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SURGICAL EXPERIENCES
IN THE
ZULU AND TRANSVAAL WARS

D. BLAIR BROWN

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SURGICAL EXPERIENCES
IN THE
ZULU AND TRANSVAAL WARS,
1879 and 1881.

BY
D. BLAIR BROWN, F.R.C.S. EDIN.,
ARMY MEDICAL DEPARTMENT.

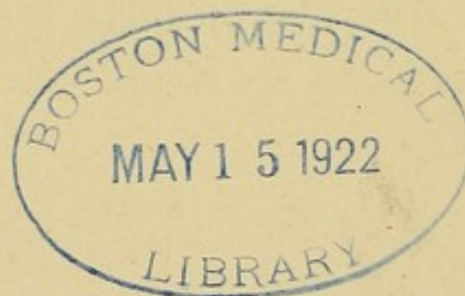
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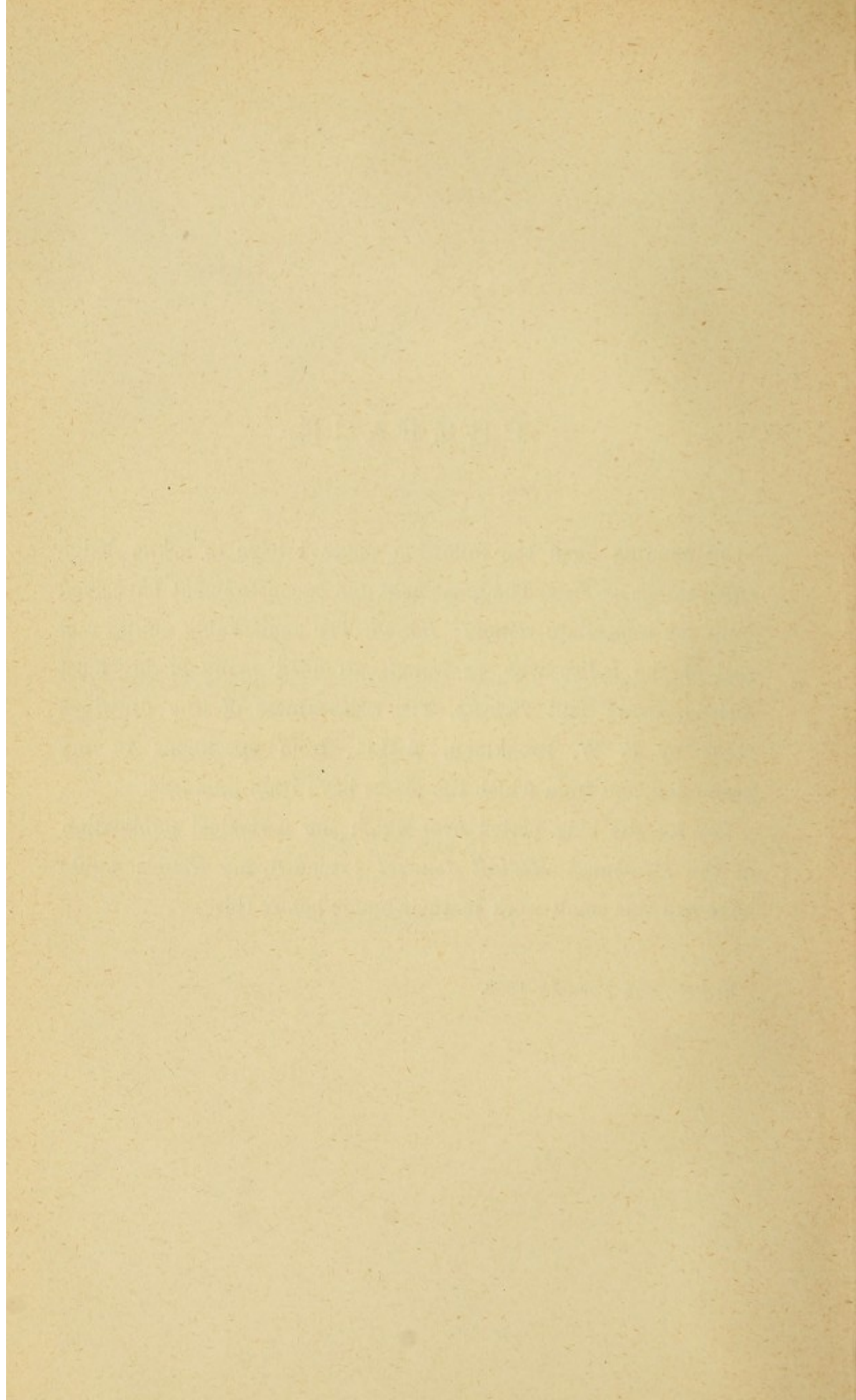


P R E F A C E.

IN sending forth the following pages I have to acknowledge three things:—*First*, The great help and encouragement I received from my immediate seniors; *Second*, The remarkable ability and zeal of the ladies who, as nurses, attended many of my most serious cases; and *Thirdly*, The truthfulness of the drawings made by F. W. Brookman, A.H.C., from specimens in my possession, and from which the plates have been produced.

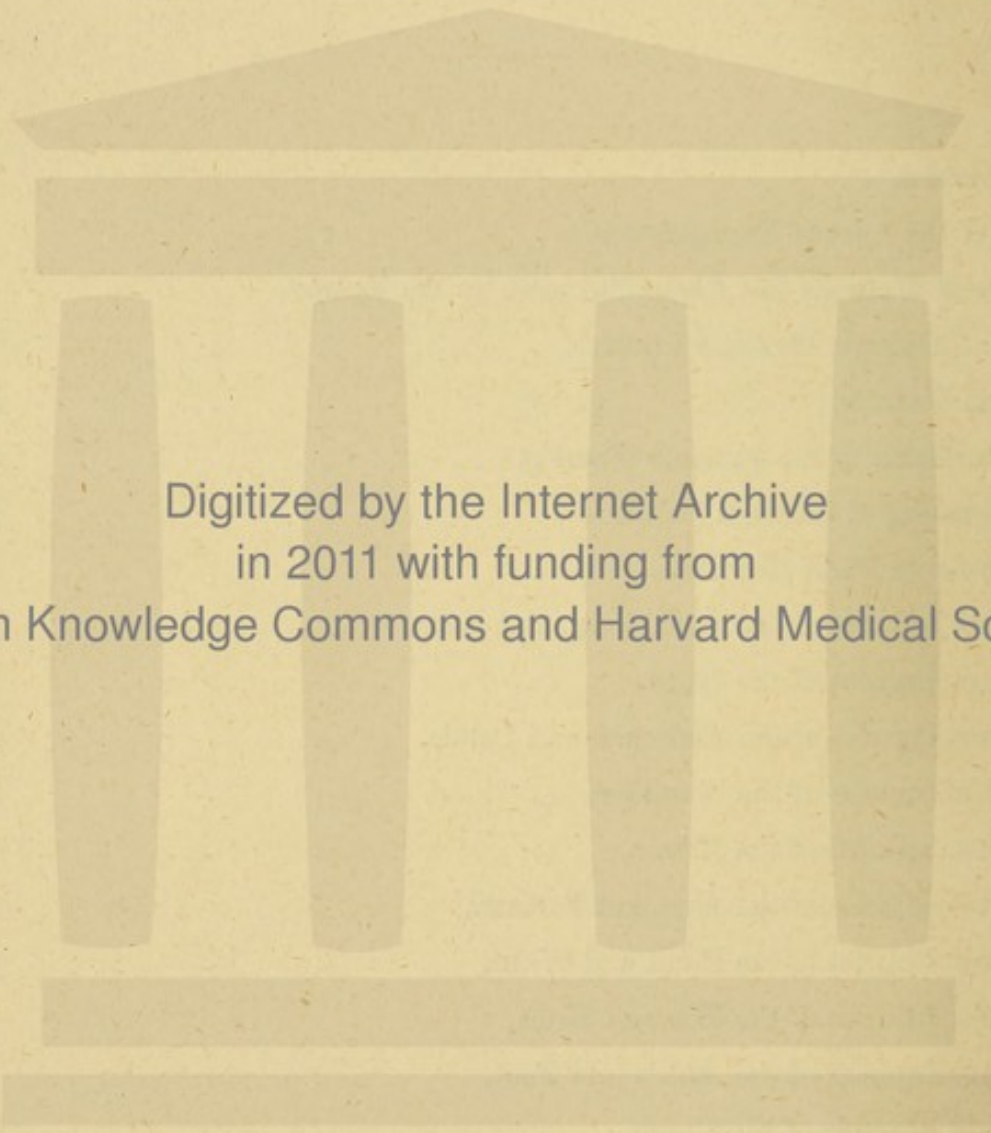
But for the long period over which the periodical publication in the *Edinburgh Medical Journal* extended, my friends would have had this small work in their hands before this.

DOVER, 15th November 1883.

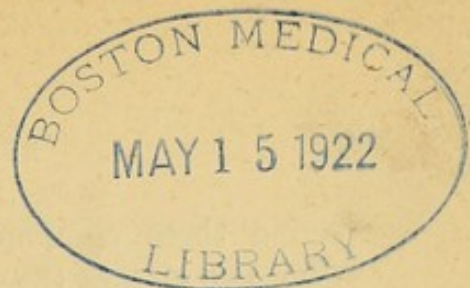


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SURGICAL EXPERIENCES IN THE ZULU AND TRANSVAAL WARS.

INTRODUCTION.

IN South Africa our army certainly found foemen worthy of its steel. Though the same amount of glory has not been attributed to the work done there as in some other wars, still the practical experience gained by every branch of the service is such that, systems thought complete having been found wanting, the whole military fabric has undergone revision of an almost revolutionary nature.

Into these changes it is not now my purpose to enter. I shall keep solely to the surgery of the two wars.

Late in 1878 I sailed for Natal in medical charge of the head-quarter companies of the 99th regiment. War was not proclaimed against the Zulus, but it was thought that the Government would soon do so. By the date of our arrival in Durban war was certain, and our troops were marching on to the Zulu frontier. On disembarking, a telegram was waiting me from the Surgeon-General, directing that I was to proceed at once by post-cart to join the head-quarter column. Several days' continuous rain brought the roads into so soft a condition as to prevent any such vehicle proceeding. The railway then only went as far as Pine Town—10 miles—and I had over 150 to travel. But for this, as events turned out, I should have been in the camp of Isandhlwana on the day of the disaster that happened there. I got to Helpmakaar on the morning of the 21st January 1879, and on the 22nd I accom-

panied three companies of infantry—chiefly 24th regiment—on their way to join the main body. As we neared Rorke's Drift we were met by fugitives who had escaped from the camp of Isandhlwana, who told us the terrible story of its capture. We thereupon returned to Helpmakaar and formed a fort, which was occupied until troops from England arrived as reinforcements. The gallant defence of Rorke's Drift was about to commence when we were turning on the road to go back: had we arrived a little earlier, we should have been sharers in the action. As it was, we wearily toiled up the hill, saw the flames bursting from the buildings, and reached our camp by midnight. In four days afterwards the wounded from Rorke's Drift arrived at Helpmakaar, so that I had the treatment of them. Contracting the prevailing fever of the place, I was sent to Ladismith. There I afterwards organized and administered the base hospital.

When the new divisions were formed on the arrival of the reinforcements, I was appointed to the medical charge of the staff and departments of the 2nd division under the command of Major-General Newdigate, C.B., and of which Brigade-Surgeon Semple was principal medical officer. In this position I had considerable work to do for both my military and medical chiefs. There were few arrangements made connected with the medical organization in the field, and no case of surgical interest occurred that did not come under my notice or care. During the advance on Ulundi I saw all the killed and wounded, the result of the various skirmishes; and being in the centre of the square formed by our troops during the decisive battle, nearly every case, I may say, passed under my observation. I afterwards remained in Zululand several weeks, and saw numerous Zulus who had been wounded by our men.

After returning to England in February 1880, I again received orders in December 1880 to proceed to South Africa. The Boers of the Transvaal had revolted, and the 94th regiment had been roughly handled at Brunker's Spruit. I went out amongst the first of the reinforcements from England with the Inniskilling Dragoons, with whom I proceeded, on arrival in Natal, up country as far as

Newcastle, on the Transvaal border. Here orders awaited me to the effect that I must leave the regimental duty and be one of the surgeons on the staff of the large hospital there, to which all the wounded had been and were being removed from the front—Lang's Neck, the Majuba Mountain, and the Ingogo battle-fields being but a few miles off.

I shall never forget my first visit into the wards. An opportunity to test my surgical skill on a fair scale, which I had longed for during my military career, was now presented to me.

The following pages may therefore be taken as a summary of two years' surgical experience in the field.

To avoid repetition when detailing the cases, the dates of the various engagements in which the men received their injuries is here given:—

Isandhlwana and Rorke's Drift,	. . . . .	22nd January 1879.
Ulundi,	. . . . .	5th July 1879.
Brunker's Spruit,	. . . . .	20th December 1880.
Lang's Neck,	. . . . .	28th January 1881.
The Ingogo,	. . . . .	18th February 1881.
Majuba Hill,	. . . . .	27th February 1881.

NATURE OF THE WEAPONS AND BALLS USED BY THE ZULUS AND BOERS.

Bravery is a very different thing in the present day to what it was in time of hand-spikes and bows and arrows. The Zulu's real weapon is the assegai, a species of instrument holding a position midway between those just mentioned, and is of two sorts, one a short-handled, broad-bladed instrument used for close encounter, and which is never parted with, and the other long-handled and small-bladed, beautifully balanced for throwing in the manner of a dart. The guns possessed by the Zulus were chiefly our old pattern ones, with the Tower mark upon them of 1847 and about that date. After the disasters they became possessed of immense numbers of our modern rifles and ammunition. However, with

very few exceptions, they were unacquainted with their use. In many instances Martini-Henry bullets were found in the cow-hide pouches around their waists, cut in two and separated from their usual cartridge combinations, the powder being doubtless mixed with other in their cow-horns which served as their powder-flasks and hung by their sides. The majority of their bullets consisted of spherical masses of lead, generally hammered into form and not moulded. Others were very roughly shaped and had a rough prominence on them, while a few were very carefully made. The latter were generally surrounded by a piece of thin cloth sewn accurately on them. Between this and the bullet a powder of an herb supposed to be poisonous was placed. These were "doctored" bullets which the witch doctors had given them as being certainly fatal. From their fairly round and smooth form they were much more likely to do mischief than the other less carefully made ones. For these reasons, in our wounded we found the most varied appearances, courses, and effects produced. Except when the injury was produced by a Martini-Henry ball, as unfortunately took place in some of the cases herein recorded, the experiences gained of the nature of the injuries agree with those detailed in the books of old military surgeons of years gone by. The most extraordinary of courses were taken, and the most trifling obstruction often caused what might have been a very serious injury to become a simple one; and, above all, the very large number of bullets lodged sometimes very superficially, and in not a few cases, after penetrating the skin, being stopped by the first bony obstruction, caused not the least damage thereto, and fell out on the garment being taken off for the purpose of examining the wound. All this proved that in the vast majority of cases the bullets were fired at considerable ranges from smooth-bore guns, charged with anything but large amounts of powder.

With the Boers we had quite a different sort of enemy and weapons to deal with. Trained from their earliest age to stalk deer and bring them down when in full retreat, naturally the very best rifles procurable were in their possession. For the first time in history the British army was placed opposite a white

race armed with weapons of modern scientific accuracy and firing cylindro-conoidal balls, and therefore for the first time were our men wounded in the manner in which they themselves are now wont to wound. The revolt commenced by the Boers using their own weapons—Westley Richard's, Express, and even Repeaters. A considerable number of Martini-Henry's had reached them through Zululand, which had been obtained after some of our defeats there in the previous year. As the war went on, and calamities succeeded one another, they of course were able to put into the hands of even their boys Martini-Henry rifles, and they knew how to use them, too. When our troops met with disaster in the Zulu war, it meant total annihilation of all unable to escape, generally on horseback. In the Boer revolt, so far as the wounded were concerned, it was the same as if the action had been successful, or nearly so. Let it be freely acknowledged that, as far as I knew, there is no well-substantiated case of cruelty to the wounded by the Boers. Every opportunity was given, as soon as the "affairs" were over, for the attendance of surgeons and for the removal of the wounded. It has been stated that explosive bullets were used. From what I saw of the wounded I had no evidence of such a thing. The following case was reported to me as a probable one, but a simpler explanation might have been arrived at.

No. 2353, Private W. F., of the 58th regiment, having previously been wounded, was one of those lying around Dr Landon on the Majuba Hill. One bullet had hit the axillary border of the latissimus muscle, penetrating it, and, running beneath the scapula, made its exit at the apex of the shoulder-blade. A second struck the right elbow near the inner condyle, furrowed the skin in an oblique direction, and passed off. A third hit him as he lay as above described. The patient states that, the fire being so severe, Dr Landon ordered them all to lie down. While so doing, "a bullet hit the doctor in the chest." "Another hit the patient over the sacrum." The wound, when I saw it, extended from the middle of the sacrum towards the left, along the iliac ridge. It measured eight inches in length, and was one inch and a quarter wide and quarter of an inch deep. At first sight it looked quite

unlike a gunshot wound produced from an ordinary bullet. It was, however, just such a one as would be produced by a partially spent cylindrical bullet hitting in its long axis, and this, I doubt not, was what had taken place. Skin-grafting was practised by me, and in less than a month he was quite well.

MULTIPLE WOUNDS OF ONE INDIVIDUAL.

Being hit by a modern bullet does not always mean anything serious. The following cases, along with the one just quoted, will show that even a number of bullets may penetrate one's frame and do little harm. At Brunker's Spruit the men were quietly marching along the ordinary open road when they were suddenly stopped. They had no cover, except a few who got behind their cart-wheels and dead oxen. Owing to this, and from having exactly calculated the range, the Boers scarcely wasted a bullet. In the case of one man there were no less than six distinct bullet penetrations of muscular tissues, which were all slight and healed rapidly. Private W. H., of the 94th regiment, was hit in three places at Brunker's Spruit. The first bullet entered the upper lip on the left side, making a furrow, smashing the teeth, passing under the tongue, and lodging near the inner side of the right ramus of jaw. The second struck at the sterno-clavicular articulation, slightly injuring the end of the clavicle, and made its escape two inches below the posterior fold of the axilla. The third entered at the inner side of the deltoid insertion to the humerus, running down the shaft and escaping near the insertion of the biceps in the forearm. All the wounds healed, but he speaks a little thickly, as if tongue-tied.

