

Reports Of Societies

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the private was less serious; he was semi-comatose, and appeared to be in great pain, but passed no blood in his stools after admission.

The treatment adopted in each case was the hypodermic injection of half a grain of morphine, the administration of brandy 3 iss, with the application of a mustard plaster to the cardiac area, hot poultice to the abdomen, and hot bottles to the extremities. On regaining consciousness they complained of intense pain in the epigastric region and all over the abdomen. Laudanum (℥xx) and gruel were given as soon as they could swallow, and the injection of morphine was repeated next morning. Both men made a good recovery, and were discharged from hospital on February 16th, 1900. On referring to an Indian textbook of toxicology, I find it stated that these seeds are highly poisonous; each seed is said to contain about one-tenth of a grain of ricine, and three seeds proved fatal to an adult in forty-six hours in a case recorded.

REPORTS OF SOCIETIES.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY.

F. W. PAVY, M.D., F.R.C.P., F.R.S., President, in the Chair.

Tuesday, May 8th, 1900.

THE WOUNDED IN THE PRESENT WAR.

MR. TREVES, lately Consulting Surgeon with the Field Force, Natal, gave an address on this subject. After expressing his sense of the honour done him in asking him to give such an address, he said:

Modern Rifles.

I may, in the first place, draw attention to the weapons that are being used in this particular campaign, especially the Mauser and the Lee-Metford rifles. It is a somewhat extraordinary thing that the development of the rifle as an instrument for carrying the missile long distances with a flat trajectory does not quite coincide with its destructive powers, because although the rifle may be said to be an enormous improvement upon the Martini-Henry, still I suppose that in war the purpose of the rifle is to destroy or disable as many men as possible and as completely as possible. And if that really be considered to be the test of a good rifle, then the rifles used in the present campaign cannot be considered as good perhaps as the old-fashioned weapon. I might perhaps be allowed to mention one or two facts about this weapon.

The Rifling.

The purpose of rifling is to give rotation to the ball in its long axis. Unless that be done the ball as a projectile, if it be a conical ball, is practically futile. A cylindrical bullet, of which I show you an example (Fig. 6), coming from a smooth-bore rifle would begin to rotate on its short axis immediately it left the muzzle, and even at the distance of a few yards would strike a target on the flat; therefore as a projectile it would be useless. A Martini rifle has one complete turn of the barrel in 22 inches, the Lee-Metford actually doubles that, and makes one complete turn in 10 inches. The Mauser makes one complete turn in 8½ inches, so that as far as velocity in the rotation of the bullet at the muzzle is concerned the Mauser is by far the superior weapon.

The great object in all four rifles is to get a flat trajectory; that means much greater accuracy in shooting in regard to the sighting of the rifle. Much harder hitting is secured, because it is a cleaner hit, and of course a very greatly-increased danger zone, especially with regard to cavalry. The bullet of a Snider, sighted to 2,000 yards, will have to rise no less than 866 feet above the line of shot; the Martini-Henry sighted for 2,000 yards will have to rise 357 feet, which means an enormous zone where a man might walk about at his ease without the least possibility of being hit between the rifle and the target. The Lee-Metford has the same range, but only rises the short distance of 194 feet, and consequently the trajectory is very nearly flat. The muzzle velocity of the Martini-Henry was only 1,350 feet per second; the muzzle velocity of the Lee-Metford is 2,000 feet per second, and the muzzle velocity of the Mauser 2,300 feet per second.

The Bullet.

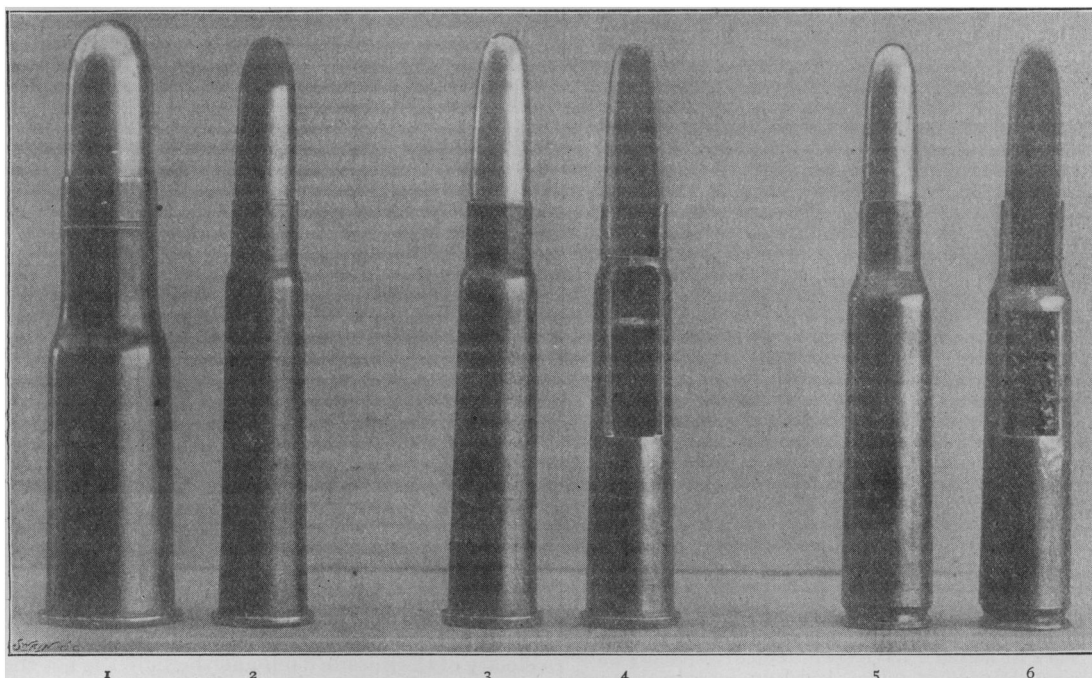
With regard to the shape of the bullet, this bullet of a Lee-Metford (Fig. 3) is supposed to represent the acme of perfection in the shape of a bullet. In a very admirable book published by the War Office authorities as a *Textbook for Military Small Arms*, it is stated that the power of a bullet to overcome resistance must be directly proportional to its weight, and inversely proportional to its cross section. It comes to pass; therefore, that an elongated trajectile such as the Mauser or the Lee-Metford bullet has an enormous advantage owing to its small diameter. This is the reason that there has been a progressive reduction in the bore until it has been reduced to its present small section. Of two bullets of equal weight and of equal diameter the longer bullet has a better range. With regard to the head of the bullet, the particular type which offers the very least resistance is that known as ogival, which means that the curve is made up of a part of the circle, the radius of which is equal to two diameters of the base of the bullet. This is shown perfectly well in a Mauser or in a Lee-Metford bullet.

