cavity has been filled up, the contour of the cornea has been restored, and there remains only the dense white scar, which I have attempted to represent in the accompanying drawing.

But, though nature has done so much to repair the mischief, the sight has been left permanently damaged, for the leucoma occupies nearly a quarter of the cornea, coming up to the central point and covering half the pupil.

I know of no surgical treatment that is likely to do any good in such a case; but it will be interesting to observe, as the child grows up, whether Nature makes any effort to remove the blemish. The leucoma is so dense and solid that we can hardly suppose that much of it will be absorbed; still, the lapse of time may bring about some amendment.

We now turn to the second and more important class of cases to which we have alluded; namely, the symmetrical opacities of both corneæ. The case which we have just related may be regarded as a surgical curiosity; it is so rare and so irremediable. But those which we have now to consider are not so very infrequent: they may, in some instances at least, be benefited by operations; and their symmetrical nature leads us to believe that they depend upon some constitutional cause which may perhaps be ascertained and counteracted.

Three cases of this affection have lately come under my observation at the Central London Ophthalmic Hospital. These I shall relate in order, and then I shall compare them with published cases of the same kind; and, finally, I shall offer some remarks upon the whole series.

CASE I.—John Woodfield, aged 55, a commercial traveller, living at Islington, presented himself at the Central London Ophthalmic Hospital in May 1870. He said that about two years ago a haze began to come over both his eyes at the same time. It was not attended by any pain or by any inflammatory symptoms, either acute or chronic. From that date it had been gradually becoming more and more dense, until it had now become so bad that he had been obliged to desist from his employment and to seek relief at the hospital. He was a hale, ruddy man, strong and healthy-looking for his age. There was an obscure history of syphilis thirty years previously, but it did not seem that he had ever had any secondary symptoms. He had never had either gout or rheumatism; his father, however, was "a martyr" to the former complaint. His work had always been of a very harassing kind, and for the last eighteen months he had felt nervous, faint, and giddy. Both eyes were affected, though the left was worse than the right. The opacities were of a rusty brown colour, and slightly shaded off at their edges. They lay somewhat horizontally, travelling in a direction from within outwards and downwards, and occupying exactly correspondent parts of the two corneæ. They were not raised above the level of the surrounding cornea, for the curvature of the eye was perfectly regular, and the epithelium covering them was smooth and brilliant. Probably they were situated in the anterior elastic lamina. With the right eye the patient could read No. 5 of Jaeger's test-types at ten inches, but with the left he was only able to make out No. 16 at the same distance, and that only when the test-type was held on the outer side of the eye. When the pupils were dilated with atropine, the *fundus oculi* could be clearly seen in both eyes, and presented a healthy appearance.

CASE II.—George Hill, aged 40, applied at the Central London Ophthalmic Hospital in February 1870. He was a water-gilder by trade, and had been in the habit of working over a hot stove, melting quicksilver and gold together; and he said that sometimes the fumes of the

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