Private T. G., of the 3rd 60th Rifles, was hit at the Ingogo in three places—first in the right arm, the bullet entering two inches above elbow-joint anteriorly at the outer margin of the biceps tendon, running upwards and inwards, making its exit in the middle of the arm, near the brachial vessels. Numbness of the thumb and slight atrophy of the hand remains. The second bullet entered the leg at the inner side of the gastrocnemius tendon, and made its exit one inch above and a little anteriorly to the outer

malleolus; no evidence of injury to the bone. The third bullet entered the right thigh, half an inch to outer side of femoral vessels in Scarpa's triangle, and made its exit at lower fold of the gluteal muscle posteriorly; no injury to the bone.

ASSEGAI WOUNDS.

In nearly every instance in which our men were taken by surprise by the Zulus, death was the result of assegai wounds. It was only very rarely that any of our men escaped on occasions when the Zulus could use their favourite weapon. The following cases came under my observation:—

Mr W. B. E., an officer in the Natal Native Contingent, was escaping on horseback from the camp of Isandhlwana when an assegai hit him in the back of the thigh, "pinning him to the saddle." When galloping on he withdrew the weapon, and was seen next day by me at Helpmakaar. The wound presented the appearance of a simple wound made by a bladed instrument, did not injure any important part, and required nothing but a bandage to effect a cure.

Another case was that of Lieut. J. of the Scots Greys, who was hit by an assegai as he was furiously taking part in the charge at Ulundi. The assegai hit him on the sternum; and though he, with characteristic British pluck, thought it a trifle, it afterwards suppurated and was some little time in healing.

The next case is a very interesting one. Private J. H. M., of the 1st Battalion 3rd regiment Native Contingent, was present on the 12th of January 1879 at the attack on Sirayo Kraal, the first encounter between our troops and the Zulus. Several prisoners were taken and were being disarmed, when one of them, being irritated by our friendly Kaffirs, tried to force his escape, and, assegai in hand, stabbed right and left at every one. This patient was one thus injured. A bandage was applied, and he was conveyed to Rorke's Drift for treatment. While there several outbursts of severe hæmorrhage occurred from the wound, and, though the bleeding points were searched for by all the surgeons

at that camp, it could not be permanently stopped, breaking out again after a day or more, or whenever the local means of arrest were withdrawn. On the 26th of January he was sent to Helpmakaar, and I found a wound of a regular punctured nature in the lower end of the left ham, a little above the popliteal space. As there was no bleeding I simply ordered the limb to be kept as quiet as possible. Next day, however, hæmorrhage—which was found by two civil surgeons who attended to be almost impossible to control—took place. When I arrived he had fainted, and his pulse could only just be felt. No further bleeding took place for two days, when it burst forth again. Assisted by Surgeon M'Gann and others, the patient being put under chloroform, I enlarged the wound to look for the bleeding vessels. Having made the incisions, I found a large cavity filled with coagulated blood extending up the limb and amongst the muscles; compression over the femoral during this procedure was maintained. On relaxing this, after the clot was cleared out, numerous points of bleeding were seen, none of which could be seized for torsion or ligature. The patient was again almost pulseless and his face very pale. Raising the limb, prolonged digital and instrumental pressure all failing, it was agreed that ligature of the femoral was the only remedy left to us. I proceeded at once to do that. On reaching the sheath of the vessel the profunda was found to have a longer course than usual, and to be lying very close to the superficial femoral, both vessels being plainly felt pulsating. On applying pressure with the point of one finger on the profunda branch, I found not a drop of blood escaped at the wound after the withdrawal of the tourniquet from the groin. I therefore adopted the lesser operation, and tied the profunda. The wound healed rapidly, and after the first two days, when he complained of slight uneasiness in the limb, there was nothing else to note. On the 15th of February he left Helpmakaar for the base hospital. He afterwards returned to duty and joined "Buller's Horse," with which famous body he went through all the reconnaissances and battles, including Ulundi, without any inconvenience. This patient was one of those in the hospital at Rorke's Drift on the memorable 22nd of January, and managed,

under fire, to hop out from one building to the other. He therefore had four marvellous escapes within a few days—first, that of the stab at Sirayo's Kraal; secondly, the escape under fire from the hospital at Rorke's Drift; thirdly, the frequent profuse hæmorrhages; and fourthly, the operation.

A case of accidental assegai wound came under my observation. When the 2nd division found its way back to the Upoko river, after the battle of Ulundi was over, athletic sports were held, one of the "events" being assegai-throwing. A great deal of interest, of course, was taken in this by all the members of the different regiments. The friendly Natal Zulus forming the Native Contingent regiment competed for the prizes. On one occasion an assegai was well, but wildly, thrown into the air, taking a high course, and descended with great rapidity amongst the ring of spectators, becoming transfixed in the upper portion of the calf of a soldier's leg. There was, of course, a sensational rush. When I got to him he had withdrawn the weapon himself, and it was found the popliteal artery had just escaped.

GENERAL REMARKS ON GUNSHOT WOUNDS.

In wounds produced by round balls, or conoidal balls fired from smooth-bored guns, as in the Zulu war, the invariable slough appeared, and generally began to separate by the end of the first week. The case, however, is different with the modern rifle-bullet. I have seen so many instances of the healing process take place without any aid, after complete perforation of a thigh or arm, that I look upon the fact of a slough occurring as unusual. The wound of entrance and exit, also, differs in the two bullet injuries, the wound of entry in cases of cylindro-conoidal ones being frequently like those of exit in size and shape, and it would as often take a microscopist to detect the eversion or inversion of their lips.

Again, in the way of healing, almost in whatever line a round bullet travels, the wound of exit is the first to heal. This is as often not the case as otherwise with regard to the conoidal bullet

injuries. I therefore look upon the simple muscular injuries produced by modern bullets as much less severe, and consequently less apt to be followed by the incidental plagues which nearly always show themselves in military hospitals in the field, than the old round ones. I believe, also, the shock of a large round bullet, and the pain caused by its lodgment, to be a much more effective way of stopping the approach of an individual than a cylindro-conoidal bullet entering the same place, passing through at great velocity, and leaving a harmless little wound which heals by first intention, unaccompanied by any shock or pain, and which, I have even noticed, the individual never knew he possessed until attention was called to it.

When, however, a bone is injured, the great difference has to be considered. It is well known that a round bullet, in passing through a bone, is more local in its injurious properties than a conoidal one. When a shaft of a long bone is struck by a round bullet, long fissures and splitting up into fragments do not occur in the way they do when a conoidal one had hit a like bone. As regards the articular ends of the long bones, the difference is not so great between the effects of the bullets. The great question at present seems to be, admitting that a femur is so reduced into fragments by a conoidal bullet passing through it, is it necessary to amputate the thigh, or will the fragments reunite, the periosteum, of course, being upon them? Sitting quietly with pen and ink in one's room, it is easy to imagine such union possible. When one reflects on what takes place in a case of a gunshot-shattered thigh, how, under the most advantageous circumstances, prolonged suppuration and the constant soaking of these bony fragments in pus must take place, it is necessary to think how, under these circumstances, this periosteum is to be made serviceable? No; the line of practice of the future, I think, lies rather in the following direction:—Knowing the nature of a fracture of the femur from a conoidal bullet, the indication is, to cut freely down as early as possible after the injury, take away all the fragments lying loosely, leaving as much of the bone and periosteum as possible, then, making a suitable drain posteriorly, draw the limb together, put it up in some firm support,

when a short, and, I doubt not, a fairly useful limb would be the result.

It scarcely requires me to follow out here the results of much of the "expectant" surgery it was my duty to witness, and afterwards form into what is generally called "conservative;" the cases speak for themselves. I cannot help pointing out, however, that in far the largest number of cases of gunshot injury, radical and immediate measures taken within the first few days after the receipt of the injury will very often suffice to save a limb or joint which is certainly doomed by the non-interference treatment. Free incisions down to the injury where there is comminution, and removal of every loose portion of bone or *débris*, will prevent any amount of irritative fever, prolonged suppuration, osteitis, and periostitis, and all the whole list of calamities which follows as certainly as day the night, if such is not done in the first instance.

Now, as regards the removal of bullets, it is generally thought, if firmly impacted in the heads of bone, for example, it is best to allow them to remain until they loosen and can be easily removed. I have seen the result of this treatment so often, and have always practised the opposite, that I have no doubt as to the latter being by far the safest course. In removing bullets, the first error which the surgeon who tries the operation for the first time commits is in making too small an incision through the tissues to get at them easily. A small wound, and tearing with the blunt forceps, causes a nasty suppurating sore, while a free incision and simply extraction movement given to the instrument will make a clean wound which heals at once. In the British surgical field-cases bullet-forceps, formed with large spoon-shaped blades and with a joint resembling those on midwifery forceps, are found. These after one trial I discarded; and as long as I have one of the American tooth-shaped instruments and a good strong lever, as supplied in the excellent "cavalry surgeon's field-cases," I shall not use any other. The needlessly large wound which is necessary to be made in order to use the "regulation" kind, the difficulty in getting the points of the blades round the further end of an impacted ball, render it a useless instrument. The small teeth of

the American instrument, the narrow radius in which the blades open, the ease with which they reach any portion of the foreign mass, the security with which they hold the object, are all points of great consideration. It has been said that the danger consists in the fact that nerves, arteries, or other important structures have been seized and injured. This I cannot believe could occur except in the hands of one so manipulatively ignorant that any instrument would have its terror. In both wars there were numerous cases in which the discovery of the bullet was not always the easy matter it usually is. In no case did I find it necessary to use electricity, the porcelain-pointed probe generally clearing the doubt in such cases.

When a battle in which there have been a good number seriously wounded has taken place, it becomes a serious question as to the necessary treatment to be adopted—what cases should be treated by the “expectant,” “conservative,” or “operative” methods. Here, indeed, the whole specialty of army surgery comes in. Any one can lop off a leg or arm: the schools teem with second year’s students who can do this; but the thing which ought to distinguish the “army” from the “ordinary” surgeon is the knowledge of what injuries should be treated according to either of the above plans. To the patient, and to the surgeon unacquainted with gunshot injuries, often the wounds externally look so trivial and the symptoms for some weeks so slight, that opinions are formed and sometimes expressed quite contrary to what the results finally show to be right. It is a very distressing thing to require to tell a poor wounded fellow, after suffering weeks of prolonged torture, that he must lose a joint or limb, after being assured it would most likely be saved. Such a thing must occasionally happen, yet with a little care these cases might almost always be avoided.

It was my fortune to visit the hospitals in Germany at the time of the triumphal entry, just after the Franco-German war. Again shortly after peace was proclaimed between Russia and Turkey, I visited the former country. On both occasions I saw numerous operations of a more or less severe description, the result of the “expectant” surgery in cases unsuited for such

treatment. Wounds through joints and bones, at first quite local, had become, by the processes so well known to surgeons, very extensive, and sacrifices had to be made in cases where earlier and less severe operative measures would have sufficed. To save as much as possible is the object of every surgeon, but not at the expense of life. When I recall the cases in which the attempt was made, and is even now made, to save joints and limbs in the wars I served through, the more I feel that operative interference is far too little adopted. Now, though I say I think we do not operate enough, yet I would never sacrifice an upper extremity on account of a gunshot injury, unless in consequence of suppuration, osteitis, or periostitis rendering too large a portion of the shafts of the bones useless, and which only could occur as the result of previous expectant treatment. In my experience I have never seen a case of gunshot injury of the upper extremity in which "conservative" surgery—*i.e.*, the excision of the shoulder, elbow, or wrist, or even the resection of the shaft—could not have been done early in the history of the case, and so saved the limb. Cases of shell wounds are different.

THE DRESSING OF GUNSHOT INJURIES.

It is very difficult to understand what the term "antiseptic" means when applied to the dressing of wounds. I remember, when a pupil of the late Professor Syme, he taught us the theory of the germs in the air, and the practical way of keeping them out by means of putty in which carbolic acid was mixed, placed on a sheet of some metal. Then came an elaborate system of steam-sprays, innumerable coverings of gauze, solutions of varying strengths of carbolic acid, carbolic acid and oil, shellac plaster, and now we have solutions of chloride of zinc, boracic lint, and iodoform, with or without the spray. Theory and practice seem to accommodate themselves in a strange way when some change takes place. Seeing it is so difficult even to keep one's self acquainted with the "latest" fashion of dressing wounds "antiseptically," I determined to arrive at a conclusion as to the best modern method of treating

wounds, without reference to theory. And here let me say that the teachings of the illustrious Professor Lister helped me more than any one else. As an army surgeon, I knew from personal observation that Mr Lister's mode of dressing wounds was quite impracticable in the field; and as I have always doubted the value of "spray" and "gauze," I was not sorry to adopt other means. In both wars I have felt such confidence in my dressing, that though much tempted to use the elaborate system so often pressed upon me by surgical nurses of vast experience, I have never yielded. Had I done so, my results would certainly have been claimed by the advocates of the "spray" and "gauze." To keep quite clear of what is commonly called—not what Mr Lister and his followers call—antiseptic dressings, I avoided carbolic acid entirely. When it was used, it was only to wash out open wounds, and in a watery solution form. This was done after the supply of Condyl's fluid, which I had previously used, ran short.

When sequestra of bone or bullets were removed, the wound was mopped out with tenax—tarred tow; a suitable drain was invariably made, either by the wound itself or by a counter opening, and a tube inserted. Then the wound was closed, a piece of dry oiled silk as a protective placed over the wound, a good pad of loosely-opened tenax placed over all, and secured by an ordinary triangular or roller bandage. No fluid, either in the form of spray or lotion, was, as a rule, used. If the parts surrounding the wound were dirty, then soap and water was applied; but the wounds were kept perfectly dry.

In excising a joint or removing a limb, much the same proceeding was adopted. The greatest attention was paid to drainage for two or three days after an operation; every point in which there was the slightest chance of effusion, or pus lodging, had a tube inserted. Rarely were the dressings removed the day after the operation, but generally on the second one. When the cases were not very severe, such as an ordinary excision of an elbow, amputation at the shoulder, thigh, or leg, the cases were quite healed in a fortnight; and with this method of treatment (if the operations be done early

after the injury) there are very few cases that could not bear transport from the locality of military operations to the reserve base in three weeks' time. In one case I took an arm off at the shoulder-joint, and it was quite healed by the fourteenth day, on which the patient started, under my care, along with a number of others, for the base, and went all the way from Newcastle to Maritzburg—200 miles—taking fourteen days to traverse, and walking part of the way quite cheerily with the other members of the convoy. This shows what can be done in warfare, and is a more important fact, when reflected on by military medical organizers, than at first sight appears. It is, therefore, both in the interest of the patient and the country that early operation in proper cases should be done. The wounds were dressed as frequently as necessity required. Some needed very few, while others, chiefly the shoulder smashes, from the implication of the scapula and its processes, required more. The temperature is always a delicate guide in the progress of the healing of wounds, and as to the necessity of opening to re-dress them.

While I am writing these pages, the following case is under my care, an officer's wife affected with scirrhus of the right breast. I removed the whole breast, and dressed it in the simple manner above described—oiled silk, tenax, and drainage. It was only dressed three times, and was healed by the eighth day. On the tenth the patient was out driving, and on the twentieth day she went for a trip to Belgium.

I do not, for a moment, give this case for any other reason, than to show that this simple method of treating wounds is satisfactory. The healing of wounds is as much an act of nature as the birth of a child; and if meddlesome midwifery is bad, needless interference with wounds is equally so. Cover up any wound when once its lips are drawn together, place on it oiled silk,—a substance with no medicinal virtue, only, being smooth and soft, it lies on the part without irritating the wounds, and allows nature's efforts, the more or less exudation of lymph or pus cells, to take place in or from the wound,—and non-interference and union is the result. Such dressing, to the army surgeon, commends itself even more highly

than to the ordinary civilian one. Here we have an armamentarium of the most simple and easily conveyed description. The tenax used by me for the dressing of the wounded from Rorke's Drift, and some of that at Ulundi, had served the purpose of a soft agent for packing the medicine-bottles in their boxes. With this, and an ample supply of oiled silk, which occupies but little space, and sufficient drainage-tubes, I want nothing more for the ordinary treatment of gunshot injuries. Boracic lint was used with benefit in foul sores. Sponges should never be used in military hospitals except to wash the surroundings of a wound. The utmost cleanliness of hands, instruments, and wards or tents is, of course, imperative. Continentalists often forget this; hence the great contrast met with by them between antiseptic and non-antiseptic. For bringing the lips of a wound together I naturally used the catgut supplied liberally for the purpose in the Boer war. I regret it did not answer. Absorption took place before the wounds had firmly healed. On arrival in England I found the great inventor had made another innovation to remedy this objection. Green catgut was now recommended, and possessed less absorbent properties. I still give the preference to the silver wire, and until these new things have been more thoroughly tried and their efficacy proved I shall not experiment any more with them. In the largest number of bleeding-points one sees when performing an operation, catgut such as we had did well; but for ligaturing a main artery in field practice, he would be a rash man who would use catgut for such a procedure. In quiet hospitals at home, without the possibility of sudden excitements, such as always take place with, and more frequently without, cause, in war times, such might safely be done, but not in army service.

As regards drainage-tubes, those sent out to us were all made of dark vulcanized indiarubber. Now, as they nearly always parted with their colour when in use, it seems to me that the gray-coloured tubes are preferable. The old-fashioned tourniquet, with buckle, belt, and pad, was never used by me. In every case the simple elastic ligature of Professor Esmarch was found suitable. In

this instrument we have received, next to the drainage-tube, the greatest boon to military surgery which the last quarter of a century has bequeathed. Not half the assistants or anxiety need be associated with operative interference as before. The bloodless method (as taught by Esmarch) by the use of the elastic bandage, has been eclipsed by the equally satisfactory and much easier applied discovery of Professor Lister's, elevation of the limb for a few minutes previous to the application of the ligature, to arrest the circulation. This I found to answer every purpose, and the operations were almost bloodless.