The Lee-Metford bullet is a more destructive bullet than the Mauser. This opinion is based upon the cases of a number of wounded Boers we had at Spearman's Camp after the battle of Vaal Krantz, and also upon the reports, especially the report of Dr. Mackenzie in the *Lancet* of February 17th, who gives an account of a certain number of wounded Boers. These specimens I have brought back are all, without exception, from the Boer trenches, and they have been beautifully mounted by Mr. Shattock, of the College of Surgeons. I should say that all these bullets, including the Lee-Metford and the Mauser—and this is a matter of the utmost importance with regard to bone injuries—are made up of a core composed of lead hardened with 2 per cent. of antimony, and of a shell or thimble made up of 80 per cent. copper and 20 per cent. nickel. So far as I know the thimble or shell of the Mauser and Lee-Metford are exactly the same. The Lee-Metford and the Mauser bullets, both placed on a level base, are shown of natural size (Figs. 3 and 5). The Lee-Metford is the larger missile of the two, but as a matter of fact the difference in size is comparatively slight. For instance, the Lee-Metford measures 1.25 inch the Mauser 1.19. The diameter of the Lee-Metford bullet is 0.311 inch, the diameter of the Mauser is 0.284 inch. The weight of the Lee-Metford bullet is 215 grs., the weight of the Mauser is 173 grs. I may mention that the weight of the Martini-Henry bullet—the most destructive bullet seen in this campaign—is 480 grs., the length 1.27 in., and the diameter 0.45. The Mauser bullet has a groove in the bottom of the cartridge to fix into the clips, for Mauser cartridges are carried in clips of five, which is the size of the magazine. In the section of the Mauser bullet (Fig. 6) and cartridge case, the smokeless powder, which is black and like minute pieces of coal, is seen packed up at the bottom of the cartridge; the core is of hardened lead and the thimble composed of copper and nickel. In the section of bullet and cartridge case the cordite is seen in the Lee-Metford (Fig. 4) arranged in strings like gelatine. The extraordinary thing is that Thomas Atkins extracts this cordite, which is made from nitro-glycerine, from the cartridge and eats it. It is a mild form of stimulant.

I pass now to what I think is a very important matter. This slide (Figs. 8 and 9) shows the thimbles of a Lee-Metford and a Mauser bullet. A gunsmith has dissolved the lead out and left the shell intact. An untouched Mauser is also shown. The weight of the thimble varies very considerably, that of the Lee-Metford weighs 33 gr., of the Mauser 22 gr. They are quite different at the apex. The Mauser seems to have been strengthened at the apex. The Lee-Metford is about the same thickness throughout, and the breaking of the cap or the apex of the bullets is a matter of very considerable importance.

The Fine Hitting of the Mauser.

There is, I suppose, no small-bore bullet that can effect the same perforations as this bullet can. I have here a specimen, one of the strangest I have seen. It is a Lee-Metford cartridge which was carried in the cartridge case of a man who was in the assault on Spion Kop. The Mauser bullet has passed through the centre of the cartridge, and the point of entry and the point of exit can be seen. It has hardly bent the cartridge, and the cordite is perfectly intact in the interior. The



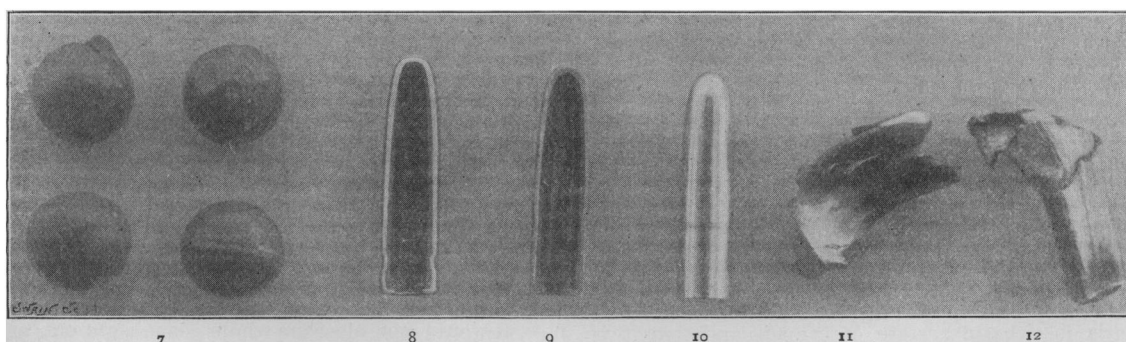
Specimens of Maxim (1), soft-nosed Lee-Metford (2), Lee-Metford (3, 4), and Mauser (5, 6) cartridges.

bullet went through the abdomen and came out through the buttock, and, as not uncommonly happens produced practically, no symptoms. One could hardly have believed that a bullet at long range, as must have been the case here, could have struck a smooth round cylinder of brass like the Lee-Metford cartridge and have gone straight through without exploding the cordite, and gone through the man without producing any ill effect. The ordinary clip of Mausers which the Boers use contains five cartridges. They are carried in a bandolier, which has a series of little pockets, each with five holes to take the five cartridges belonging to each clip. The only piece of sentiment connected with the particular bandolier I show is that it was taken from a dead Boer in a trench at Pieters on the road to Ladysmith, and he

covery. When I last saw that man you could not tell that the hand had been wounded. I do not say his bones had been perforated, because they were less in diameter than the section of the Mauser bullet, but the fracture was so clean that he recovered with a useful hand. As far as I have been able to see, I believe the Mauser bullet is never diverted in the body.

Effects at Different Ranges.

There is another very important matter which this war will settle. The textbooks on gunshot injuries all repeat this one formula, that is that the mechanical power of a bullet, the measure of the work it can do, is represented by the formula MV^2 , M being the mass and V the velocity. If that be true of course the range is everything. If a man is shot at 150



Specimens of shrapnel bullets (7), thimbles of Lee-Metford (8) and Mauser (9) bullets with core (10), and Mauser bullets distorted by impact (11, 12).

had only one single clip of cartridges left. I have left it as it was taken off the body. He was, like many of the Boers in that last engagement, reduced to his very last round. There were several cases on the Mooi River of a nerve being penetrated by

Mauser bullet. One bullet which I have made a button-hole opening, and went through a nerve without dividing it. We had several cases of bones perforated by the Mauser bullet, as though a gimlet had been passed through. The most picturesque case of that was a man who was shot in the armoured train fight between Frere and Chieveley. A Mauser bullet went through the middle phalanx of the ring finger, and through the middle phalanx of the little finger, making four perfect holes, and he made an absolutely perfect re-

yards his limb would be smashed; if at 1,500 yards the wound would be trifling. That is said to be based on experiments in which corpses and dead animals had been shot at at various ranges. I feel as certain as I can be of anything that that formula is wrong, and I believe that when the details and data of this war are published that formula will be modified. Of course it is very difficult to get a proper account of the range, for every man says he was shot at a range of 150 or 200 yards. With smokeless powder it is very difficult to get the range in most cases, and in some there had been a cross fire, and it was difficult to know from which side the man was shot. From noting myself men who were struck down in an engagement which I was watching, I was quite certain, being

able to form an idea of the range, that range was not everything. Mr. Dent, whose very admirable letters in the BRITISH MEDICAL JOURNAL we have all read with such instruction, says that the range matters very little. Perhaps that is a little too strong, but I am quite confident that the range does not mean what that formula MV^2 means.

The "Explosive" Effect.

The next point is as to the explosive effect of these bullets. This unfortunate term has crept into the reports. Of course there is no such thing as an explosive bullet; it is a preposterous term. The term "expansile bullet" may be perhaps justifiable, and the explosive effect depends upon this, that when a man is struck with a bullet it makes a small point of entrance and the rest of the wound is like an inverted funnel. I have seen the point of entrance as big as what a soldier calls a bugbite, and the point of exit the size of a five-shilling piece¹ or bigger, the wound being practically funnel-shaped. It is not a question of the shock of the impact, the wound is blown out, the bone is broken, and the fragments are driven up and down the limb, so that there is a gap between the two ends. This effect is uniform, precise, and easily recognised, and is what is meant when the explosive effect of a bullet is spoken of. There is a very positive cavity, and the bone is separated by a real gap. All the textbooks state that that is solely the effect of the velocity of the bullet, or, in other words, the range of it; but I am confident that that is not accurate in regard to this small-bore bullet. I notice from the textbooks that experiments on animals do not always quite agree. Some say that the explosive effect is shown up to 500 yards and others up to 750 yards. All I can say is that all the cases in which I have seen explosive effects have been at comparatively short range, and I am certain it is not range and range only. I have seen a perfectly clean perforation of a bone at a short range, as for instance at Vaal Krantz, where the firing was from one Boer ridge. It is true that in every case in which explosive effects have been manifest it has been at a short range, and in every instance in which the bullet has been retained it has been found to be deformed.

The Soft-nosed Bullet.

The bullet which I show (Fig. 2) I picked up in the Boer trenches after the Boers had evacuated Hlanganwe Hill. The nickel casing of the bullet has been cut away at the top, exposing the lead core, which is not hardened with antimony. The result is that the lead mushrooms out. It has been said that the Boers use this, that, and the other bullet, but I was through the whole of the Natal campaign, and we never had any evidence of the so-called explosive bullet until the last thirteen days before the entrance into Ladysmith. Then about 10 per cent. of the wounds were due to soft-nosed bullets. I must bear witness that the statements about the use of these bullets are not well founded.

"Poisoned Bullets," So-called.

A point uppermost in the public mind at this moment has reference to poisoned bullets, and I have here an ordinary clip of Mauser bullets which I picked up at Colenso. The bullet is coated with some bright green greasy material, and it is evident the bullets have been dipped into something, for the tallow-like material is seen adherent to the metal. It is positively stated that this is poison. I saw in the *Daily News* of as recent a date as three or four days ago the statement that these bullets had been dipped in verdigris. I understand that verdigris is a basic acetate of copper, and that it is poisonous. Some of these clips, all of which I picked up in the Boer trenches, have been examined by Mr. Hugh Candy, the Lecturer on Chemistry at the London Hospital, who reports as the result of his chemical analysis that the green material is absolutely non-poisonous. The basis of the compound is paraffin, and the colour is due to an oxide of nickel; and as there is 20 per cent. of nickel in the coating of this bullet, it is reasonable to suppose that it is produced from the thimble and not from anything added. Anyhow, Mr. Candy assures me that it has been examined for every reasonable poison, but that the results have been negative; therefore this substance must have been used for the purpose of keeping the barrel free of fouling.

¹ 3.8 cmm.

Shell Wounds.

With regard to shell wounds, I will say nothing except that we met with both common shell and shrapnel. Nothing is more magnificent than the bursting of English shrapnel; and the sight of the last assault at Ladysmith, when there were ninety-four guns playing upon Pieters Hill, was a sight which could not be equalled on this earth. It was towards the end of the evening, the sun was lighting up the edge of the ridge, and at the back was a thunder cloud rising over Umbulwana. The shrapnel, looking like puffs of white snow, afforded a very marvellous spectacle.