ERYSIPELAS OCCURRING AMONGST WOUNDED IN FIELD HOSPITALS.

Probably no better air and climate exists than that of South Africa, and the wounded, being treated in tents, marquees, and huts, had every possible advantage. Yet cases of gangrenous sloughing of flaps after operation, and several cases of well-marked erysipelas, took place. As I had no experience of the former, the following remarks will be limited to the latter. No matter how carefully wounds are dressed, or in what manner, if surgeons and attendants are told off so as to attend to cases of erysipelas occurring sporadically, and also on numerous cases of gunshot injuries, the chances of this disease spreading are very great. It is not always possible to find any class of officers, when suddenly placed in the midst of an amount of work they have never before been called upon to perform, able to keep their natural balance and not lose their heads. Hurried and distracted with minor and often foreign duties, they are apt to neglect or insufficiently attend to their more specific ones. When regulations are framed on any point, it is always easy to quote them, and generally with good result. This subject is one requiring such regulations most urgently. It is always an easy matter to detail both medical officers and attendants doing duty in the medical divisions of the hospitals to look after such cases, and to prevent them, even as assistants or spectators, being present during any surgical undertaking. The cases I saw of gunshot injuries contracting erysipelas

(in my opinion) from the attendants, and the consequent gravity of such cases after recovery from the inflammatory affection, was one of the most practical lessons I learnt in my field service. The cases of erysipelas which I saw were at first sight very like the symptoms present in cases of acute osteitis, and the subsequent results, as proved by the radical operative means which had to be resorted to, in so many instances, tended to show that both were combined. Never in one single instance were cases so attacked found in such a favourable condition as before. In one case, when I had successfully performed an excision of the shoulder-joint, and when a most successful limb had resulted, after being attacked by erysipelas it was found necessary, owing to the acute periostitis and osteitis which ensued in the shaft of the humerus, to amputate the limb at the joint. In another case, that of a captain in the ——— regiment, on whom I was asked to perform whatever operation I considered right, even to the amputation of the arm, I found the shaft of the humerus not so badly injured as to exclude the possibility of saving the limb. He was attacked by erysipelas, and his chance disappeared.

From the way the products of this specific inflammation burrow between the periosteum and the bone, and also between the muscles, it is necessary to make free incisions down as far as such a state of parts exists, and as early as possible whenever the probe or other symptoms denote that such is the case; and a drainage-tube should be introduced. Treated thus, there is a fair chance of a case doing well even after it has contracted erysipelas.

GUNSHOT INJURIES OF THE HEAD, FACE, AND NECK.

In laager fighting, such as at Rorke's Drift and Kambula, the heads and shoulders of our troops were chiefly exposed to the Zulus. Consequently, most of the severely wounded under those conditions received penetrating injuries to the head, which necessarily ended fatally. At Ulundi a Zulu chief called Stulumaan was taken prisoner after the action, and it was found he had been hit by one of our bullets. The missile entered behind the

lobe of the right ear, and, passing internally across the cheek, lodged in the fold of the upper eyelid, from which it was removed.

CASE I.—No. 1112, Corporal J. L., of the 2nd 24th regiment, when engaged in the defence of Rorke's Drift, received a bullet in his neck, near the posterior margin of the sterno-mastoid on the left side, about the upper portion of the middle third of its length. Only one wound, that of entrance, was present. He complained of great pain in the neck on the slightest movement. When in bed, the pillow caused an increase of this. He had lost almost all use of his arms and hands, especially the right one, which he described as "quite dead." Painful "twitchings" were experienced in the arms. Whenever he wished to move his head from the bed, some one had to support it between their hands before he could do so. At Rorke's Drift several surgeons tried to find the bullet, but were unsuccessful. In the above condition he came under my care at Helpmakaar on the 26th January 1879, four days after the injury. Next day I put him under chloroform and made a prolonged attempt to find the bullet. The course I found it had taken was in a direct line with the spinal cord. I made a free opening in the middle line as far down the course as possible, and again attempted to reach the bullet. I found by digital examination now that the processes of two adjacent vertebræ were smashed. I could also feel the spinal cord itself. Pressure thereon instantly caused the patient to turn pale and the pulse to be almost imperceptible, and necessitated the immediate withdrawal of the chloroform and the adoption of artificial respiration. I took away several pieces of the vertebral processes which were lying loose, but had to give up attempting to reach the bullet. The case continued much as described for some time. He was sent to the base hospital at Ladismith, and on taking over the medical charge of that hospital a month later, I found my old patient much in the same condition. He was suffering greatly from the pain in his arms, and wished "to have them both off to relieve him from it." On examination, on making firm pressure, I found a distinct hard sub-

stance beneath the ligamentum nuchæ which was not present on former occasions. On consultation with the Surgeon-General of the forces, who happened to be on a tour of inspection at the time, I cut down upon it and enucleated an ordinary round bullet with a rather long rough process extending from its smooth surface. This wound healed rapidly, but the original one continued to discharge slightly for a long time. In a few days the pain entirely disappeared from his arms, and their use nearly returned. He was shortly after this sent home to England.

CASE II.—No. 893, Private J. R., of the 58th regiment, was hit at Lang's Neck in the middle of the right cheek, through the malar bone; the bullet took a course downwards across the ramus of the jaw, through the neck, including the sterno-mastoid muscle, down to the shoulder towards the scapula, and made its escape near the lower side of middle of the scapular spine, passing in its whole long course beneath the skin. Several pieces of bone had come away. On the 15th of May, there being several small abscesses present, one over the mastoid process of the temporal bone, another at the middle of the sterno-mastoid muscle, and a third at the ramus of the jaw, I opened them all and gave vent to collections of pus and bony *débris*; the latter was chiefly from the injury to the malar and inferior maxillary bones produced by the bullet in its course. On probing the wound of exit, a large amount of bare bone was present, the spine of the scapula being chiefly implicated. No loose portions were detected. On the 7th June I made an incision over the spine of the scapula in order to ascertain the amount of bare bone present which was keeping up so much supuration and delaying the man's recovery. I found the whole of the ridge called the scapular spine, bare, freed of its muscular attachments and its periosteum. I therefore excised the whole of it.

10th June.—Healing nicely; drainage-tube acting freely.

17th June.—Healed entirely.

5th July.—Left for Maritzburg quite well. Owing to the loss of the muscular attachments to the injured scapula, that shoulder

is pulled considerably forward, giving the patient a peculiar look. The face, except the small cicatrices, is not disfigured at all. In December 1881, when on my way home, this man came on board the ship I was travelling in at Cape Town. He informed me he had got his discharge from the service, and was living with his family, who had emigrated to the Cape, and was employed in a shop in Cape Town as a salesman. He continued quite well and able for any duty; the twisted shoulder of course remained, but was not very noticeable.

CASE III.—Sergeant J. B., of the 94th regiment, was hit at Brun-ker's Spruit, and there ably treated. In passing down country he came under my care. The bullet, a conoidal one, hit over the left eyelid, then entered the globe of the eye, and, taking an oblique course, penetrated the nasal bones, then passed across the cheek, and lodged at the ramus of the jaw on the right side, from which it had been removed. I saw the projectile, and found it considerably misshapen, the base of it being levelled into three facet-shaped portions. There was a slight discharge from the nose remaining as the result of the injury to the nasal bones. Except the loss of the eye, there was no other disfigurement.

The case of Private H., wounded in three distinct places, is already recorded. One of the bullets entered the mouth through the lip, smashed the teeth, passed under the tongue, and lodged at the ramus of the jaw.

GUNSHOT INJURIES OF THE CHEST.

It is always a most important point for the field surgeon to ascertain whether a ball has entered the cavity of the thorax or not. Here experience will guide one more than anything else. The discovery of the bullet in the parietes, the absence or presence of a painful tract round the walls, the knowledge of the nature of the projectile fired by the enemy, these have all to be thought of. In well-marked cases the symptoms leave no doubt of the severity of the injury. In others it is usually considered the best practice

to wait for the unfavourable symptoms to set in before forming a positive opinion. However, statistics must be made up, and a good many are shown as cases of penetration when such is an open question. In forming opinions afterwards, such records must be received for what they are worth. There is little need for me to detail fatal cases of this kind. That men may be but slightly injured by conoidal balls hitting the chest the following cases show :—

CASE I.—Private T. C., of the 92nd Highlanders, was wounded on the Majuba Hill. The bullet hit him in front, at the insertion of the eighth rib to the sternum, and made its exit in the side, in a direct line posteriorly in the same intercostal space, and about three inches from the vertebral column. The wound healed at once without suppuration or slough. With the exception of a slight feeling of dragging in the region, he suffers no other symptom. The projectile, in this case, must have been deflected from its direct course, and resembled the behaviour of a round bullet in its course.

CASE II.—No. 280, Private R., of the 58th regiment, was struck at the attack on Lang's Neck. The bullet entered two inches to the left of the ensiform cartilage, and made its exit at the eighth rib on the same side, about four inches apart from wound of entrance. A large amount of pus was constantly coming away, accompanied by bubbles of air, and the outside air rushed in and out in a most unmistakable manner every time the wound was dressed. The pus was very profuse and foul. On the 10th April a drainage-tube was inserted, and in a fortnight the wound had been completely kept free of pus and had healed up, leaving the man in excellent health, only suffering on exertion from "a stitch in his injured side."

We are a great deal too frightened about the pleura. The day was when the same fear extended to the peritoneum. Should I ever have the opportunity in war, I shall not hesitate to operate and drain such cavities freely, in cases which, according to present experience, must end in death.

CASE III.—No. 832, Private E. G., of the 94th regiment, came under my care for a short time on his way down country. He was one of the garrison besieged in Lydenberg, in the Transvaal. While on guard there he was hit one inch to left of middle of sternum through a loophole in the fort. The bullet made its exit at the outer border of the scapula, one inch from its apex. Slight puriform expectoration ensued, but no hæmorrhage. He recovered completely.

GUNSHOT INJURIES OF THE ABDOMEN AND PELVIS.

As in cases of gunshot injuries of the chest, so with those of the abdomen it is not always easy to say where they have penetrated. A few hours, however, generally suffices to make the point certain. The following case may be taken as an example of an injury, commonly met with in savage warfare, but more rarely found when such an enemy as the Boers inflicted it, as in this instance:—

CASE I.—No. 1109, Private W. S., of the 58th regiment, was hit at the storming of Lang's Neck. The bullet entered two inches to the left side of the lower dorsal vertebra; from that point it passed subcutaneously across the whole of the back, injuring in its course the spinous processes, and making its exit one inch above the right great trochanter of the femur. The course taken measured twelve inches in length. Suppuration of course followed until all the bony *débris* had come away. When this took place the wound healed rapidly.

CASE II.—Private T., of the 58th regiment, was hit, at the Majuba Hill action, in the abdomen and foot. The latter is described in the section dealing with injuries of that part. The wound in the abdomen had healed when I saw him. The cicatrix of the bullet's entrance was found to be in the back, half an inch to the left of the spine of the middle lumbar vertebra, and that of exit in a direct line anteriorly three inches to right of umbilicus. The wound healed very rapidly, and, with the exception of slight

paralysis and numbness in his left leg, causing it to drag a little, he suffered no inconvenience. The patient died from exhaustion following operation on his leg, as elsewhere detailed, and I made out the following facts at the post-mortem examination:—Interior to the cicatrix on the back, a canal into which the tip of the finger could be easily pushed, extended through the lumbar muscles, with a distinct puckering of the parietal peritoneum at this point. Anteriorly the omentum was pushed into the wall of the abdomen, and was firmly adherent along the track of the bullet as far as the integumentary cicatrix. The long strip of omentum so fixed was a most striking phenomenon. The crural nerve was injured, but even on most careful search no distinct cicatrix was made out in the intestines. The mitral valve of the heart was greatly diseased, being very incompetent. The valve closed so imperfectly that a very large opening always remained. Now there cannot be a doubt but that this case was one of penetration, the bullet traversing the whole cavity, and yet recovery would have followed, for had he not been also injured in the foot he would most certainly have returned to England in fair health. It is just one of those cases which makes the exception to the general rule, as to the fatality which commonly accompanies such injuries.

CASE III.—Staff-Sergeant P., one of the chief clerks in the divisional office, was accidentally shot at Newcastle, at very close range, on the 16th April 1881, by a comrade practising firing with a Colt's revolver. The bullet entered five inches to the left of the umbilicus and two and a half inches below the ribs, and lodged in the abdomen. The patient was able to walk a considerable way after the receipt of the injury. On arriving at hospital about fifteen minutes after the accident, there was no doubt as to the serious and fatal nature of the injury. Collapse, vomiting, frequent micturition, cold sweat, and rapid thready pulse, knees slightly drawn up, and inability to lie on affected side, with anxious expression of countenance, were present. He lived for thirty-two hours. After death, oedema was present in the scrotum; blood issued from his nostrils. The parietal and visceral peritoneum were injected,

and flakes of yellow lymph were present between the coils of the intestines, and two penetrating wounds were found in the small intestines. At the inner side of the psoas muscle, behind the peritoneum, the bullet was found, base upwards, just touching the vertebral column. With the exception of a slight dent on the margin of the bullet's base, it was not altered in appearance.

The following case of suicide by stabbing, which occurred at Aldershot on the 11th October 1877, came under my immediate notice and care ; and as it will serve to show one or two points of interest, I insert it here :—

CASE IV.—Farrier-Sergeant W., of the 1st Royal Dragoons, possessed the good conduct medal and had over twenty years' service. His comrades had noticed he had become more reserved than usual and talked about being hanged ; but as he always drank freely, though never intoxicated, they paid no attention. On the above date, about noon, while alone in his barrack-room, he took a large regulation blunt cavalry sabre and made five plunges with it at his chest. Owing to the firmness of the walls and the bluntness of the weapon, he did not succeed in penetrating the cavity. He then, with perfect success, plunged it into the abdomen, just below the ensiform cartilage, and down as far as the pubes, and while in this position, he told me, "he twisted it about." When found by a comrade, he walked in this condition several hundred yards and up two flights of stairs, and when seen by me he was lying quietly on his back as if nothing had happened, talking quite naturally, and giving a full description, when questioned, about the whole affair. On examination I found he had fractured two of his ribs, and the skin over them was emphysematous. The wounds bled but little. When taken to hospital he kept his hand constantly over the pubes, as indicating the chief seat of pain. Urine passed frequently, scanty, and bilious. Body cold, pulse feeble. In the evening he began to spit up from his throat a quantity of dark glairy mucus. He was quite conscious, almost to the last, when he died on the 12th—next day—at 4 P.M. A coroner's inquest was held, and a

verdict of unsound mind was given. I made a post-mortem examination, with the following result:—The sixth, seventh, and part of the eighth ribs were broken. No penetration of the chest cavity. The cartilages of the ribs were ossified. The abdominal wound was closed by recent lymph. The abdomen was filled with fetid gas. The stomach had been grazed, but not penetrated, and was filled with black grumous material. The small intestines were completely severed in four places, and a deep wound existed down the right side of the pelvis near the vessels, the bladder escaping. The whole of the intestinal coils were injected, and recent lymph filled up the interspaces and held them slightly together. Heart externally loaded with fat, 1 lb. 2 oz. in weight. Ascending aorta atheromatous and dilated.

The following cases illustrate injuries to the pelvis:—

CASE V.—No. 956, Private C. F., of the 58th regiment, was hit at Ulundi. A bullet from the enemy struck his ammunition pouch, which was attached to his waist-belt and held sixty rounds at the time. A hole was made in the pouch, and the cartridges fell through it on the ground. At the same time a bullet entered the highest point of the crest of the left ileum, and made its escape over the middle of Poupart's ligament on the same side, forming a long subcutaneous sinus. After the slough came away, the wound healed quickly.

CASE VI.—Private J. H., of the 58th regiment, was struck on the Majuba Hill. The bullet entered the gluteal region, about two inches from the great trochanter of the femur, and, penetrating the os innominatum, made its escape over the abdominal wall about midway between the anterior superior spinous process of the ileum and the navel. With the exception of suppuration as long as the bony *débris* was coming away, the wound healed up without a bad symptom.

CASE VII.—Private G. F., of the 3rd 60th regiment, was hit at

the Ingogo when kneeling in the act of firing his rifle. The bullet struck the inner side of the raphe of the scrotum, went through the integument, and, without coming out, passed up through the right groin and pelvis, making its exit three inches from the sacrum, at upper third of gluteus muscle. Numerous pieces of bone came away from the ileum. The testes were uninjured, and the wounds healed in a little time perfectly.

GUNSHOT INJURIES OF THE SHOULDER.