Common shell for the 4.7 gun is an explosive cylindrical hollow cell, containing a bursting charge. The effect of the explosion is seen from the dust it raises, and the bits of stone it knocks up. I picked up pieces of shell which were hurled out by the shell bursting, some of the pieces of which might be driven right through a man's head. One particular specimen I have shown is a piece of a shell from "Long Tom," which was fired into a street at Ladysmith. I brought it from there, and it was given me by the man who picked it up. At the bottom of the specimen can be seen what is called the driving band, and a notion can be formed of the gigantic weight of the shell fired by that enormous gun, and how it breaks up into fragments.

Shrapnel I need not say is a conical shell containing from 150 to 200 bullets (Fig. 7), according to whether it is fired from a 12 or 15-pounder. Shrapnel contains a bursting charge set off by a time fuse, the end of the shrapnel is blown out and the bullets acquire the velocity of the missile. All shrapnel breaks in the air, and from a howitzer it breaks high up in the air and descends. The velocity of the descending shrapnel is the velocity of the missile itself and the bullet is not shot out of it by gunpowder. The iron of the shell itself is twisted by the bursting charge. The Boer shrapnel, of which I have a specimen picked up in Ladysmith, and not exploded, is similar in shape to our shrapnel.

A water-bottle belonging to an English soldier at the battlefield of Spion Kop shows the point of entrance or a shrapnel bullet which went through the water-bottle and then through the man; the man recovered without any grave symptoms. The bottle shows that the hole was a very clean one, just taking the shrapnel bullet and not very much more. The size of the shell of the Maxim gun is shown in Fig. 1.

Lyddite.

The Boer prisoners were not pleased with lyddite, but it has nothing like the effect that is ascribed to it. A lyddite shell bursting in soft ground, as it did in a farm near Spearman's Camp, makes certainly a big hole, but if it falls on to well-made ground such as railway road it does not make the enormous cavern that has been described. The fumes are always dense yellow. Several Boers were brought in suffering from concussion produced by lyddite. They remained insensible for one or two days, but without any sign of injury of any sort due to lyddite. The smell of lyddite is very distressing, and the best testimony as to this is from our own men. Some of the King's Royal Rifles in mounting a kopje to take a trench had one of our shells fall within a distance of 50 yards from them. The officer in charge of the line told me that they could scarcely breathe; they had to keep their faces almost on the ground to avoid the awful stench of this explosive. But I think the statement of the terrific effect of lyddite shells is exaggerated. If one came into a room like the one we are in now, it would not blow the whole place right out, and to say that its fumes are absolutely poisonous is untrue.

Expansile Effect.

I show a specimen (Fig. 13) demonstrating the expansile effect of a Mauser bullet. In this case the man was struck on the outer side of the deltoid muscle; the wound was a clean hole which would not have taken more than the point of a pencil. It had produced an ordinary oblique fracture of the bone as was inevitable, and it had blown away the head of the humerus. On examination hardly any fragments of bone were found at all; they had been practically pulverised. The bullet made a kind of trap door into the scapula, and was found close to the vertebra. The bullet has been fixed on the scapula, and is shown

on the photograph. It presents the ordinary deformity, that is to say, the flattening out of the core and a breaking up of the thimble. The case is an interesting one to me because I amputated the entire upper extremity, collar bone, shoulder blade, and upper limb, and it is the first case so treated in the field. The man is now, I am glad to say, in England, and quite well.

The next specimens illustrate how the Mauser bullet is deformed by striking bone. Here is a bullet that is almost in pieces (Fig. 11). The top can be lifted off like a cap, and you can scarcely believe that this bullet fractured a man's femur. It did not, however, pass out of the limb, and I cut it out after the battle of Colenso.

Shrapnel bullets (Fig. 7) are not quite round, the spheres being seldom perfect, but these bullets may pass through liver and kidneys practically without producing symptoms.

Hospitals, Transport, and Ambulances.

Mr. Treves next showed on the screen lantern slides of the photographs reproduced in the *BRITISH MEDICAL JOURNAL* of April 14th, pp. 914 and 915, and then made the following observation on the ambulances:

The ambulance carts are certainly not adapted to the country in which they are now working. They are magnificently made waggons, will stand anything, and are drawn by ten mules and driven by Kaffir boys; they are very serviceable, but they are very hard to ride in. The Boer ambulance cart, on the other hand, is a modified spider cart, and is admirably suited to its work.

I think you will permit me to show you the next slide, because I really wish to do everything I can to acknowledge the extraordinary kindness and generosity of the authorities of the Army Medical Department. They very kindly put at my disposal this cart (Fig. 14), with sixteen mules, a Scotch cart, a conductor, four Kaffir boys, a horse, and a man. The cart shown in the figure entered Ladysmith; but it broke down coming from Ladysmith and was left in a spruit. According to some of the enterprising war correspondents, this was the cart that Joubert lived in, and as such it has been accurately described.

Mr. Treves then showed photographs of the hospital trains, which he said were managed by the indefatigable Major Brazier-Creagh, and were of enormous service in Natal. Commenting on that reproduced in the *JOURNAL* of April 14th, p. 914, he said:

We had to fill up the train from the level of the line, and it was very distressing to get the patients on board, because they had to be taken from the army stretchers, then put into the carriage stretchers, and then put into the train.

Wounds of Soft Parts.

The skin wounds are exceedingly simple and very small. The wound of entrance is circular, and Mr. Tommy Atkins always describes it as a bug-bite. The wound of exit is in many cases but little larger; possibly it may be a little larger, but in many cases the entrance and the exit wounds are of exactly the same size. Wounds are very easily overlooked, and primary healing is almost invariable.

The field dressing attached to every soldier's coat is quite admirable, and one of the very best things that has been introduced as a primary dressing. The only criticism is that it contains a piece of mackintosh which it is directed should be put over the wound. In hot weather it is better for that to be omitted, but of course if it is raining it should be used.

In no case have I found any clothing carried into the wound. Once I found a piece of a rifle carried in. In this case the officer was on a stretcher when he was struck in the knee and where it can now quite easily be seen with the x-rays. The thimble went into the hand, and I removed it yesterday. I may say this, that in spite of statements to the contrary, I am certain that 20 per cent. of Mauser bullets are retained. They do not go right through the body.