In modern tactics the shoulder becomes a much more frequently injured region than any other except the head. Not many years ago it would have been thought cowardly to lie down and take every available means of shelter when advancing against an enemy, while now it is the recognised custom. At any field day in ordinary peace times the movements by "rushes" can be seen, and the prostrate positions assumed by the troops at intervals, as well as the rapid formation of shelter trenches by the free use of the spade. Such is the characteristic of modern "attack" against a civilized foe. The long range and the accurate aim of modern rifles as compared with the old smooth bore guns render such proceedings necessary. For this reason it is found that a large portion of our most serious cases are wounds of the most exposed shoulder, that is, the left one, in a fair stand-up open fight, and the right one, in "laager," "recumbent," or "entrenchment" firing. In most of the "laager" fights in the Zulu war, as well as the engagement of the Ingogo in the Transvaal, the frequency of such injuries was considerable. In the first of these engagements the fighting took place from behind the shelter afforded by large bags of maize or earth which had been skilfully arranged for the purpose; while at the Ingogo numerous large boulders which fringed the border of the plateau held by our men, served a similar, though not so complete a purpose. It is most important that settled opinions should be formed concerning the military surgery of the shoulder. If the eye be taken as the guide in forming an opinion as to the implication or non-implication of any joint, it is a very

misleading one. This is almost as much the case with regard to conoidal as to round balls. In the shoulder we have a complex portion of the framework to deal with. There is the ball-and-socket joint surrounded by numerous firm bony processes, the head and shaft of the humerus, the clavicle, coracoid, and acromial processes, and the spine and blade of the scapula. Add to this the numerous strong muscles and tendons arising from or attached to any of these, and the difficulty of a bullet being able to penetrate the joint is seen to be considerable. Professor Longmore says, with regard to the shoulder and elbow joints, that "expectant surgery is more fatal, and the results less satisfactory, than after resection." As in all cases of injury near joints, the earlier the diagnosis as to the exact nature of the injury (by the most thorough physical examination if need be), and the earlier the right treatment is adopted, the less will be the sufferings of the patient, and the more useful the result of whatever is done. There was a very common occurrence in the Boer war, of which several examples are here recorded, calling for serious consideration. Conoidal bullets hit at great velocity and penetrated the shoulder, often injuring the clavicle, some process of the scapula, and the blade as well, and then escaped. After the sequestra and bony *débris* had come away, by nature's aid, through the influence of suppuration, a certain degree of caries and necrosis was generally found to be present in and around such injuries. When such wounds are probed no loose bones are found, therefore the orthodox treatment is to let them alone. Now, it is this treatment I wish to prove to be wrong. If the following cases, in which such symptoms were present, teach anything, it is that operative means should be adopted to remove these carious and necrosed portions of bone. They ought not to occur, but, being present, they should be at once removed. But then, after taking such parts away with bone-pliers or saw, what do we leave? say some. Certainly not uninjured, but healthy bone, which, if the rules of wound-draining be attended to, will at once go through the quick and natural course of healing. Contrast this with the months, even years, through which cases not so treated drag their weary course. For a time they partly

heal up, and then start afresh in their cruel career, until one sequestrum after another is thrown off, and nature has effected a cure by the total destruction of all the bone in the neighbourhood. The limb all this time being useless, the muscles glue themselves together through the inflammatory exudations thrown out, muscular atrophy takes place, fixation of the joint results, and, with the exception of the fingers, the arm is of little or no service. The chances of one of the many severe inflammatory attacks, which accompany the blocking up the free exit of the pus from the presence of such fresh sequestra, being followed by any of the alarming symptoms of blood-poisoning is an additional danger. In addition, there is the constant open wound, the continual careful dressings and anxious attentions, and the drain on the system from the pus formed and evacuated, and the chances of erysipelas, etc. Every surgeon with such cases under his care would consider the knife is cruelly withheld in their early history; and I have not met with a single such patient who would not willingly undergo anything to get radically well, so tired and disheartened do they become. Unfortunately, radical action then cannot do what it most certainly could earlier, namely, procure a *useful* limb. I shall now detail a few cases of gunshot injuries to the shoulder which occurred at Rorke's Drift and Ulundi in the Zulu war, and go more fully into those, which were more complex, occurring in the Boer war.

CASE I.—No. 1362, Private F. H., of the 2nd 24th regiment, was hit, during the defence of Rorke's Drift, in the right shoulder. The bullet entered near the base of the scapula, having been fired from the hills opposite to which he was fighting. The bullet made its exit over the bicipital groove in the humerus. There was great swelling of the whole shoulder when seen by me on the 26th of January 1879, and ecchymosis. The tract of the wound was sloughing. Poultices and cold water sufficed to allay this, and the case did well.

CASE II.—Corporal C. S., of the 1st battalion 2nd Co. Natal Native Contingent, was wounded at Rorke's Drift. The bullet hit

the back of the head at the posterior margin of the left sternomastoid at its origin, and took a course towards the middle of the scapular base, where the bullet lodged subcutaneously, from which position it had been removed when I took charge of him on the 26th January. Here also the whole shoulder was greatly swollen and painful, requiring poultices. This case, after the usual slough came away, got well.

CASE III.—No. 1240, Corporal W. A., of the 2nd 24th regiment, was hit, at Rorke's Drift, in the right shoulder. The bullet entered near the insertion of the deltoid muscle to the humerus, and made its exit at the upper and inner angle of the scapula. The bullet appears to have passed under the scapula, no bone or joint being touched. This wound sloughed and then very rapidly healed up.

CASE IV.—Acting Assistant-Commissary D. was hit in the right shoulder at Rorke's Drift when busily engaged forming the "laager," which he had originally commenced, and to which was due the safety of the place. The bullet entered about half an inch above the middle of the clavicle, and made its escape posteriorly at the lowest border of the trapezius muscle. The course taken was curious, regularly running round the shoulder and down the back, escaping all the important structures. The wounds, like all those received at Rorke's Drift, were wide and open and sloughing when seen by me on the 26th January. After the slough came away the usual tenax was applied. The whole of the field medical equipment having been captured by the enemy at Isandhlwana, I had no antiseptic to use. I thought of quinine, which I knew was a wonderful preserver of animal tissues, and used a solution of that, experimenting in this case. It seemed to answer, as the wounds got well after being injected several times with it. My subsequent experience, however, is that the wound would have done as well without it.

CASE V.—No. 447, Private J. W., of the 1st 24th regiment. This man had been left behind by his regiment (the one annihili-

lated at Isandhlwana), as he was fulfilling the duties at Rorke's Drift of an hospital orderly. During the fight he was hit in the right shoulder. The bullet entered the deltoid muscle about its lower third anteriorly, and lodged opposite the surgical neck of the humerus posteriorly, where it had been cut out. On probing this wound no bone was felt, and after the usual sloughing it healed. In every case the projectile found was an ordinary round one, and the nature of the injuries tend to show that they were all produced by similar bullets.

CASE VI.—No. 1979, Private W. B., of the 21st regiment, in the square at the battle of Ulundi, was in the act of loading his rifle when he felt a thud on his shoulder. So great was this, as also the numbness which immediately succeeded in his arm, that at first he thought it was completely blown off. The bullet entered immediately above the sterno-clavicular articulation on the right side, and, taking a transverse direction towards the acromion process of the scapula, lodged. From this position, after having to cut deeply, I removed it. It was a mass of lead roughly hammered into a round form. For some days the whole shoulder was ecchymosed and much swollen. The case recovered.

CASE VII.—No. 564, Sergeant J. M'N., of the 94th regiment, was in one of the reserve companies in the square at Ulundi, in its "rear face," and he left his place for a little to point out a body of Zulus coming down a hill to one of his brother sergeants in the front rank; while so pointing with his arm extended, he was hit in the shoulder, right over the head of the humerus. No wound of exit. Numerous attempts had been made to find the bullet. Though no probe could reach it, knowing it must be there, I freely opened up the locality, and found it very firmly impacted in the head of the bone, and, aided by the "elevator," extracted it. It was a large Enfield rifle bullet, which, from the absence of groovings on its surface, proved it was fired from a smooth bore gun.

In the surgery of the Boer war cases of injury to this region

were more complex. In no instance could the difference be so well seen, as in these wars, between the effects of round and conoidal bullets striking muscular or bony tissues. Amongst six cases of gunshot injuries to the shoulder I examined, caused by conoidal bullets, in the Boer war, where there were distinct cicatrices of wounds of entrance and exit, I found no injury to any important part whatever, and the wounds had healed without trouble. My friend and confrère Surgeon-Major James Scanlan drew my attention to one which was thought by many a case of joint perforation, in which recovery was taking place. We both agreed, after most careful examination, that such had not been the case. The wounds being still open, the probe passed quite away from the joint. I afterwards saw another case, a soldier who had been made a prisoner by the Boers and taken to Heidelberg and compelled to work. His shoulder presented similar cicatrices, and, considering the course a conoidal ball would probably take, little doubt would have been entertained regarding the penetration of the joint. This case was examined by several of my colleagues at Newcastle when the man was temporarily in hospital on his way down country. The patient stated "they had no doctor to look after them, and all they did was to go down regularly to the river and wash their wounds." Looking at the result, it could not have been more perfect.

The following two cases, having much in common, terminated so differently, that they may prove instructive:—

CASE VIII.—No. 3771, Private G. S., A.H.C., was shot in both shoulders when dressing a wounded man on Majuba Hill. Was treated afterwards at Newcastle. One bullet entered the right shoulder just above the clavicle, and made its escape posteriorly over the scapula immediately above the middle of its spine. He was also hit on the left side. The bullet entered near the inner margin of the deltoid muscle, and made its exit posteriorly at the glenoid ridge of the scapula, again without injuring the bones or joints. Here were two wounds fairly through the shoulders,

and the bullets taking most marvellous courses for conoidal ones, which, from the nature of the wounds, they must certainly have been. The wounds healed rapidly, and there was no difficulty in the movement of the arms.

CASE IX.—Major M. was struck at Majuba Hill. The bullet entered through the upper half of the right clavicle, going through and escaping beneath the spine of the scapula. The clavicle was found, when I first was asked to examine him, to be partially smashed. A ridge, however, at the under surface was intact; the bullet had furrowed its way through. Several loose portions of bone were found. Posteriorly the probe found the scapula penetrated, a considerable hole existing in the blade, and quite a quarry of fragments of bone existed between the scapula and the wall of the chest. There was immense tumefaction and suppuration in the surrounding parts and the wound. The loose fragments were removed, and an examination performed under chloroform. I found for quite half an inch round the hole in the scapula that it was devoid of life. My finger passed right through and in front of the scapula, and could feel the state of parts well. The results of the inflammatory action were spreading to the joint, and it was quickly becoming stiff. I advised a free exploration, and, if necessary, the excision of all implicated tissues. In this opinion I was fully borne out by the medical officer in whose care the patient immediately was. This was not permitted. Crop after crop of bony *débris* crumbled off the scapula, the gradual caries and necrosis went on, one outburst after another of acute suppuration, accompanied by high temperature, great tumefaction and swelling of the shoulder, and consequent emaciation, succeeded. Then the injured clavicle threw out an immense amount of callus, and afterwards a sequestrum therein appeared, setting up fresh inflammation, which was ultimately taken out in England. I saw him just before this was done, on my return home. The wounds were healing and breaking out as usual fifteen months after the injury, and the probe detected the loose bone in the clavicle and the bare bone in the scapula. I also found that by the gradual weakening through

diseased processes in the scapula the glenoid cup had become separated from the rest of the bone. The arm was atrophied and comparatively useless. He had some use in his forearm and hand, which he carried in a sling.

Here were two cases occurring on the same occasion, from the same enemy, and from like bullets, and yet how different were the effects produced in the shoulders—in the one case the bullet behaving almost in the way round ones are known frequently to do, and in the other penetrating in a direct line every obstruction it met.

CASE X.—No. 201, Corporal M'K., of the 92nd Highlanders, was hit, on the Majuba Hill, in the right shoulder, the bullet entering posteriorly near the upper angle of the scapula, close to the vertebral column, taking a course beneath the scapula, and part of it lodging. The bullet seems to have become broken, for one portion made its exit at the posterior edge of the insertion of the deltoid muscle in the arm. Taking for granted that because there is a wound of entrance and exit the whole of the projectile has escaped may lead to error in some cases. In this instance this was done, and in another I overlooked the presence of a bullet myself. My attention was called to an easily felt mass over the scapula; and receiving from the patient and the attendants a history of a severe blow by the butt end of a rifle on that part, without further examination I concluded it must be a broken-off portion of the angle of the scapula. There were no less than eleven cicatrices, the result of abscesses, around this man's shoulder when I saw him in England fifteen months after the injury. These, besides being over the shoulder, extended down two-thirds of the arm. On then examining this case I discovered a large piece of the bullet lying in the arm, and which I saw at once removed. Here the probe found, as in the former cases, considerable evidence of bare but no loose bone. The progress of the case was similar to the others, and the patient's patience was quite exhausted.

CASE XI.—No. 2172, Private M. S., of the 94th regiment, was wounded on the 19th February 1881 at Marabastad, one of the

besieged garrisons in the Transvaal. The fort was built of stone and sand, and while on duty as a sentry he saw a Boer fire from a neighbouring hill quite one thousand yards away, and in a few seconds a bullet passed through a loophole in the fort's wall and hit him in the shoulder and there lodged. He was stationed at a corner of the fort, with a loophole on either side of him, and he thinks the projectile must have entered at one loophole and hit him as he was looking out of the other. The bullet entered obliquely at the middle of the glenoid margin posteriorly, passing beneath the scapula and lodging at the spine of the third dorsal vertebra, from which it had been extracted. I was first asked to see this case on the road between Newcastle and Maritzburg. I was in charge of a convoy of wounded passing down country, and overtook the convoy of which this man was a member. This was in August 1881. I made out the following conditions:—Numerous abscesses existed all over the scapular region. On probing, several loose sequestra of bone were felt. Anteriorly similar abscesses existed in the infra and subclavicular regions. A large one extended over the sterno-clavicular articulation, from which several pieces of bone had come. A probe passed closely round, but not into, the capsule of the joint. I considered it a case even then for immediate excision of the joint and removal of all bare and loose bone. I next saw the case in England in April 1882—fourteen months after the injury—and I found him in the following conditions:—One abscess after another continued to form, often accompanied by severe febrile attacks, great tumefaction and swelling of the shoulder, etc., as in the other cases. The opening at the sterno-clavicular articulation, as also the wound of entrance, were open and discharging very foul-smelling pus. The probe came on quantities of bare but no loose bone, and went down towards, but not into, the glenoid cavity. The shoulder-joint was quite stiff, and could not be moved without also moving the scapula. Ten cicatrices, the result of abscesses, posteriorly, and two anteriorly, existed, showing the ineffectual struggles nature had made to throw off the injured and diseased tissues. When I last saw the case—12th June—a fresh abscess had formed an inch

below the clavicle, which I caused to be opened, giving exit to a large quantity of the most fetid pus. The case dragged its weary course along, and the man's patience was exhausted, so that he was willing even to lose his arm rather than go on as he was. The bullet which produced this injury is in the patient's possession. It is an Enfield rifle one, weight 1 oz. 16 grs. It is greatly misshapen and deeply grooved, so much so that I do not think any bone in the body could have offered sufficient resistance to have caused such an alteration in shape. It is highly probable that it hit the side of the loophole through which it passed before lodging in the man's shoulder.

CASE XII.—No. 2136, Private W. S., of the 94th regiment, was wounded, at the action of Brunker's Spruit, in the right shoulder. The bullet entered at the posterior edge of the insertion of the deltoid muscle, smashing the head of the humerus and injuring the joint, and lodged. Numerous pieces of bone had come away, one unmistakably a portion of the articular end of the humerus. As the probe passed freely into the joint, and found it full of sequestra accompanied by profuse suppuration, on the 7th May 1881 I made the necessary deltoid incision to excise the joint, remove the sequestra, and look for the bullet. The head of the humerus was found in fragments lying in the glenoid cup, which was devoid of all its articular cartilage. I removed the former and freely gouged out the latter. The bullet could not be found. The case was dressed in the manner I have advocated.

10th May.—I discovered the bullet lying at the apex of the scapula, it having gravitated downwards behind the scapula, and cut it out. It is remarkable how many instances of this one meets with, bullets entering the shoulder being eventually discovered in this position. The bullet was a Westley Richards rifle one, and had its apex considerably flattened.

16th May.—The incision having all healed, the sutures were removed.

7th June.—This man was one of the most useful helps in the ward, and was able to flex and extend his forearm excellently,

and to move his shoulder a little. Only a few drops of pus, from point where drainage-tube was in, now.

21st June.—Arm so well that he carries heavy pails of water from the water-cart and into the ward with it.

22nd June.—Unfortunately erysipelas attacked the small open wound mentioned, and rapidly spread over the whole shoulder. A large abscess formed in the tissues of the forearm, which was incised and a quantity of pus evacuated.

26th.—The temperature at nights being still high, 103° F., and the probe coming on bare bone at the point where the humeral shaft was divided, on consultation with Brigade Surgeon Watts, my immediate medical chief, and Surgeon-Major J. Scanlan, he was placed under chloroform in order to remove this. As there existed evidence of considerable mischief, the tissues posteriorly over the joint being greatly inflamed and infiltrated with pus, I made a free incision posteriorly and reached the joint, when I found a long tunnel-shaped abscess sac enveloping the shaft of the humerus. I thereupon enlarged the anterior wound, and found the shaft bare of its periosteum. By means of a chain saw I removed about an inch of the humerus, as we considered it necessary to remove all dead bone. Acute periostitis and ostitis had occurred, not a particle of periosteum enveloped the bone, and its texture was so soft that the nail easily penetrated it. Under those circumstances I had to remove, in a similar manner, another inch. This also was found in a like condition, so I had to go on removing piece after piece until, counting the previous excision, far more than five inches—the amount once removed with success in the American war—were taken away. It was now decided that amputation at the shoulder was our only course. This I at once did, making use of the incisions anterior and posterior already made, forming a deltoid and inner flap. The outer edges of the flaps were so infiltrated with inflammatory products that it was with difficulty I could pierce them with a needle or draw them together. I again had to scrape and gouge the glenoid cavity. Two hours and a half were expended before the various steps undertaken were accomplished, every effort being taken to save the limb. The patient,

who had been so proud of his arm after the former operation, never imagined, any more than we did, that it would be necessary to amputate the limb. He was very philosophic on the subject, and bore the loss most cheerfully.

27th.—Fever subsided, and the patient slept well.

28th.—Owing to the profuse foul-smelling discharge, the wound required to be dressed twice a day. From the nature of the glenoid cavity this was to be expected for a time.

29th.—Temperature normal. Wound freely discharging.

2nd July.—The outer flap a little inflamed to-day. Poulticed.

4th.—Poultices stopped, inflammation subsided, free discharge.

6th.—Took out all the stitches; wounds healed completely except where drainage-tubes are; all ligatures but the main one away. This latter came away the following day.

8th.—Patient up and out of the ward for a little to-day.

10th.—Quite healed, fourteen days after operation. This man is now in the corps of commissionaires, London.

CASE XIII.—No. 4454, Corporal J. E., of the 3rd 60th regiment, was shot, at the Ingogo, in the shoulder and elbow of left arm and in the right heel, making three distinct bullet hits. The projectile striking the shoulder entered through the upper anterior portion of the deltoid, passing through the head of the humerus, going down the back without escaping through the axilla, and emerging about the fifth rib, two inches to inner side of angle of scapula. The second ball hit the elbow in its posterior aspect near the inner humeral condyle, passing through the joint, and escaping two inches below upper end of ulna, also posteriorly. The elbow was bent when hit. The wound in the foot was a deep hole in the os calcis. From this I removed a piece of his sock and leather of his boot, which had been driven in by the bullet, the latter not itself lodging. Nothing could exceed the emaciation and pain which this man suffered from when I saw him. The shoulder and elbow joints were greatly swollen and full of pus, and his agony when being dressed was beyond description. On the 28th March I removed the arm at the shoulder-joint. The articular

cartilage of the joint was quite gone, the glenoid cavity was rough, and required freely gouging. The humerus was smashed anteriorly through the anatomical neck, and several sequestra were present. Posteriorly the head was uninjured, and no evidence of starring or fracture existed. The elbow-joint was open, the inner condyle of the humerus was deeply grooved by the bullet, the head of the ulna was in fragments, so also was the articular surface of the head of radius. Both joints were full of foully-smelling pus. The stump was treated in the way I have advised. The method adopted for removal of the limb was Larrey's, slightly modified. By making the semilunar flaps from the acromion process down to an inch below the top of the humerus after they are dissected back, we have practically done the operation without cutting a large vessel, the final sweep of the knife being so simple that the operator himself can with one hand seize the remaining tissues with the vessels, while he divides with the other. There is one slight objection to this not encountered with the deltoid flap; that is, the want of muscular covering for the acromion process, which is very apt to be unduly prominent and tender for some time. However, in military surgery, as well as in civil, the individual circumstances of cases must guide us. The patient had had hypodermic injections of morphia for such a long period, it was found difficult to get him to discontinue them, even when the source of his pain was removed.

31st March.—Complained greatly of his old pains in the arm and elbow, which he knew must be imaginary, as the limb was off. Temperature had gone down, and the wounds healing well.

4th April.—Temperature normal; sat on the edge of the bed to have his stump dressed. Wounds healing rapidly.

7th April.—Tubes, ligatures, and stitches all away.

8th April.—Was outside the hospital, sitting for a little while.

19th April.—Was up and about; wounds quite healed. He is now in the corps commissionaires, London.

CASE XIV.—No. 1760, Private E. C., of the 58th regiment, was hit in the right shoulder at the attack on Lang's Neck. The bullet

entered at the acromion process, near the posterior edge of the insertion of the deltoid, going directly through the glenoid cavity, and made its exit through the middle of the clavicle, smashing the bone, so that the ends protruded from the wound and were denuded of their tissues. On its way it passed outwards, grooving its course along the whole side of his neck, and escaped. The head was turned towards the opposite side to that on which he was hit, otherwise he would have been immediately killed. The bullet, instead of hitting the neck obliquely, would have entered it in a direct line, and probably lodged at the base of the brain, fracturing the skull. The humerus appeared to be quite uninjured, but on rotating it the articular ends, glenoid, and head of humerus were found to be rough. The probe passed direct into the cavity of the joint, which was full of offensive pus. A very large abscess full of similar fluid existed along the sheath of the biceps; a small opening was present at the base of the belly of this muscle, giving egress to a portion of the accumulated matter. On the 28th of April he was placed under chloroform for the purpose of doing what I thought necessary. After making the usual deltoid incision and tilting out the head of the humerus from the glenoid cavity, hoping to be able to excise, I found the head and shaft of the humerus bare and rough, neither cartilage nor periosteum being present. This condition of things extended as far down the shaft of the humerus as the abscess above noticed, namely, as far as the muscular portion of the biceps. There was therefore no course open but to amputate, which was done. I made use of the incisions already made, so as to have a large muscular deltoid and posterior flap. The whole of the cup of the glenoid was found bare, and the coracoid and acromion processes fractured. The whole of these were removed by dissection and the bone-pliers. The smashed end of the clavicle was also excised through a separate incision. Owing to the prolonged nature of the proceeding, a good deal of bleeding took place. The wounds were dressed in the usual way. Temperature the night previous to the operation $102^{\circ}6$ F.; the night after it fell to 100° F. The dressing was not removed until the second day after operation, when it was found that all the discharge was coming

freely away from the tubes. The pus had a very foul smell. In order to maintain the patient's strength, (he being greatly prostrated,) champagne, brandy, and soups were given at regular intervals.

1st May.—The flaps being very much inflamed, and the discharge still being copious and offensive, poultices were applied. Temperature 101° F. at night.

2nd May.—Put in another drainage-tube, making three in all.

3rd May.—Stump had lost its red appearance and the pus its smell. Patient was able to smoke. When asked how he was, replied "A1" in a most cheery manner, and he was known in the hospitals by this sobriquet for weeks afterwards.

5th May.—The poultices were stopped, flaps and wound looking well.

10th May.—Pus gradually lessening in quantity.

15th May.—Sutures and ligatures all away; healing rapidly.

1st June.—Is so well as to be able to get up to-day.

18th June.—Having quite recovered, left Newcastle *en route* for England.

CASE XV.—Private W. H., of the 58th regiment, was shot in his left shoulder while storming Lang's Neck. When wounded he was one of the front men, and was in the "recumbent" position, a "rush" having just finished, and was loading his rifle, ready to fire. The bullet entered at the highest point of the shoulder, in line with the sterno-clavicular articulation, proceeding in a line downwards towards the axillary space, crushing the scapular processes and glenoid cup, and escaping in the hollow of the axilla. When first seen by me the arm was perfectly useless. There were numerous large collections of most fetid-smelling pus in the arm and along the parietes of the thorax. At the camp from which he had come, he had been kept in a separate tent, and the attendants waiting upon him had been allowed to smoke, so dreadful was the smell from his shoulder. He was emaciated to the very greatest degree, "nothing but bone and integument." Quite a pint of pus was daily taken from the abscesses. His other

arm had been injured by a blow, he said; it also was rendered useless and stiff. He was therefore in a condition of the most extreme helplessness. He would only allow himself to be raised in bed by catching him by the hair of the head and thus getting him up. His awful yells during the process of changing his dressings were familiar to every one in the camp. No less hopeful a case could possibly have been met with for operative treatment, which, of course, was urgently called for. On the 8th May I determined to give him the chance, and he was placed under chloroform. Not knowing for certain the amount of destruction caused by the prolonged continuance of inflammatory action, I determined to commence as if I were about to excise the shoulder-joint, and see how things were. I commenced my incision from the point of entrance of the bullet and in a direct line over the acromion and down the arm, reflecting the lips of the wound, and laying open the joint. The head of the humerus was destitute of cartilage and very rough, the glenoid cup was fractured from the body of the scapula, and the articular cartilage all gone. The arm being stiff and useless, I amputated the limb, extending the incision already made round the upper part of the arm. When the arm was off I then removed the cup of the glenoid and all the sequestra of scapula found loose about the shoulder.

15th May.—Wound healing by first intention; the tube drains the whole stump most perfectly. A tube was inserted into the abscess on the thoracic wall, and now that the limb is off it is quickly drying up.

26th May.—Chest abscess quite well. Patient sitting up on a chair. This is the first time he has done this since wounded, four months ago. Sutures and ligatures all out by the twelfth day after operation. Patient gained strength and flesh in a most marvellous manner. Uses now his right arm to eat his meals with, though the movement is impaired, and he has ceased to "bellow" when being dressed.

29th May.—Some local signs of inflammation at bottom of the stump to-day. Poulticed.

1st June.—On pushing in a probe to a considerable depth, I

found some bare bone. This accounts for the unexpected renewal of the inflammation and suppuration.

3rd June.—The above still continuing, under chloroform I had to reopen half of the healed cicatrix of the stump to reach the cause of the mischief. The acromion and coracoid processes and nearly half of the clavicle were found more or less in a state of inflammation, soft, and destitute of periosteum. I therefore excised the whole of these. Tubes, as usual, were put in.

17th June.—Discharging now freely, and no bony smell.

20th June.—Wound healing well; sutures removed again.

27th June.—Drainage-tube removed. Is up most of the day.

30th June.—Out walking. Voraciously hungry.

From this date he got rapidly well. In March 1882 I saw him in England. He was then a very powerful, muscular man, and, from the peculiar nature of the parts removed, served as a difficult "nut to crack" for several surgeons unacquainted with the details of the case.

GUNSHOT INJURIES OF THE ELBOW.

Four cases of penetrating gunshot injuries of the elbow came under my care, all of which required the operation of excision to be performed upon them. It is very hard to know what the expectant surgeons look forward to in treating such injuries in their way. After weeks of suffering, inflammation, and all its concomitants, if the patient survive, there is a remote chance of ankylosis resulting. In all the cases now to be recorded, no probability of such a termination showed itself, but rather bad becoming worse, through periostitis and osteitis setting in, as is usual under such conditions. It will be seen that I was not deterred from attempting excision under a variety of conditions which might lead some surgeons to the opinion that the cases were too severe for such treatment, and suitable only for amputation. As regards the manner of operating, I was guided entirely by the nature of the injury, the wounds of flesh and bone. There cannot be a doubt as to whether of the two methods of operating is the easiest and

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SURGICAL EXPERIENCES IN THE

theoretically followed by the best results. The single long incision, by avoiding injury in a transverse direction to the triceps and the fascia of the forearm, as well as preserving the relationship between them and the anconeus muscle, must always be more surely followed by successful use of the limb afterwards than when the H or \neg shaped incisions are made. Two of the following cases were operated on by means of the single straight, and two with the H shaped incisions. It will be noticed that one of the cases operated on by the latter method, even after a great deal of the forearm was removed, was followed by the most complete success.

CASE I.—No. 1932, Private B. Q., of the 94th regiment, was hit in the right elbow at Brunker's Spruit. He came under my care on the 23rd of April, four months after the injury. His condition was as follows:—The bullet had entered 2 inches from the olecranon on the radial side, passing through the head of the radius and elbow-joint, then going towards the inner side, and making its exit $1\frac{1}{2}$ inch from the middle line of the limb anteriorly. The joint had been poulticed for a long period, and was much swollen and full of pus. A probe passed into the joint. No attempt at ankylosis had taken place. On 2nd May, by means of a single straight incision, I excised the joint, bringing the drainage-tubes and ligatures through an opening I made for the purpose in the under lip of the wound, a practice I strongly recommend. The outer part of the articular end of the humerus was found to be in fragments, but the inner was intact. About 2 inches of the head of the ulna was shattered, and the shaft for another inch down was devoid of vitality, free of periosteum, and rough. Several pieces of bone were found lying loose, portions of the articular end of the humerus and head of the ulna. The removal of the joint was effected without trouble, but in getting out the large portion of dead ulnar shaft the interosseous artery was divided. No difficulty was experienced in tying both cut ends. Only the articular surface of the humerus was at first removed, but it was found that the shaft above was devoid of life, so another slice had to be taken away, as far up as the commencement of the condyloid expansion.

3rd May.—Considerable oozing ; tube acting well.

4th May.—Suppuration free, especially from wound of exit. By the 7th the incision was quite healed and all the discharge coming through the drainage-tube.

13th May.—Patient sat up in a chair ; wound firmly healed ; the arm in a sling flexed, all sutures and ligatures away. Assisted by his other arm, he moved his injured one.

20th May.—Was out walking about most of the day.

25th May.—Walked about without a sling, using his elbow-joint readily. The fingers work normally and without pain.

31st May.—Commenced working a weight and pulley apparatus fixed up in the ward for this and the other cases.

14th June.—Arm quite well ; washed his own clothes without difficulty ; can now use his arm for any purpose. Shakes hands with friends as well as he ever could. I have heard from him in England. "He can perform any duty he ever could with his arm."

CASE II.—Private H. C., of the 58th Regiment, was wounded, on Majuba Hill, in the right elbow. Came under my care on the 6th of May. The bullet entered the joint posteriorly at the situation of the ulnar nerve at the inner condyle of humerus, smashed the olecranon, passing through the joint and along the under surface of the ulna, making its exit through that bone, fracturing and carrying off a portion of it in the middle of the anterior aspect of the forearm. The probe passed directly into the joint, which was full of pus. The temperature at night was usually 102° F., and there was great emaciation. On the 7th May I operated by means of a single straight incision. Having removed the joint, I examined the condition of the ulna. I found that the affected portion of the ulna was denuded of periosteum posteriorly, while anteriorly it was quite healthy. Believing that the source of the periostitis was the presence of the inflammatory products passing down for exit from the elbow-joint, I felt certain, if that was removed, there being enough periosteum to keep up the vitality of the bone, that all would come right and the fracture even unite. The outer half of the condyloid process of the humerus was greatly

broken, and the whole of the remaining articular surface bare and destitute of periosteum. The head of the ulna was in fragments. The bullet must have passed between the bones and then along the ulna. The radius was uninjured. A large abscess full of *débris* existed beneath the head of the ulna. After the joint was removed, owing to the long disuse of the limb and the presence of inflammation for such a lengthened period, the muscles and their tendons in the forearm were greatly matted together, and considerable difficulty was experienced in extending the arm. A drainage-tube was at first inserted along the ulnar track of the bullet, as well as at the incision. The ligatures were brought through an opening made in the under lip of the wound. Oozing took place for two days afterwards.

12th May.—Incision healing by first intention.

20th May.—All but healed; very little discharge from the fractured point of the ulna now; removed the tubes.

25th May.—Flexing and extending the joint freely. Wound over ulnar fracture quite closed.

29th May.—Moves his arms and fingers himself to-day. Fracture of ulna united. His middle three fingers are very stiff. Commenced practising with the weight and pulley arrangement.

22nd May.—Placed the patient under chloroform, and forcibly broke down the adhesions which bound down middle three fingers and prevented him using them. The arm extends and flexes properly now.

30th May.—Wounds all healed; fingers move much better.

24th March 1882.—I received a letter from this patient, and find he is now a member of corps commissionaires in London. He says "his arm is strong, but his fingers are a little stiff yet, but they are ever so much better. He can lift a heavy table about, and do almost anything with his arm."

CASE III.—Lieut. H., of the 58th Regiment, was on the Majuba Hill, and there wounded in the right elbow. On the 29th of March he was placed under my care in the following condition:—The bullet had entered the joint through the middle of the humeral

condyle, passing obliquely and in a downward direction, and made its exit over the radial shaft anteriorly, quite 4 inches from bend of elbow. The joint was enormously swollen and full of pus, the whole forearm acutely inflamed, and the fingers immovable from adhesions. His temperature for some time past had been most alarming, generally 105° F. at night. It was thought that amputation was the only proceeding under the circumstances. On this date I placed him under chloroform, and, after a careful examination, proceeded to excise the joint, considering it offered a prospect of success. Owing to the large and complex nature of the injury, I made an H-shaped incision to get at the joint. The length of bone to be removed, and the swollen condition of the joint, necessitated such an incision; a single one would not have sufficed. The condyloid end of the humerus, except its outer ridge, was grooved by the bullet, and for 2 inches up the shaft the periosteum was wanting and the bone bare. The joint was distended with pus. The head of the ulna and its shaft for 3 inches down were comminuted and bare. Head of the radius was devoid of its cartilaginous covering, but the shaft was healthy. I removed the joint, together with the whole of the bare portions of the shafts of the bones.

31st March.—The temperature to-day was nearly normal. A little oozing and free discharge, especially from the wound at exit, took place. Swelling of arm subsiding.

8th April.—The edge of under flap sloughed and came away on a charcoal poultice which had been applied. A few fresh stitches were introduced, and the arm placed on a splint.

10th April.—Wound quite healthy now; upper portion of the incisions healed. Owing to the great stiffness of the fingers from adhesions, great pain is experienced on forcibly moving them. Such passive movements were very regularly employed, so much so that the transverse incision threatened to break asunder; extra care was taken in consequence. The arm required for some time to be kept extended, so as to relax the edges and keep them close.

15th April.—Temperature rose to-day, signs of an abscess forming at upper edge of wound. Poultices applied.

18th April.—The whole of the inner surface of arm was hard, painful, and inflamed up as far as the insertion of the deltoid. There was ample evidence that a subcutaneous collection of pus had formed. A free incision was made into this, and a large amount of creamy pus evacuated. The "excision" wounds went on healing nicely all this time; all the sutures now out.

28th April.—Another collection of pus formed, requiring similar surgical treatment. Drainage-tubes always used on those occasions. Temperature again normal.

6th May.—Suppuration all gone, and, except a small sinus at the outer edge of the cicatrix, all the wound had healed. The arm was flexed with but little pain.

17th May.—Out of bed, with arm flexed in a sling.

19th May.—Out for a walk. Arm flexed and extended daily, though still considerably swollen.

23rd May.—Is now quite strong; commenced pulling at the weight arrangement in order to regain the use of the joints.

13th June.—As the elbow and fingers remain stiff, he was placed under chloroform, and I flexed the forearm without difficulty, so that the hand touched the chin, and extended it straight out. All the fingers were severally flexed and extended. Is now in excellent health.

18th June. — He left my care, proceeding *en route* to England.

27th March 1882.—I received a letter from Mr Lumley of Northallerton, the surgeon who attended this patient on his arrival at home. A letter from the patient accompanied it. The following account of the patient's subsequent surgical history will be read with profit:—"The small sinus was present on arrival in England, but he was able to hunt during the whole season. For the time after the operation I considered he had a fair amount of motion in the joint. The hand was cold and somewhat brawny and swollen, also the fingers; and owing, I should suppose, to some form of adhesive inflammation, the tendons, particularly the extensors of the fingers, appeared to be adherent, and, as it were, shortened, preventing any flexion of the fingers. The short muscles of the thumb

had undergone a similar shortening. The sensations of the hands and fingers was perceptibly impaired, but not lost. I advised friction, moderate passive motion of the forearm and hand, galvanism, and constantly bandaging in flannel, and a warm glove to be worn. My patient nevertheless went in vigorously for hunting all the season, not, I may say, with my advice. In October of last year he saw Sir James Paget, who advised continuation of treatment above mentioned, suggesting a kind of galvanic battery, which was got. He had not made much progress during the winter. A few weeks ago he went up to town and saw Professor Lister, who removed a portion of bone, and advised that the fingers should be (under ether) forcibly flexed one by one. This I did on Friday last, breaking down without great difficulty all adhesions. I have opened the hand out every day since, and fully extended and flexed the fingers and thumb. No inflammation has followed the operation, and already he can flex better without help, and also extend the fingers more."