I have picked out three statements from the current textbooks which I merely mention because I think they are not borne out by what has been observed during the present war. It is stated that the entrance and the exit holes decrease in size as the range increases, but that is not my experience. Again it is said that a circular and small wound of exit is rare when a bone is hit, but that is not my experience. I have seen the very smallest hole after the bullet has actually passed through a bone. It is said

that the largest exit wounds are those at short ranges, but that again is not my experience.

Shock is always slight in these cases, and it is often slight after abdominal wounds. Some men scarcely know that they are hurt, and the common remark is

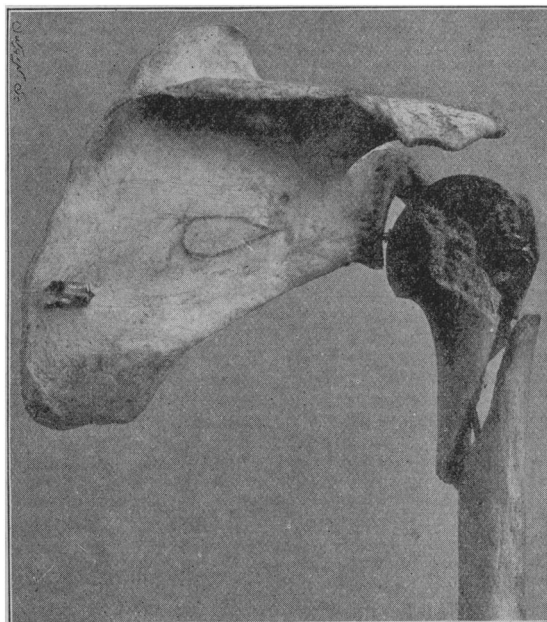


Fig. 13.

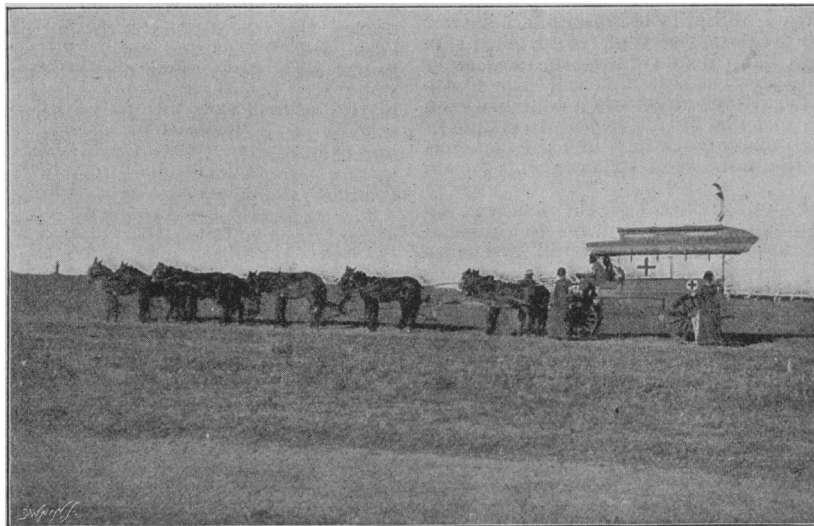


Fig. 14.

that the blow felt as if the man had been struck with a hammer.

Hæmorrhage.

External hæmorrhage of any kind is rare. Colonel Stevenson, in by far the best book on gunshot wounds that has appeared, writes that hæmorrhage from direct hits from the new bullet will certainly be more profuse than was the case in similar injuries with the old spherical bullet, but that has not been borne out, for the hæmorrhage is less. Men coming down with tourniquets are exceedingly few. The ingenuity with which a sailor invents a tourniquet is marvellous; the most perfect I saw was in a case of a wound of the ulnar artery, where the tourniquet on the brachial was composed of a plug of tobacco and the tape of a puttee. Internal bleeding is not uncommon, especially in abdominal cases, and it may be very copious. Extensive subcutaneous hæmorrhages are seen with injuries received at a short range.

I will not trouble you with any bullet stories, for the bullet story is becoming very much worse than the fish story. Bullets have gone through brain, lung, heart almost, and every other part of the body without causing the man anything more than a little interest in his case. I will mention one case, however, which I have already published,² and it still remains unintelligible to me. The man was crawling up towards a ridge when he was struck by a bullet which entered above the collarbone in the neck and the bullet came out on the inner side of the opposite thigh without producing literally any inconvenience or any symptoms of any sort whatsoever, except that the man being wounded thought he had better take advantage of it and get the bread and other luxuries that we might have for the wounded.

Injuries of Bones.

I hope you will permit me to take four of the most prominent statements made in the most recent textbooks, which I have picked out because I do not believe that they are accurate; at all events they are not borne out by experience in the present war. The first is that the severity of the injury to bone decreases as the range increases; the second is that explosive effects are produced when a bone is hit at short range, such as 500 yards or under; the third is that fractures are nearly always oblique; and the fourth is that when a bone is fractured the exit wound is always larger than when this does not occur.

The first of these statements is not in accord with my experience; and Mr. Dent, I am glad to find, says also that he is not convinced of the influence of range.

With regard to the alleged obliquity of fractures, I should say deliberately that the great majority of fractures in this war due to Mauser bullets have been transverse. Certainly they are adjusted with the greatest possible ease. The statement that the exit wound is always larger when bone has been struck is not correct. It has not been possible to establish any such rule; I have seen many cases in which the bone has been fractured, in which the wounds of exit and entry were exactly alike.

Transverse fractures of the lower end of the femur going into the joint are uncommon, whereas injuries to the head of the humerus and the lower end of the tibia are more common.

The injuries involving bone are as aseptic as the wounds of the soft parts, with the exception that the very worst element in the treatment of these bone fractures is the long transport which is almost fatal for a gunshot wound of the thigh. But if such a case were allowed to lie in the field hospital for 5 days it was not necessary to look at him any more. If, however, such a case was put into a train and taken for 2 days on the railway down to the base hospital that case would probably end fatally. Long transport was really impossible in gunshot wounds of big bones like the femur. In our field hospital we could keep such patients quiet and they did exceedingly well, and we never had any sort of anxiety with cases of fracture of the femur. We always kept them until we had the usual notice to quit.