The patient himself says: "The hand, you must know, is the backward part, but I am afraid that is a good deal my own fault for not having it worked properly till just lately. The elbow is all right as far as moving it goes, and I can raise the hand up almost as far as my mouth. I have been able to do the 'light fantastic,' and found I could hold my partners fairly tight with my bad arm, so that shows I have a good deal of strength in it, and I did that at Christmas. I have not let my arm interfere with my going about. Shooting was the only thing barred. I have been able to hunt very nearly as per usual. In that I have been frightfully lucky, as I have had several falls, but never once on my bad arm. It was rather through fear of stopping my hunting, etc., I had not my arm attended to sooner." The arm is most useful as it is, and conservative surgery has demonstrated that even in such an extensive injury an arm can be preserved. He is now at his duty with his regiment.

CASE IV.—Corporal W. C., of the King's Dragoon Guards, was hit when taking part in the small cavalry charge on to the Koppie

at Lang's Neck. He came under my care on the 18th March, in the following condition:—The bullet had hit the ulnar shaft of the left elbow three inches from the coronoid process, passing obliquely upwards and outwards through the joint, making its exit posteriorly about the situation of the ulnar nerve at the inner condyle of the humerus. A large abscess full of pus was present on the inner side of the elbow; a probe passed freely into the joint, finding the articulation completely bare. The temperature at night was two degrees above the normal, and he implored for "something to be done, as he was in such pain." On the 1st April, so much of the bones being implicated, I made an H-shaped incision, and thus removed all the joint and injured bones. The head of the ulna was found in fragments, and for three inches down its shaft it was devoid of periosteum and required removal. The head of the radius was uncovered by cartilage, but unbroken; immediately below it, however, the shaft was found in fragments, quite a dozen being removed. A third part, therefore, of the bones of the forearm had to be removed. As regards the humerus, the inner condyle alone was injured. In order to compensate as far as possible for the absence of the large portions of the other bones, I removed just enough of the articular end of the humerus to include the portion usually covered with cartilage, which was gone. In order to get at the detached and bare portions of bone in the forearm, the under flap of the H-incision had to be enlarged, though the possibility of its after sloughing from want of arterial supply was kept in view. Considerable oozing took place for two days after the operation, and on the third a small slough was present at the upper edge of the under flap.

6th April.—The slough came away on a charcoal poultice. Several fresh stitches were introduced, and the edges again drawn together.

10th April.—The wounds were healing well, the inflammatory swelling all but gone, allowing passive movements to be commenced. The whole of the upper incisions having healed, the sutures from these were withdrawn.

15th April.—Arm easily flexed; wounds healing; sits up in bed,

supporting his arm. A small wound at the inner side of the transverse wound is the only unhealed portion.

17th April.—Out of bed. Above hole filling up with granulations.

20th April.—Out of doors walking about. Arm hanging by his side, and patient moving it about himself without assistance.

27th April.—Quite healed. Commenced working a weight on a rope and pulley. Took to carrying cans of water, cleaning his cavalry equipment, including long boots, bits, and spurs. Very shortly nearly complete restoration of the motions of the joint was effected. He flexed and extended his arm to the fullest extent, and a considerable amount of pronation and supination was present. This man took his discharge from the service in Natal. I have seen this man perform his duties as servant at the dinner-table, also driving restive horses, as well as taking part in a sergeant's ball, in all of which he acquitted himself so thoroughly that, unless one knew what had been done to one arm, it would never have been remarked there was anything extraordinary present. The great difference in length of his two arms greatly puzzles his friends.

He has been good enough to have his photograph taken, holding a full-sized Martini-Henry rifle at the "present." This he does with perfect ease, and can keep it up in that position as long as most men. This patient has lately paid a visit to England, and is now back in Natal at his former employment.

This is scarcely the place to enter into the after-treatment of such excisions. From the practice of Professor Syme I learnt the value of early movement as soon as the incisions would bear the slightest strain. The pulley and weight arrangement, which did so much good service, was very easily extemporized. One of the brass pulleys belonging to the fracture and dislocation apparatus box was fixed in a cross-beam in the roof of the hut. The ordinary rope belonging to it was inserted through it. At first a small stone enveloped in a handkerchief, and, as the case improved, a larger one, formed the weight. The patients soon got up a healthy rivalry amongst them, and for hours they would sit working this simple apparatus. The last case recorded shows that,

though all the theoretic objections to the H-shaped incision hold good, in practice the most perfect results can be thus obtained. In the great majority of cases Mr Syme used to perform his excisions by the H-shaped incisions, and, being the father of conservative joint surgery, his practice rested on grounds as solid as his general results were perfect.

GUNSHOT INJURIES OF THE ARM AND FOREARM.

The day, I believe, has come for the more extensive adoption of the practice of resection for gunshot injuries to the shafts of long bones. The experience of the Crimea, Indian Mutiny, and American wars was not in its favour, the cases thus treated almost invariably ending fatally. However, the use of counter-openings and drainage was not understood then as now, which entirely alters the case. I shall detail cases in which the immediate removal of the shattered fragments, and also where surgical interference of a more complex nature, was successfully practised.

CASE I.—No. 3160, Private R. B., of the 58th Regiment, received a wound at the Ingogo fight, in the right arm. The bullet entered its anterior surface $2\frac{1}{2}$ inches above the wrist, and as there were no wounds of exit, it was concluded it had lodged. The probe found a sinus extending up almost to the external condyle of the humerus. It was a matter of some difficulty to make out the presence of the bullet, but when pressure was made in the centre of the arm $2\frac{1}{2}$ inches below the elbow-joint, between the radius and ulna, the feelings of the patient led him to be sure that the bullet was there. An incision over this point revealed it. No bone was injured, and the case rapidly got well.

CASE II.—Colonel B., of the 58th Regiment, was standing in front of his men forming a portion of the celebrated square at Ulundi. The Zulus attacked this portion in great force, crawling up amongst long grass. Suddenly he felt a stinging sensation in his right forearm, for which he could not

imagine a cause. Very shortly after, Major H. of the same corps called his attention to the fact that his arm was bleeding. The bullet had entered the upper part of his forearm anteriorly, and, penetrating, made its exit in the middle of the forearm posteriorly. The entrance wound was the size of a shilling, clean and regular; that of exit large and irregular. The whole of the ulnar shaft between the two wounds was smashed, and there was considerable hæmorrhage. I removed the whole of the broken bone, controlled the bleeding, dressed it in tenax, etc., and put on a splint. This officer made an excellent recovery, and two years after, when for six weeks sitting at the same mess-table together, I had the satisfaction of noticing the very slight diminution of power and use he suffered from after such a severe injury.

CASE III.—No. 2339, Private J. B., 94th Regiment, was shot, at Brunker's Spruit, in the arm and leg. He came under my care on the 23rd April 1881. His arm was in splints. On removing them the limb was found to be inflamed and very painful. A wound existed about the middle of the humeral shaft, and penetrating the limb in a direct line. On inserting a probe dead bone was felt, but the fragments were not movable. A considerable amount of lateral motion—false joint—existed, but the question was, whether union was being attempted and partially formed? The thigh had a penetrating wound in it, the bullet entering at one side of the ham, and coming out, in the same line, on the other. The case being very slow in its progress, and having doubts as to the union which was supposed to be going on, he was placed under chloroform, for the purpose of diagnosis and treatment, on the 5th of May 1881. Three large sequestra were found in the arm and removed. There was no attempt at union, no sign of callus being thrown out. The limb was carefully bandaged in splints. From the wound in the thigh I removed a considerable portion of serge, the material his trousers were made of. This was very deep down amongst the muscles, and required a free incision to reach. As the wound had a history of healing up and constantly opening out

afresh, I knew some foreign body had lodged. After this treatment the latter wound healed rapidly, and did not break out again.

A case of erysipelas appeared in the ward where this man was, and, being "chums," this man used to attend upon the other. He soon contracted the same affection, and had a struggle for life, so severe was the attack. On getting over this a fistulous opening still remained in his arm, and the movement at the seat of injury continued, so I determined once more to try operative surgery. On the 27th of June, under chloroform, I made a free incision down to the false joint, and found the shaft of the bone much injured; the lower end was grasped by two projecting pieces of the upper, and so nothing but impaction was present, neither fibrous, nor even an attempt at callous union. With a pair of forceps I snipped off these projections and broke the connexion, tilted out both ends, and with a chain saw made them even. There being no drill in the possession of the surgical armamentarium at the front, I made use of one extemporized by a sergeant in the Royal Engineers. After succeeding in putting one suture through, the boring end of the instrument broke in the shaft, and I was deprived of the means of keeping the ends together. I thereupon made a free drain, and put a Stromeyer pad beneath the limb. After a few days of rise of temperature he was able to be out of bed. Again, his active habits, and being of so much use to his "chums," were against him. Nothing would prevent him helping his less able fellow-sufferers. I had therefore to place the whole of both shoulders and the injured limb in plaster of Paris, and placing a smaller Stromeyer pad in position as well. A window was cut anteriorly over the wound in the plaster, and also posteriorly at the opening, where the drainage was taking place.

16th July.—I took off the plaster to apply it fresh, and found the bones in excellent position, and no grating could be made out. The anterior wound was quite healed, and only a few drops of pus came away from the posterior one. The arm was put up in the same way as before. Walks about the whole day.

19th July.—Wounds quite healed. From this date, being detailed for other duties, I lost sight of him. On arrival in England, how-

ever, I learnt he was at Netley with a very firm fibrous union at the seat of injury ; and he writes to me to say that, with a support which has been supplied to him, he is able for most work. But for the want of a proper drill, this would have been a case where osseous union would have resulted.

CASE IV.—Corporal R. H., of the 3rd 60th Rifles, was hit at the engagement on the Ingogo heights. The bullet first struck the neck a little to the left of the trachea, passing across it without penetrating, and made its exit at the sterno-clavicular articulation. Again it entered at the bicipital groove in the right arm, as he was at the moment firing his rifle. The bullet passed through the shaft of the humerus and made its exit posteriorly about the middle of the arm. On the 18th of March, when placed under my care, I found the case in the following condition :—A very distinct fracture existed in the shaft of the humerus at the above situation, and mobility was great. The probe found a large amount of loose and bare bone. There was very profuse discharge of foul pus, and the patient was day and night moaning piteously, being in great agony. A very large abscess occupied the bicipital sheath, which I at once opened, and placed the arm in a suitable splint. A second wound of a non-penetrating nature was present over the inner condyle of the elbow on the same limb.

On the 30th March I amputated the limb at the shoulder-joint, and it was found that very little beyond the head of the bone had escaped injury. A little below the head the shaft of the humerus was found split into fragments. The smallest trace of callus was noticed forming on the edge of some of the larger sequestra. The surrounding tissues were greatly disorganized. The lower portion had two processes of bone, one at either side, with a deep depression between them. A large sequestrum lay between the fractured ends. The case was dressed in the usual manner.

8th April.—Three ligatures, the tubes, and sutures were removed, the stump being almost healed. Continues to moan, and fancies he is suffering from the old pain, and that his arm is still on, though he knows it is not.

13th April.—The stump is quite healed, and all tubes, etc., away. The operation was performed with the flaps of Larrey, as already recommended. This man is now in England, employed in the Corps Commissionaires; and I lately heard from him, saying he was in excellent health, doing well, and lately married. In such a case as this if I ever get an opportunity of performing resection sufficiently early after the receipt of the injury, I most certainly shall adopt that course. Even a limb with strong fibrous union is preferable to its complete loss, which in such conditions as these is the only alternative.

GUNSHOT WOUNDS OF THE HAND AND WRIST.

Cases of accidental injury to the hand, in the progress of campaigns, either when performing the duties of night piquet or before the enemy, are by no means rare. On several such occasions I have seen fingers torn or completely severed by a rifle being accidentally discharged either into the owner's limb or into that of a comrade. On one occasion, at the battle of Ulundi, my attention was directed to a severe case by the Sanitary Officer to the Forces. There had been a lull in the firing, and the soldier was resting on his rifle, the hand being upon the muzzle. Something must have touched the trigger, as the weapon went off and made a great hole in the hand. Notwithstanding this I felt sure that immediate removal of all the injured bones, etc., would result in a serviceable limb. This I there and then did, afterwards effectually controlling the severe hæmorrhage which naturally was present. This case, I afterwards learnt, made rapid progress; and though all the fingers were not of use, the majority were, and the hand was most serviceable.

Simple cases of taking off fingers I shall not allude to here, as in all such instances the injury had done most of the operation, and a pair of scissors generally did the rest. Conservative surgery, in such cases, has the most remarkable results.

There have been numerous cases recorded of the removal of one or two bones of the carpus after gunshot injuries such as occur

as above described, but total excision of them as well as the joint, with articular ends of ulna and radius, are rare. According to no less an authority than Professor Longmore, the following case is the only one performed for gunshot injury on record in the annals of British army surgery.

CASE.—Captain H., of the 92nd Highlanders, after a very important and conspicuously gallant morning's work on the Majuba Hill, was hit in his left wrist during the surprise which subsequently took place. On the 2nd April I was asked to give my opinion on his case, which resulted in his being placed under my care the following day for operation. The bullet entered the joint at the styloid process of the ulna, passing obliquely upwards, and making its exit between the bones anteriorly about an inch above their articular ends. A probe passed freely into the joint, and a large quantity of bare bone and some loose portions were found. The joint was filled with very foul-smelling pus. The temperature every night was above 102° F., and he was suffering acute pain. Assisted by Brigade-Surgeon Roe, C.B., Surgeons-Major J. Scott and J. Scanlan, I performed the operation of excision of the wrist in strict conformity with the rules laid down so clearly by the illustrious surgeon whose genius solved the difficulty — Professor Lister. The details of the operation are so complicated,—in fact, it might reasonably be called a dissection,—that I shall not attempt to describe what I did, further than to record the nature of the injury and the results of prolonged suppuration present. No tendon but those laid down as necessary were cut; every bone of the carpus was removed except the pisiform, which had its cartilaginous side pared; the ends of the metacarpal bones, and those of the ulna and radius, were removed. The bullet had broken the articular ends of the radius and ulna, and they were found in fragments; a large one lay between the two shafts. The shaft of the radius for 3 inches up was in a like condition, in pieces. From prolonged soaking in pus, and extension of the inflammatory process, internal caries of the bones of the carpus had taken place, and the first row

were found very soft, breaking away easily in the forceps. The articular end of the ulna was intact, and in order to compensate for the destruction of so much of the radius I removed merely the cartilaginous end of this bone. Three small arteries were tied. Previous to operation an attempt—under chloroform—was made to flex the fingers. Owing to the long continuance of the inflammation, and the presence of so much adhesive lymph being thrown out, the greatest force was required to do so. In stitching up the incisions it was found impossible, from the oedema which set in, to get the lips together. Deep double sutures were introduced, and gradually tightened as the swelling subsided. Considerable oozing took place, and in the evening the fingers were quite livid and cold, and I fully expected to be called during the night to amputate the arm. However, the careful application of heat assisted in the return of the circulation to the hand, the arrest of which, we knew, was due to the great swelling of the tissues.

4th April.—Lividity greatly lessened. Oozing still continues. A water-drip extemporized.

6th April.—The cedema going down; lips of wound pulled closer together in consequence. Some of the lower stitches had loosened owing to the subsidence of the swelling, requiring new ones to be introduced.

8th April.—Looking very much better. Wounds quite close, and the suppuration free through the drainage-tubes.

10th.—Two-thirds of upper incision healing by first intention. Temperature almost normal. Appetite better.

13th.—Shortened drainage-tubes. All the ligatures now away. Took out several of the sutures. Upper wound healed. Lower one still gapes, but edges less swollen. Withdrew the drainage-tubes.

17th.—Wounds being now nearly united, all the sutures were taken out. Fingers still very stiff, requiring considerable force to move them.

19th.—Attacked by a severe form of ague. This officer was invalided from Afghanistan only a few months previously for that

fever, from which he had suffered most severely, and nothing but the glory of being again actively engaged with his regiment would have taken him from England while on sick leave. Quinine, etc., were duly administered. This feverish attack continued, more or less, until the 28th April. During all this time, however, the hand went on improving, only a little sinus being present at the upper corner of the lower incision, from which slight discharge came. Gets up now, and dresses, for most of the day.

1st May.—To-day he went outside for a walk. The fingers are regularly worked, though it causes considerable pain. His servant, Private Smith, one of the finest types of Highlanders, is a most zealous “worker of his fingers,” taking a great interest in the future use of the limb.

7th May.—Having now got over his fever, and his health being greatly improved, as the fingers were still too firmly bound down by adhesions, I placed him under chloroform and forcibly flexed and extended them to their full limits. The wrist-joint was now found fairly formed and able to support the hand when the splint was taken off. The appearance now “is like a hand.”

18th May.—Regular movements of the fingers being practised, health improved, and everything healed, he was sent off by convoy *en route* to England to-day.

The splint which I used for this case was made in accordance with the instructions of Professor Lister. I got two ordinary forearm fenestrated zinc splints, of which there were a large number in the stores, and by means of a soda-water bottle wire I secured them together so as to form a long one, which extended from the tips of the fingers to beyond the olecranon. On one end of this I placed a cork, two glued together, of large size, out of ointment jars, and then cut them into the desired shape. I then fixed them by boring holes through them and passing similar wires through and securing all to the fenestrated zinc splint in a similar way. The other end of the splint had a hole made in it in order to take off pressure from the prominence of the humeral condyles, which became painful and showed a tendency to ulcerate. As the joint became formed the anterior part of the splint and the

cork elevation were lessened, so as to allow of more extensive passive movements.