I think I am sure that the Director-General will agree with me in saying that that is an advantage of having a big field hospital following the main column, because these cases can

be kept for four days or so and then allowed to go down. Hard transport or mule train or the big mule ambulance was really impossible.

Trephining.

I can say nothing whatever about the telephone probe because of the want of time, nor about head injuries, except to say that no operations in the field did anything like so well as these. There is no doubt that in head injuries the rule should be not to operate in this case or to operate in that, or to operate under these conditions or under those conditions, but to operate in every single instance of gunshot wound of the head. I have been asked what were the usual fatal cases. A man taking shelter behind a boulder lifts up his head and gets a bullet through it, and though in going over the dead I could not give the exact proportion—I could not even guess at it—yet I think, because probably the head injuries are more easily seen, one came to arrive at the impression that the majority of those killed on the spot were shot through the head.

Abdominal Injuries.

I will say nothing about spinal injuries, but if you will allow me I will say a few words about abdominal injuries. Everyone who went out to this war thought that this was the time for abdominal surgery, because abdominal surgery had been introduced since the last big war. The results, however, have been very disappointing. Two factors must be considered: First of all, the proportion of recoveries without operation is very high; and secondly, operative treatment of gunshot wounds of the abdomen in the field is exceedingly disappointing. I had this advantage, that, being quite close up to the front all the time, we could have our patients brought into the hospital directly, and so there was no question of loss of time. Nevertheless, the results were exceedingly disappointing.

The mortality from abdominal wounds in the American Civil War was over 90 per cent. My impression is that in this war, taking men shot through the belly, 60 per cent. have recovered without operation. How that opinion may be modified when the actual facts are published I do not know, but, as I say, I have come to the conclusion that a Mauser bullet through the abdomen only involved a 60 per cent. risk of death. I will first of all ask, Why do these cases get well without operation? How is it that 60 per cent. get well without any treatment? If the individual is wounded when fasting—and in these long engagements such as Colenso the men were always fasting, and often had been for hours—that circumstance contributes to recovery. Another fact favouring recovery, the importance of which cannot be exaggerated, is easy and short transport. The men that came down from Spion Kop were, from a surgical point of view, hopeless. Spion Kop is very difficult to get up, and almost worse to get down; a long distance had to be done over rocks, and the men had to be brought by hand-carriage down the mule path and then carried by mule ambulance into the hospital. We lost 33 men in seven days after the battle of Spion Kop, having had 750 wounded on that particular night.

The marvellous things that happened are shown by the cases I have published, all in patients who were shot through the belly. Beyond that fact nothing occurred. They were shot through the abdomen, and it was interesting to them to know that, but there was nothing else to notice. One of the cases was that of a bullet wound close to the umbilicus; the bullet came out by the spine of the second lumbar vertebra. What had happened to the structures like the big blood vessels I do not know. One bullet went in in the anterior part of one loin and came out at the other loin, after having traversed the whole belly. One went in exactly over the stomach and came out over the right loin; another went in at the tip of the eleventh rib and came out at the axilla. In none of those cases had the men any more than what would be called trifling symptoms, such as those they would get from eating a green apple. We unfortunately learned by carrying out operations which ought not to have been done that the hole made by the Mauser bullet in the bowel is very minute. It is often quite well closed by two Lembert sutures, and I am certain that the hole is closed almost directly by the apposition of adjacent coils of intestine. I may be wrong, but my impression is that when a man is struck in the abdomen peristalsis stops. I think it physiologically probable

² BRITISH MEDICAL JOURNAL, January 27th, p. 221.

that the shock of a wound through the belly would stop peristalsis. I never found a case in which it was necessary to dilate the bowel with hydrogen or anything of that sort. I found in one or two abdominal sections I made that I did nothing but harm, because in searching for the damage I opened wounds which were already closed. That of course one had to learn by experience. I began to search about, when out came some gas, and I said, "Here I have opened a part which was already sealed." I think I learned that the cases that do worst are those associated not with a particular wound here or a wound there, but those associated with copious internal hæmorrhage, and I think that impression is likely to be correct.

The next point is why these operations are so exceedingly disappointing. There are five points I would draw your attention to: First, there is the enormous pressure on time, when men are coming in by ambulance after ambulance, not in tens and twenties, but in hundreds, and there are only ten medical men. Under such circumstances, you cannot really say "We will do an abdominal section in this case." The afternoon would be taken up by it, and there are fifty things which must be done—men who are bleeding, and matters of great urgency to be attended to. Therefore it would be inhuman to say, "We will let all this crowd go, let us do this abdominal section." No department could have been more royally liberal than the Army Medical Department was in this campaign; but of course you cannot flood the place with medical men; you cannot say let us have fifty or sixty. But after a big engagement like that of Colenso, when we had 800 wounded, and after Spion Kop there was great pressure. Then there is great delay in getting the patients in from the field. At Spion Kop the wounded had to lie on the hill many hours before the Boers buried their own dead, and would allow us to touch our wounded. Then there was the difficulty of getting them down. Long transport was another reason for patients doing badly. Think of the difficulties of operating on an abdominal case. I show you a slide of the operating table we had, made of biscuit boxes.³ There was no water; at least there was water, but it was not anything that we are accustomed to call water. It will be said, Why not boil it? But where is the fuel? There is nothing on the veld but grass; we are twenty-six miles from the railway. Some may say, Why not use methylated spirits? Can you carry that about in any quantity? Others may say, Filter the water. Well, I never could get anything like half a bottle of water filtered without having to take the filter to pieces and clean it, because it was found to be thickly coated with mud. There was no doubt that Jameson was right when he said that the proper way to treat South African water is first to boil it, then pass it through a filter, and then throw it away. You cannot realise starting an abdominal section without towels. You may say, Have plenty of towels, but if we started with 600 towels where are the laundries? There is the veld and there is the Tugela, but the Tugela is covered by Boer rifles. What is to be done? You say well take 1,000 towels. Well, take 1,000—that means 16 more oxen—and even then your towels are no good. It cannot be done; in the country you cannot manufacture water, and you cannot produce in the middle of a deserted place a complete laundry.

Another thing which rendered abdominal surgery almost impossible was the trouble we had from flies. It is easy to imagine it, but I do not think anybody can describe it. One's hands were covered with flies as one operated; put them away as we might they were there again. If a piece of bowel came out it was covered with flies; we kept wisps going, and we tried all sorts of things, but you cannot keep the South African fly away.

Lastly—and I do not wish to say too much about this—of course, the hospital orderly, admirable as he may be, is not really quite the man to nurse from first to last an abdominal case. I should like to be very gentle with the hospital orderly; but he has to go and unship a waggon, pitch a lot of tents, and dig a trench for the kitchen. At one time he is handling a spade, at another time a bucket, at another time heavy boxes, and he is not exactly aseptic to look at. There are not unlimited shirts up there. It cannot be helped;

if you had millions with you you could not do much better. There remains the fact that the hospital orderly is not quite the person you would entrust with an abdominal case. I might mention this: that I was able to do all my abdominal cases by taking with me sealed tins containing dressings and needles. They do not take up much room, they are all prepared in England, and I took enough to last me all through. The tin is opened by taking hold of a strip and tearing across, as a meat tin is opened. The box makes a tray for sponges. The box contains enough carbolic to make a 1 in 20 solution, and all the ligatures and catgut, in fact all the material necessary for abdominal section. The lid makes an instrument tray, and will take all the scalpels or scissors wanted. I suppose it is true, as Lord Lister said, that an instrument kept for 15 minutes in a 1 in 20 solution of carbolic acid is clean. The sponges are all damp, ready for use. I brought two or three tins back, and they were examined in the bacteriological laboratory at the London Hospital by Dr. Bulloch, who says they are absolutely sterile. I did not want any water, as the sponges were wet; I wanted nothing. Of course, one would like to wash one's hands, but there are clean instruments, clean sponges, and so on.

Conclusions.

I have put down the circumstances that I think I learnt would argue for abdominal section, and the circumstances against it. The circumstances in favour of operation I would enumerate under five heads:

1. If the patient is seen before seven hours, which is not an unreasonable limit.
2. If the patient has had a short and easy transport. We had many of those.
3. An empty stomach. I should say that in some few antero-posterior wounds of the abdomen above the umbilicus it is a *sine quâ non* that it should be a case with an escaped bullet, especially when associated with extensive hæmorrhage. Then I deliberately believe that a patient ought to be operated upon. It might be thought that such cases would be very common; but, in fact they are very uncommon.

The circumstances against operation are:

1. If the patient is not seen till more than seven hours after the wound. I do not say that this is an absolute bar, but it is one argument against operation.
2. If there has been a long and arduous transport.
3. If he has been wounded soon after a meal. That is very improbable.
4. I should exclude all cases of transverse or oblique wounds above the umbilicus, because it is practically impossible to do all that is required. I will not trouble you with the details now, but I did some operations in such cases. I found six, eight, ten, twelve openings in the bowel, and when I had seen to these I had six holes in the mesentery, and very likely wounds in the liver. I am speaking of transverse or oblique wounds.
5. I exclude all cases of retained bullet. We can see the point of entrance, but where is the bullet? It may have gone this way or it may have gone that way; we do not know anything about it. You cannot in the field embark on any of those operations where you can bring out the viscera in the same way as you might *post mortem*. It may be very well in a hospital but it cannot be done in the field. I would not touch such a case.
6. I would exclude all cases of wound of the liver, of the spleen, and of the kidney. We had such cases in large numbers. A certain famous officer, whose name I will not mention, had a shrapnel bullet go through the liver and through the right kidney. He has come home here and is now quite well.
7. Do not operate on most cases below the umbilicus, because they do all right if they are left alone.
8. Lastly, I would not operate upon a case in which I thought the colon was implicated alone (I might except the transverse colon), because the cases did very well if they were left alone. But with an antero-posterior wound with an escaped bullet, which is a *sine quâ non*—that is to say, if where it went in and where it came out can be seen, I believe I have learnt that the bowels do not move after they have been struck.

³ BRITISH MEDICAL JOURNAL, April 14th, p. 915.

It comes to this, that the cases that are suited for abdominal section in the field are, roughly, exceedingly few.

Stationary Hospitals.

The DIRECTOR-GENERAL OF THE ARMY MEDICAL DEPARTMENT felt that he had some of the credit of the good results of which he had heard that night in that he had had the honour of recommending Mr. Treves for the appointment. A stationary hospital behind the field hospital was not always possible; its possibility depended greatly on whether or not we were getting the best of the battle. The length of transport certainly governed in great measure the septicity of wounds, and doubtless the wounded should be kept in stationary hospitals for days whenever possible. The observations on the plague of women which Mr. Treves had made at home had borne fruit in South Africa, as manifested by the fact that the Royal Engineers had already encircled the hospitals containing enteric cases with a barbed-wire fence.

Surgeon-General MUIR thanked Mr. Treves for his very instructive and able paper.

The meeting was adjourned.

EDINBURGH MEDICO-CHIRURGICAL SOCIETY.

Wednesday, May 2nd, 1900.

ALEXANDER E. MILLER, M.D., F.R.C.S.E., President, in the Chair.

CASE.

MR. COTTERILL showed a patient after laminectomy for paralysis of two years' standing, the result of spinal caries.

SPECIMENS.

MR. SHAW McLAREN showed (1) carcinoma of œsophagus and stomach after gastrotomy, (2) bilateral fracture of scaphoid bone of carpus.

CROSS INFECTION (SO-CALLED) IN FEVER HOSPITALS.