The following account is from the patient's pen, which he sent me on my arrival in England. It is dated the 26th March 1882 : —“ I got through the joltings of my journey down to Durban very well. The hand swelled up after a long trek—journey—but quickly got right again after a few hours' rest. On board ship I made a great improvement, and began to be able distinctly to move my fingers. When I got home I went to see Mr Lister. . . . He broke down a good many adhesions in the fingers, causing me the most horrid pain. My servant also worked the fingers twice a day. About a month after I came home, by Mr Lister's advice I had a cast made of my arm and hand, and then a light copper splint, exactly fitting the lower half of my arm and fitting up into the palm of the hand. It was covered with leather and laced tightly up. It extends from the knuckles to within about three inches of the elbow. I used to see Mr Lister about once a fortnight, and was repeatedly 'broken down' by him, the last time under chloroform. The hand has every night to have a flat piece of wood bandaged along the back of the arm and projecting over the fingers. These have then a small square piece of wood put under them, and are strapped up to the flat piece of wood. This has done much good in keeping them straight. All this time my hand has steadily been gaining strength. I can straighten the fingers nearly quite out, and the first and second joints bend in well. The knuckles, however, are pretty stiff. I can lift five or six pounds between my fingers, and (with my splint on) I use a fork, but can't bend wrist sufficiently round to put anything in my mouth. I always carry my stick or umbrella in my left hand, and can dress myself entirely, with the exception of tying my necktie. Mr Lister says I shall go on improving for a long time to come.”

Shortly before this officer left to take up his appointment in India I saw him walking down the Haymarket with his umbrella in his hand, which he held in a free manner. Being in a cab, hurrying to catch a train, I missed the opportunity of examining it. If such a success follows so severe and complex an injury of

these parts, what must similar treatment effect when resorted to early, and when large portions of the shafts of either bones of the forearms are not injured? It certainly is one of the most melancholy sights to see a stump, the result of amputation for injuries to the wrist, hand, or forearm.

In all cases of surgical interference I have undertaken for gunshot injuries of the upper extremity it has been my fortune not to have lost a single case. Under such circumstances I am quite satisfied with my dressings.

GUNSHOT INJURIES OF THE HIP AND KNEE.

Very few cases of gunshot injuries to the hip came under my observation. The following was the only one I made notes of:—

CASE I.—No. 1105, Private E. G., of the 58th Regiment, was struck, on the top of the Majuba Hill, near the great trochanter of the femur. There was no wound of exit. The probe passed downwards and backwards behind the bone and towards the perinæum. On the 13th of April the bullet was extracted, being found 3 inches below the gluteal fold amongst the hamstring muscles.

With regard to the method of treatment of penetrating gunshot injuries of the knee-joint there appear to be conflicting opinions held by our first authorities. Every case in which expectant or conservative surgery (that is, excision) was practised in the Crimea proved fatal. The wonderful results of Dr Reyher in the Russo-Turkish war, where he treated eighteen penetrating wounds of the knee antiseptically,—that is, with spray and gauze,—have startled the surgical world. Three deaths only took place amongst these cases, while the remaining fifteen not only recovered, but had mobility in their joints! Such results have certainly never been attained by any other surgeon. Almost as startling is the following evidence taken from Mr Cheyne's great work on antiseptic surgery. He says, "Excision of joints is now rarely performed, for with aseptic treatment an incision into a joint and the inser-

tion of a drainage-tube is generally sufficient in cases where formerly excision, or even amputation, would have been required." When this comes to be recognised I shall at once fall in with it, but the demonstrations I have witnessed by its supporters fall very far short of the conditions met with in gunshot injuries. I was present in Edinburgh when Professor Lister performed on a man a serious operation to cure a ruptured tendon of the quadriceps femoris. During the operation he made incisions which laid the knee-joint open. This had rarely been attempted before, and was followed by no bad result. It is quite a different thing to make such a clean incision, and for a bullet to traverse the same joint. If one remembers the furrowing of the bones, the most certainly present bony *débris*, the complete entrance of air with all its germs, and the rough transport, it will be seen the cases are not parallel. But we have Dr Reyher's cases. True, but then I have seen not a few cases of wounds of the knee-joint diagnosed as penetrating in which recovery took place without any but the very simplest treatment, and were, in the opinion of others beside myself, not cases of penetration at all. It must not be forgotten, now we are living in the epoch of conoidal bullets flying at great velocities, that they very frequently pass in the neighbourhood of joints, as we have seen in the shoulder, but more frequently in the knee, without penetrating them. Let it be remembered how the knee is encircled by strong ligaments, and possesses a powerful tendon as well as a bony shield. The chances of such bullets being deflected from their line of flight is considerable, though theoretically scarcely what we should have expected in the case of conoidal bullets. Diagnosis of the most complete nature ought to be made at all hazards in cases of gunshot injuries to the knee, if the view I take of such injuries be the correct one, while if the other is adopted no such diagnosis is required. It is, at the best, conjecture, if the very erroneous evidence that presented to the sight of the observer as to the supposed course taken by the projectile, gathered from inspection of the joint and the situation of wound of entrance and exit, be the only physical sign made out. There is a practice followed on some occasions after an engagement of placing what is called a "diagnosis ticket" on the

injured soldier. This is an excellent custom, but can be carried too far. I have seen cases of the most trivial natures and most apparent conditions so labelled. This is done by some as a red-tape duty, which the spirit of the regulations does not expect, and takes up precious time. In cases of gunshot penetrations of the knee, such a ticket would be of the greatest value if a complete diagnosis as to the perforation and amount of injury be duly appended by the surgeon under whose care the case first falls. In my future practice, if ever placed in charge of such injuries early enough after an engagement, I shall be desirous to freely open knee-joints that have been penetrated, so as to remove all foreign matter and *débris* of bone, and introduce a suitable tube for drainage, apply ice and splints and the usual constitutional means to combat inflammatory action, and expect by these means to save both life and limb, though possibly with a stiff joint. Before the days of drainage as applied as at present to wounds, the practice of the Peninsular, Crimean, and American wars all confirmed Dupuytren's statement, that by trying to save such limbs "we lost more lives than we saved limbs," and amputation was the safest treatment to pursue.

The following cases will illustrate the different conditions met with after gunshot injuries to the knee:—

CASE II.—A wounded Zulu, captured by Captain B. of the contingent at Ulundi, was seen by me on the field. The bullet had entered at the outer side of the patella and went right through the knee-joint, escaping in the popliteal space. I pushed the tip of my little finger into the joint and felt the articular cartilage. I reported the case to my chief, who gave me permission to operate. Circumstances occurred which prevented this, and he accompanied the convoy of wounded to Ladismith base hospital, nearly 200 miles distant, where he arrived in such a condition that immediate amputation was resorted to, and he died.

CASE III.—Another case in a Zulu wounded at Ulundi came under my observation. For two months I was detained in Zululand after the war, and saw many of our former enemies come in to our

camp, to get the written passes to enable them to return to their homes. Not a few of them were wounded. The number of simple penetrations of muscles was remarkable. I found one with the most distinct marks of a gunshot wound of the knee, which any one would have said, from the line of flight the bullet must have taken and from the situation of wounds of entrance and exit, must have penetrated the joint. The bullet hit the inner border of the patella, grooving it distinctly, and made its exit posteriorly half an inch internally to the tendons forming the outer upper margin of the popliteal space. A month after the injury it was completely healed, the joint being perfectly mobile, without the aid of surgery. Through an interpreter he told me all about the progress of healing and the means adopted to get it well. There is a small flat-leaved orchid which grows very plentifully on the Veldt. A leaf of this was secured on both wounds and changed occasionally: this was all that was done. A piece of oil-silk would have answered the same purpose and been followed by the same result.

CASE IV.—Private S. T., of the 94th Regiment, was hit in the left knee at Brunner's Spruit. The bullet entered at the tibial side of the apex of the patella, and made its exit over the popliteal vessels, in the middle line of the space. No inflammation nor evidence of bony *débris* followed. The wound healed by first intention, leaving the movements of the joint unimpaired.

What was the nature of such injuries? I do not believe they touched the joint at all, however much they appear to have done so when looking at them. In the Franco-German war such cases of periarticular injuries caused not a little remark. Unless such a thing be remembered as possible, the most misleading opinions may be formed. The following case was almost moribund when I saw it, so amputation was imperative:—

CASE V.—No. 3472, Private H. B., of the 3rd 60th Regiment, was wounded at the fight on the Ingogo Heights. On the 18th March he came under my care, when I found the knee enormously

swollen and painful, a profuse discharge of pus coming from the joint, which was being poulticed. The patient was suffering from severe diarrhoea, red glazed tongue, high temperature, and other signs of hectic fever. The bullet had entered at the outer upper margin of the popliteal space, traversing the joint, and splitting the articular surfaces of the tibia and fibula, and made its exit at the inner side of the joint, through the head of the gastrocnemius muscle, a very wide track. I had the limb suspended in a swing, and freedom was given to the pent-up discharge in the joint. The bullet, which had penetrated the knee, had lodged in the opposite ankle, from which I removed it.

23rd March.—I amputated the limb at the lower third of the femur. I intended to have performed Mr Carden's operation through the cancellated tissues of the articular end, but on reflecting the long anterior flap a large abscess existed, running up from the outer condyle of the femur amongst the muscles of the thigh, the shaft of the bone forming its inner side, and which was filled with fetid pus. The periosteum was found quite off the articular and lower portion of the femur, and for this reason the severance had to be made higher up the shaft than expected. Besides the ordinary drainage-tubes, I placed one in the abscess sac itself and made a counter-opening in it, so that, should pus secrete, a free drain would exist and thus save the flaps from any deleterious influence that might ensue if such matter got amongst them. The bullet was found to have tunnelled through the articular end of the fibula and the outer articular facet of the tibia, and a well-marked groove was present on the outer condyle of the femur. The smashing of the tibia extended down its outer side as far as the anterior tuberosity. The outer condyloid articular surface was split. The whole of the joint was full of bony *débris*, some pieces of considerable size. There was not a vestige of articular cartilage left in the joint.

25th March.—The diarrhoea began to ameliorate and the tongue to become a little moist, and from the very low condition he was in he has become quite cheerful.

30th March.—The wounds are healing rapidly. The discharge

only comes through the drainage-tubes. Patient held his own stump up while being dressed. Abscess draining nicely, very little discharge coming from it now. The usual oil-silk and tenax dressing were used throughout.

2nd April.—Stitches, ligatures, and drainage-tubes removed to-day; wounds healing very quickly.

7th April.—Stump quite healed. The diarrhœa, however, showed itself again. Ordered astringents.

9th April.—Diarrhœa gone. This patient was sent shortly after this to England. When I got home I saw this man in March 1882, and found he had become so stout and muscular that I would scarcely have recognised him. He had an excellent stump, which was fitted with a cork leg, and he could walk with the greatest comfort. The bullet which produced this injury was one of our own Martini-Henry ones, and had the broad arrow mark most distinctly on its base.

GUNSHOT INJURIES OF THE ANKLE AND FOOT.

So long as the posterior tibial vessels are not included in a gunshot injury to the ankle, some hopes may with reason be entertained of saving the foot. It is remarkable the number of such injuries which are met with in modern warfare. In the majority of cases the bullets which hit this joint or the foot have had their velocity lessened and their shape altered by hitting some stone or other object first.

While it is hardly possible to conceive a cylindrico-conoidal bullet passing through a knee-joint and setting up so little irritation that the joint does not become filled with pus and acutely inflamed, yet this can most certainly happen in the case of the ankle. In no other joint in the body is the practice of waiting, expectant surgery more frequently rewarded as in this one. Partial operations, such as the removal of one or more bones of the foot, are done with advantage, though this can be carried too far, especially in otherwise complicated cases.

CASE I.—Mr F. S., a non-commissioned officer in the Native Contingent Corps, a native of Switzerland, while in a most gallant manner—for which personal bravery he was awarded the Victoria Cross—defending the post of Rorke's Drift, was hit on the ankle by a bullet. The wound was a small one. The projectile struck just over the instep of the left foot, a little anterior to the outer malleolus. When I saw him four days after the injury there was very great swelling of all the tissues in the neighbourhood, both ankle and foot. Poultices were kept regularly applied, and in two days evidence of diffuse suppuration was found, necessitating my making several long incisions into the tissues. After this was done and the poultices continued for some time, he made a very rapid recovery, and regained the use of his joint. The bullet must, in this case, have been an ordinary round one, which had ricocheted off some box or stone and struck the patient in the ankle.

CASE II.—Private H. E., of the 3rd 60th Rifles, was wounded, at the Ingogo fight, in the left ankle, near the inner malleolus. There was considerable difference of opinion, because of the difficulty in finding the bullet, as to whether there was one present or not. There was considerable swelling, great discharge of pus, and distinct evidence of injury to the malleolar process. On the 14th of April he was placed under chloroform, and with a Nelaton probe I obtained evidence of the presence of lead. No forceps could be made to reach or seize the mass. I accordingly made a free incision and cut up the bone with strong pliers, and extracted several irregular pieces of lead, the result, no doubt, of a broken-up spent bullet. The case at once took healthy action and got well.

CASE III.—No. 3472, Private H. B., of the 3rd 60th Rifles, was shot through the right knee, as already recorded, the bullet lodging in the left ankle. A sore was found at the lower end of the tibia, full of pus. Several pieces of bone had become loose and been taken away. When I introduced a probe I felt something round

and hard. The presence of a bullet had not been suspected. Applying the porcelain-ended probe, a mark of lead was obtained. I enlarged the wound, and seized the bullet, which was firmly impacted in the bone, by its base and extracted it. It was one of our own bullets, Martini-Henry, in the most perfect preservation, the apex of it alone being a little flattened by the opposition it had encountered in its flight. The bullet had remained in its position for over six weeks, and in consequence there was a large amount of carious bone in its neighbourhood. I removed all the detached portions and as much as I dared of the bare parts, without unduly interfering with the surroundings of the joint. The patient having lost his other leg, I was the more careful of the remaining one. A little more removed at the time, I think now, would have been the better practice, for continuous suppuration took place for a very long time afterwards, during the progress of the formation of new callus. However, ultimately a strong, movable joint resulted, which, with his cork leg, served all the purposes of locomotion.

CASE IV.—Private J. S., of the 58th Regiment, was hit, at the Majuba Hill, in the left ankle. The bullet entered two inches above the outer ankle anteriorly, and made its exit at the inner edge of the tendo Achilles, near the inner malleolus. With the exception of some gritty bony material coming away in the discharges for a few days, there was no other evidence of injury, and the wound healed up rapidly without leaving any impairment of movement of the joint behind.

CASE V.—Captain L., of the 58th Regiment. This officer was hit twice,—the only case of the kind which occurred at Ulundi,—in the arm, and in the ankle. He wore a pair of leather gaiters over his boots. On taking these off, the internal malleolus of the left ankle was found swollen and exceedingly tender. A very small opening existed, though none could be found in either boot or gaiter. A probe found a small splinter of the end of the bone broken off and loose. The joint soon got very much

swollen, and evidence of suppuration being present, I had to freely incise the tissues, giving freedom to a considerable amount of pus. Poultices were then kept regularly applied. For quite a year afterwards this patient limped when walking, but nothing serious occurred to the joint afterwards, which is now sound and well. This was a case of the usual gunshot injuries met with in Zululand, round balls fired at long range, with little ammunition to propel them. The gaiter and boot saved the ankle. Had he not been mounted, I should have thought it likely that the injury was inflicted by a spent bullet.

CASE VI.—No. 1393, Private W. W., of the 3rd 60th Regiment, was wounded at the battle of the Ingogo. The bullet entered the left ankle at the outer malleolus posteriorly, apparently traversing the ankle-joint, and making its escape close to the inner malleolus. The whole foot, but especially the joint, was much swollen when on the 18th March I first took charge of him, and he had no power whatever in his toes. The wounds were open and discharging. The foot drooped, and was almost in the same line with the limb. I put it up in a wire splint, supporting the foot and keeping it at its proper angle.

1st April.—Immensely better; swelling going down and the suppuration stopped; wounds nearly healed.

7th April.—Wounds healed. Took the foot out of the wire splint and put it up in dextrin bandages, and allowed him to go out of doors on crutches.

27th April.—Patient to-day was afraid his ankle had become worse, and that it was again suppurating. I therefore removed the dextrin support, and found that such had not occurred. The swelling had all gone down, and there was no tendency to the wounds opening again. This case progressed most satisfactorily, though at first sight it looked very like one that would not get well with such simple treatment.

CASE VII.—No. 2103, Private G. W., of the 3rd 60th Rifles, was hit, at the battle of the Ingogo, in the left ankle. My *confrère*,

Surgeon L. B. Ward, asked my opinion about the case, which was under his care, and we made out the following:—The bullet had entered one inch below the left internal malleolus, and made its exit a little below the external one. The tarsal bones were rattling about like a bag of marbles. On probing it was found that the tarsal bones as well as the joint were destitute of cartilaginous covering, and the suppuration and swelling, as well as pain, were excessive. Amputation at the ankle was performed by Mr Ward, I acting as assistant. The rules and incisions taught by Mr Syme were faithfully adhered to, and the stump dressed with oil-silk, tenax, etc., as recommended. The operation was done on the 14th April. The stump had healed, and the patient was out of doors enjoying the cool fresh air, sitting in a chair, on the 3rd of May. An excellent stump resulted.

Of injuries to the foot the following may serve as illustrations:—

CASE VIII.—No. 999, Private R. M., of the 94th Regiment, was wounded at the engagement of Ulundi, while in the middle of the square. The bullet passed through the toe of his boot, entering the inner side of the matrix of the nail of the large toe of left foot, passing along its side into the sole of the foot, tearing up the tissues of the arch of the foot, and forming a wide, gaping wound, and lodging in the inner side of the os calcis without fracturing it. From this bone, after using considerable force with the lever, I extracted it, and the case did exceedingly well. This case presents several points of interest,—the small entrance wound, the absence of any open track as far as the commencement of the plantar arch, and the presence from that locality, along the whole curve, of a wide, gaping furrow, and the lodgement of the bullet in the os calcis. The bullet, a well-preserved Enfield rifle one, must have passed into the toe in its normal axis of flight, and, when it lost part of its momentum, must have somewhat changed it in passing along the plantar arch, and then lodged. Such injuries to the os calcis, unless freely drained from the commencement, really are more serious than one would at first believe. Bones of this nature

readily take on internal carious action, and what was quite local becomes much extended and more severe. This case, for example, did well; the next one did not.