Dr. CLAUDE B. KER, medical superintendent of the Edinburgh City Hospital, read a paper on this subject. In the Edinburgh City Hospital a certain number of cases were annually attacked by some infection other than that for which they were admitted. Such accidents could hardly fail to happen in any building with a large population of children. The causes alleged by critics were (1) the carrying of infection by the staff from one ward to another, (2) infection by the air from other wards, (3) mixing of the nurses at meals, (4) inefficient disinfection of wards. In Dr. Ker's opinion, though certain rare cases might depend on those causes, they only accounted for a very small proportion of the second infections. He himself attributed the latter to (1) wrong diagnosis of the practitioner outside, (2) the admission of cases suffering simultaneously from two diseases, only one of which was at first recognised, and (3) most frequently the admission with one disease of a patient who was in the incubation stage of another, and afterwards developed it. Dr. Ker maintained that it was absolutely impossible to prevent outbreaks of a second infection which depended on this last cause. He did not expect a smaller number of such outbreaks in the new hospital, but he suggested that a fewer number of persons would be exposed in each instance owing to it being constructed on the pavilion system.

In the discussion which followed Drs. JAMES RITCHIE, T. R. RONALDSON, JAMES CARMICHAEL, DOWDEN, LUNDIE, WEBSTER, HARVEY LITTLEJOHN, and the PRESIDENT took part.

THE ACTIVITY OF THE SALIVA IN DISEASED CONDITIONS OF THE BODY.

Dr. AITCHISON ROBERTSON read a paper, in which he said that in order to eliminate the fallacy which might arise from the hourly variation in the diastatic power of the secretion, the experiments were always performed at the same hour each evening. Above 100 cases of disease of various kinds were investigated in order to see if the activity of the salivary ferment had undergone any change.

Amongst gastro-intestinal disorders, the average amount of sugar formed by the action of 2 c.cm. of saliva on 10 c.cm. of starch mucilage for ten minutes at a temperature of 38° C. was 0.080 gram (the normal average being taken as 0.080 gram). In chronic gastric catarrh this figure varied from 0.078 gram to 0.1 gram. In acid dyspepsia the amount of sugar formed was above the healthy average, while in ulceration of the stomach the amount was generally only slightly below the normal average. In dilatation of the stomach the salivary ferment was

found to be almost absent, or, at least, inactive. In cirrhosis of the liver the amount of sugar was not reduced, and in some cases it was greatly increased. In the group of pulmonary diseases the salivary ferment was generally fairly active, and on an average 0.087 gram sugar was formed. In phthisis the ferment was present in normal amount, and in pneumonia the amylolytic power of the secretion was above the normal during the period preceding the crisis, but lower after this event. In the large group of heart diseases the saliva retained its usual composition, and the amount of sugar formed hovered at or about the normal limit. A larger proportion of subnormal cases occurred in the group of nervous diseases, fully 41 per cent. giving a proportion of sugar lower than the normal. In three cases of Addison's disease which were examined the saliva of two showed a marked deficiency in diastatic power, while the third exceeded the normal limit. In the group of renal diseases 55.5 per cent. gave a production of sugar lower than the normal amount. In diabetes the saliva had a very active converting power, and in general the amount of sugar produced was much above the usual figure. In simple anæmia the converting power of the saliva reached the normal limit, but if the affection were associated with dyspepsia then the average was subnormal. In subacute and chronic rheumatism the ferment existed in its normal proportion. In general febrile conditions the secretion of saliva was greatly reduced in amount and this reduction increased *pari passu* with the increase in temperature. This scanty secretion, however, seemed to possess increased amylolytic power.

With regard to the quantity of saliva secreted, the author said that in most cases of acid dyspepsia the amount of saliva secreted was above the normal. In chronic gastric catarrh the quantity was hardly up to the average and the same deficiency was seen in ulceration of the stomach. In those cases associated with diarrhoea or ascites the secretion was often far below the normal amount. In bronchitis and in the early stage of pneumonia the secretion was generally up to the full average and might even exceed it. In chronic phthisis the secretion was always very scanty. In heart affections of a grave character the amount of saliva secreted was always low. In affections of the spinal cord the amount secreted reached and even surpassed the average amount; in some cases of cerebral tumour the reverse occurred. In chronic Bright's disease a scanty secretion of saliva was also found. In simple anæmia, chronic rheumatism, and in Addison's disease, the secretion was subnormal in amount. In many cases where the secretion was scanty its diastatic power was also feeble, and on the contrary where the secretion was copious its proteolytic power was also great. Dr. Robertson described an easy method of estimating the diastatic power of saliva, and stated that it was evident that a full appreciation of the diastatic power of the secretion was necessary when one came to consider the dietetics of disease. In those cases where the secretion was exceedingly scanty, or even in abeyance, or in those cases where ptyalin was absent from the saliva, or again in cases where the secretion was inhibited by drugs, ordinary starchy foods ought not to be given. If they were administered at all the starch must first be rendered soluble by treatment with some of the artificial digestant agents. The author advocated a more systematic examination of the saliva in all diseases of the gastro-intestinal tract, as also in other diseases where ordinary starchy food was found to disagree with the patient.

FOLKESTONE MEDICAL SOCIETY.—At a meeting on April 6th, Mr. READ in the chair, several members spoke as to the inconvenience of so-called "travellers" calling upon them. Others said that, although they did not object to representatives of firms they dealt with calling on them, they objected to those from proprietary medicine firms and such like.—Mr. W. F. CHAMBERS read a paper on operative midwifery. The prevention of sepsis should be carried out with even more care than in a surgical operation. A cocaine tablet in a piece of wool, wetted and then applied to the cervix had done good in two cases. He sterilised the forceps in iodic hydrarg. solution. Axis traction forceps were of assistance, and those of Le Page were simple and economical, but were liable to slip. External version was impossible in most cases of transverse presentation, as the cases were seen too late. The use of a curette directly after delivery or during the lying-in period should be discouraged; the finger nail was more to be trusted. In ruptured perineum he did not suture unless the tear was severe or unless there was a good nurse in attendance. In his experience the sutures gave way. He tied the legs together and kept the wound clean.

INTERNATIONAL ANTI-ALCOHOL CONGRESS.—The eighth meeting of the International Anti-alcohol Congress is to be held in Vienna in 1901. An Organising Committee, with Professor Max Gruber as Chairman, has been formed.