CASE IX.—Private T. T., of the 58th Regiment, was hit, on the Majuba Hill, in two places, the abdomen, as already recorded, and foot. The former was a penetrating wound, and was followed, after healing, by partial paralysis of the limb. The patient stated that when in the act of running he was hit in the heel, the bullet passing from the outer to the inner side of the os calcis, near the insertion of the tendo Achilles. On probing, a large number of sequestra were found. The wounds were discharging very foul pus, and the patient was suffering from hectic and great nervous excitability, being quite maniacal when his wound was being examined.

16th April.—Under chloroform I removed numerous loose lying pieces of bone. I, however, found, after doing this, that the whole of the surrounding tissues were soft and carious. I therefore determined to remove whatever there was necessity for, and gouged for over fifteen minutes, and was unable to come on healthy bony tissues. Finding this, I made an incision from the tendo Achilles down the centre of the heel to the end of the os calcis, and excised the bone. A great deal of venous oozing succeeded. Case went on favourably.

19th April.—The temperature rose alarmingly to-day to 104° F. The foot became red and swollen, and a very abundant and purulent discharge came away from the wound. Charcoal poultices freely applied.

20th April.—Symptoms of blood-poisoning developed, and continued for several days to increase.

2nd May.—The above not diminishing, and the wound being very purulent, amputation of the leg at the lower third was resorted to.

The stump was dressed in the manner recommended. The articulations of the astragalus and cuboid bones were far advanced in caries, and the ankle-joint itself was a huge collection of pus.

5th May.—Very little discharge; flaps healing, and patient very much more cheerful.

7th May.—A restless night. Had a severe rigor, followed by profuse perspiration. A large bed-sore formed over the sacrum.

10th May.—The bed-sore sloughed, leaving the sacrum quite bare of its natural coverings. Patient very weak.

28th May.—After a prolonged struggle for life, he died from exhaustion. This case was treated in a bell tent.

GUNSHOT WOUNDS OF THE THIGH.

Except penetrations of the body cavities, by far the most serious injuries the field surgeon is called upon to treat are those of the thigh in which there is shattering of the femur. Surgeons have formed various opinions as to the proper method of treatment to adopt in such cases. In wars in civilized countries, where there are towns near most battlefields, and good roads along which to convey such serious cases, they have a much better chance of being soon placed in a position where rest is possible, and are therefore more likely to recover. In South African warfare how different is the case! As in gunshot injuries elsewhere, where the bullet passes through the muscular portion only of the thigh, the wound heals very rapidly.

CASE I.—No. 295, Private R. C., of the 94th Regiment, was in the square at Ulundi, and hit in the right thigh. The bullet entered at the apex of Scarpa's triangle, just avoiding the femoral artery, and, taking a course round the bone, came out on the other side exactly opposite. The wound, after sloughing, healed very soon, without any constitutional or other complications.

CASE II.—No. 1876, Private J. G., of the 58th Regiment, was in the square at Ulundi. Firing had just ceased, and he was turning round on the ground, he having lain down, when he accidentally came into contact with a comrade's rifle, which was loaded and lying close to him. It went off, the bullet entering the right thigh posteriorly about its middle, in the central line, and made its exit two inches above the outer side of the patella. Wound of

entrance was small and clean, that of exit triangular and large, more than an inch long. A long, very painful sinus, followed by suppuration, was present. This after a time got well.

With regard to cases of fracture of the femur in gunshot injuries, I shall detail three cases illustrative of the effects of the modern rifle and conoidal bullet. In one case I attended immediately after he fell, during the thick of the battle; in the second the patient was removed to a camp adjacent to the battlefield; and the third was conveyed ten miles along a bad road by the "bearers" to the hospital.

CASE III.—Lieutenant P., of the 13th Light Infantry, was hit in the engagement at Ulundi, and I saw him almost immediately afterwards. The bullet entered the right thigh about its middle, passing through it in a direct line without injuring vessel or bone, and entered the thigh of the opposite limb about its upper third, causing severe comminution of the femur, and then escaped on the other side. The wound in the right thigh healed, without a drop of pus coming from it, in a few days. The wounds were small, clean, and round, and no difference was perceptible between the entrance and exit. Those in the left thigh were different, the wound of entrance being twice the size of that of the other limb, and that of exit being large, deep, and gaping, and there was considerable hæmorrhage present. I put the limb up in a long splint at the time, and immediately after the battle I wished to remove the limb. This was not agreed to, and I lost sight of him for two days. When seen then his leg was still in the splint I had put on, but the case had become more complicated. A considerable tumour, pulsating strongly, occupied Scarpa's space. Ten days after the injury the wound began to bleed alarmingly and all efforts failed to check it. The limb was then amputated—I assisting—but the patient died upon the table.

The following was the condition of the limb I found on making an examination afterwards. The whole of the femur, except a few inches near the trochanters and condyles, was fractured, and existed only in fragments, large, loose, sharp-edged and pointed

pieces. The medullary canal was full of a fungoid mass smelling most foully, and all the fragments of bone were quite destitute of living covering. An inch below where the profunda branch is given off by the femoral the main artery was cut half through, evidently by one of the sharp fragments of the femur, and a long dark clot was hanging from it. The tissues immediately in this vicinity were in a softened condition, the adductors and vastus muscles being pulpified and separated from one another, and the space filled with blood-clot.

CASE IV.—1911, Private S. D., of the 58th Regiment, was wounded when storming the heights of Lang's Neck. When seen by me on the 16th April he was emaciated to the greatest degree, and had severe bed-sores over the trochanters and sacrum. The bullet entered the thigh in front, about its middle, and made its exit through the head—origin—of the gastrocnemius muscle, thus traversing the middle and lower third of the thigh. The leg was not in splints, and lay out of its normal line. The discharge was very profuse and foul. On probing, loose fragments and bare bone were easily detected. On movement of the limb some mobility was made out, but as he was so weak very little manipulation could be practised. He had all the symptoms of hectic, high evening temperature, profuse perspirations, diarrhoea, red tongue, etc. As this man would most certainly die if left alone, and as there was the faintest chance of life if operated on, I determined to do so.

21st April.—I removed the limb by means of a long anterior flap, according to the teaching of Spence, in the upper third of the thigh, the wound of entrance of the bullet being in the flap. I have frequently found these can be utilized for putting in drainage-tubes, and thus serve as already made counter-openings.

The femur was found much broken, the upper and lower ends riding over one another for several inches. The slight callus which was being thrown out was not enough to hold the fragments firmly, the blade of a knife easily going between any point of approximation. A large loose sequestrum lay between both ends

The medullary canal was full of fungoid foul material. Periosteum covered the large fragments. A very large abscess existed along the shaft of the bone, up as far as the groin and down to the knee, full of very fetid pus. The knee-joint itself was filled with pulpy material. The muscles of the thigh were pale and waxy in appearance, infiltrated with pus. The leg was œdematous, pitting deeply on pressure. During the operation, before a knife was used, very alarming syncope came on, requiring the immediate withdrawal of the chloroform which was being administered, and artificial respiration being resorted to energetically. It then became a question, as the man was moribund, whether we should operate or not. Slight as the chance of recovery was, however, I gave it the patient.

22nd April.—No bleeding, only a little serous discharge on the dressings. Wound of entrance acts as an excellent point of drainage for the stump.

23rd April.—Discharge dark and offensive in odour to-day. Flaps fit easily all round. In the evening oppressive breathing and great weakness set in. Vomits his food, and also the stimulants given him.

24th April.—Sweats a great deal; oppression of breathing getting worse. Died, conscious to the last.

CASE V.—No. 231, Gunner T. H., of N. 5 battery R.A., was hit at the Ingogo. This man had been a member of the unfortunate column that met with disaster in the Zulu War, and was afterwards a patient of mine at Helpmakaar for enteric fever. The bullet entered his right thigh posteriorly about its middle, taking a direct course through the bone, making its exit anteriorly about the lower part of the upper third of the thigh and hitting the opposite thigh, making a deep flesh wound and escaping. On the 18th March I took charge of this case in the following condition:—His limb was supported in a MacIntyre splint, very great and foul discharge welling up from the top wound. Pressure over the vastus and rectus muscles caused half a pint of pus to come away. The lower wound was temporarily healed, but was evidently about to break open. The

upper fragment of the femur was sticking out very prominently at the middle third of thigh, only the integument covering it. The probe found loose bone and bare shaft. Had a very bad bed-sore over sacrum.

21st March.—Got a weight and pulley extension apparatus fitted up in hopes of bringing the fractured ends of the bone together. Amputation was not thought to be the treatment, at least not until conservative surgery had failed. Drainage-tubes were put into the abscess sacs, so that there could be no collection of pus. Removed all loose portions of bone.

2nd April.—The pus is now draining off, but the pulley and weight has not made any change in the relationship of the fractured ends of the shaft.

15th April.—Under chloroform I made a thorough examination of the case; removed several loose sequestra of bone. The upper fragment of the femur still stuck out anteriorly, while the lower one was drawn up and pressing on to the pelvis. The sharp, bare point of the upper portion of the shaft was removed, as it was causing pain from pressure on the integument. A huge abscess sac existed amongst the muscles at the back of the thigh. A drainage-tube was inserted through a counter-opening made in it. The pulley and weight extension apparatus was again fairly tried. The high position of the injury, and the weakness of the patient, and the chance of the extension succeeding, deterred me from amputation at this time.

20th April.—This patient contracted erysipelas, and was placed under the care of another surgeon. After he recovered from that, the same gentleman removed the limb, with a fatal result.

As an instance of what successful results may be obtained by means of the pulley and weight extension apparatus, I shall relate the following case here:—An old man (over 60), called M. H., came under my care when doing duty in the Herbert Hospital, Woolwich, on the 13th March 1878. It was at the time when the scare connected with the Russo-Turkish war was in progress, and huge stores, and sheds to contain them, were being taken to and

formed in the dockyard at that station. This man, when engaged in building one of those sheds, met with the following accident through the falling of the building. He was the most severely injured of many, most of whom were treated by me. When admitted he was apparently moribund. Face pale, pulse almost imperceptible, most obstinate vomiting, everything swallowed being returned. The right thigh was comminuted, quite in pieces; a simple fracture of the left one existed. The knee of the left leg was greatly swollen and painful. Three ribs on the right side were fractured, and extensive emphysema of the cellular tissue over this side of chest was found. Altogether a most serious case.

14th March.—As he was unable to bear any moving, his limbs were put temporarily in MacIntyre splints. Continues to vomit everything taken. Very feeble.

15th March.—A little better; still vomits, however.

17th March.—Has not vomited since yesterday. Having iced milk and soda-water only. Had a castor-oil enema with good result.

19th March.—Took off the MacIntyre splints, as they were hurting his legs, and rolled pillows simply round them.

20th March.—Put up pulley and weight apparatus at foot of bed for both legs. I managed to get both limbs alike in size, and normal in line; great relief followed.

25th March.—Tenderness over sacrum; placed on a "fracture bed."

28th March.—Bed-sore sloughing. Removed from the "fracture bed" to an ordinary one, which suits much better; air-cushions used to take weight off the bed-sores.

29th March.—Raised himself in bed to-day; no pain felt in the ribs, a bandage being still worn around his chest.

5th April.—Along with the senior medical officer, I took off all the apparatus to-day. The limbs are nearly the same size, the right one being half an inch less. The bones were decidedly uniting, a good deal of callus being thrown out around the right thigh fractures. No eversion of the feet. Sand-bags are kept

along either side of the limbs; no splints. Bed-sores healing rapidly now, black-wash alternating with red-wash being used to them.

13th April.—Took sand-bags, etc., from left thigh permanently. Knee still swollen; evaporating lotions used.

16th April.—Removed all apparatus to-day. Union seems complete; moved the limbs about freely.

21st April.—Sleeps in same manner as other patients now in bed; allowed full liberty. His knee is still a little swollen. Lifts his legs himself readily in bed now.

2nd May.—Gets out of bed himself now, and sits on a chair. The legs swell when up. To have friction applied and flannel bandages.

11th May.—Walked half way across the ward, aided only with sticks.

19th May.—Walks about regularly. From this date he made an uninterrupted recovery, and he left the hospital, walking out, and going over a mile to his home. The limbs were exactly alike in size; the left thigh, when examined, had a slight outward curve, due to use before the callus had quite hardened, a fault on the right side, as I have seen so many cases of useless limbs result from too long disuse of them after such injuries. With this little exception, the limbs were as shapely as ever they were.

GUNSHOT INJURIES OF THE LEG.

As in cases of gunshot injuries to the forearm, a great many cases where the tibial and fibial shafts are broken by a bullet can be treated conservatively if done early in their history. It is chiefly in cases where conoidal balls hit the shaft of the femur that the extensive splitting of the bone beyond the locality of the injury is found. When the same occurs to the bones of the forearm or leg, the injury is more of a local character, though less so than when a round bullet had done the mischief.

CASE I.—No. 1107, Corporal P. W., of the 58th Regiment, was

wounded, at Lang's Neck, in the right leg. The bullet entered the head of the tibia near the outer tuberosity, there tunnelling down to the anterior tuberosity or tubercle and making its escape. When I saw the case there was a wide, gaping opening into the articular end of the bone, and for about three inches down the shaft anteriorly the bone was quite bare, with separation of the integuments over it, allowing a probe to pass all round. The discharge of pus was very copious and foul. No loose bone was found. I placed him under chloroform, made an incision through the integuments covering the bare shaft, and with bone forceps removed that portion. I then gouged out all the soft carious bone from the interior of the head of the tibia, and applied strong nitric acid to the surface of the cavity. The result was that for several weeks small portions of bony tissues came away, and, being black, the patient went by the name of the "coal-box" amongst his comrades in the hospital. The case had an uninterrupted course towards recovery. The large hole did not fill up much, but the bone around became thicker, so that he was able to get about very well, assisted by a stick. Nearly a year after the operation I met this man in the streets of Dover. He came up and spoke to me. I found he was walking without a stick. On inquiry I found there was still a hole in his leg, but it was quite healed, and his leg as strong as ever. He was looking very well, and employed as one of the Government station keepers on the royal military canal near Hythe, a duty which kept him on his legs all day.

CASE II.—Trooper L., of the 15th Hussars, was employed by the commanding officer of Mount Prospect camp to take orders to two companies forming a reserve at the foot of the Majuba Hill, after the repulse. In this duty he was shot in the right leg. The bullet passed through the right tibia about its middle, making a large hole at point of exit. I found several sequestra present, which I removed, also a portion of the shaft of the bone, which was dead, bare of the periosteum, with the end sticking prominently across the open wound. I enlarged the wound and cut out all this portion of the shaft. The case at once

did well, and the limb became strong. He is now a waiter in the cavalry canteen at Aldershot.

CASE III.—Seaman C. H., of the Naval Brigade, belonging to H.M.S. "Dido," while in the camp at Mount Prospect, near the Majuba Hill, on the 22nd February, was accidentally shot in the leg with a revolver. One of his fellow-sailors was cleaning the weapon, not knowing it was loaded; it went off, and produced the following injury in this man's leg:—The bullet entered the inner side of the tibia anteriorly, about four inches above the malleolus, and, passing in the same line as the bones, passed through them and lodged superficially between the fibula and skin. The bullet had been removed when I took charge of the case on the 17th April. On examination I found the limb very much swollen and œdematous, the wounds discharging the most profuse and foul pus. A probe passed into the shaft of both bones, finding sequestra and bare bone. Considerable constitutional distress; hectic was present. Patient very anxious to get relief.

25th April.—I amputated the leg at the "seat of election," with anterior and posterior flaps, dressing it in the manner advocated. The fibula 4 inches above the ankle was smashed for over $1\frac{1}{2}$ inches. Several sequestra of bone were here found imbedded in the tissues, quite dead. In the tibia, about the same distance from the ankle, a large hole was present nearly 2 inches long and $\frac{3}{4}$ of an inch wide. The bone posteriorly was intact. The medullary canal was quite open. This cavity was full of putrescent matter, pieces of flattened lead, and, except at the edges of the shaft, where there was a slight attempt at the formation of callus, there was no other effort of nature to throw off what was causing the mischief, or to fill up and heal the wound. The upper fragment of the fibula for over 2 inches was quite bare of periosteum—dead.

26th April.—Temperature less than last night.

27th April.—Stump looking very well; tubes acting satisfactorily; no discharge elsewhere.

29th April.—Holds his own stump up to be dressed to-day. Case doing very well.

30th April.—Pus in some quantity coming through tubes. Stump looking well, cool and normal.

1st May.—Stump all healed round, except points where the tubes are. Upper tube discharges freely; very little coming away from the under one. All the ligatures but two are now away. Several of the sutures removed.

6th May.—All the sutures out, as well as ligatures; one tube in, as a little discharge still present.

10th May.—All healed, and patient moving his knee a little. Shortly after this he was sent down country *en route* to England. A few weeks after I arrived at home I received a letter from this patient. He is employed in a shop all day, and has to walk to and from it during the day, a distance of over three miles. He finds no difficulty whatever in performing this distance, and he does "a good day's work."

In this case I thought of operating lower down the leg than the "seat of election," but am glad I did not, for two reasons. First, had I done so, I must needs have performed a second one higher up, owing to the nature of the injury of the shaft of the fibula, which could not have been diagnosed earlier. This is a circumstance one must not forget in cases of gunshot injuries treated expectantly where there is evidence of œdematous swelling and general brawniness of the limb. The second reason is one that field surgeons should also consider. It is generally the rule in surgery to save all one can. In the leg, however, after-utility is a most important consideration, and if we can make a limb more serviceable by taking it off just below the knee than if it was taken off in the middle, or even just above the ankle, we should do it. Artificial limb makers consider that it is a very simple and satisfactory matter to make a substitute of the most economical and serviceable kind for legs which have been removed near the knee, while for those taken off further down the difficulty and expense is greater and the result less satisfactory. The effect is that a man of the class our soldiers usually belong to, whose leg has been taken off low down, is obliged to get a contrivance in which he places his knee, while his leg sticks out uselessly and

hideously behind. The patient whose case is just related states in his letter that "a neighbour of his has a leg taken off just above the ankle, and he is very sorry it was not operated on as his was," higher up.

INJURIES TO GENERAL OFFICERS IN THE FIELD.

When one considers what a general of an army or a division in the field is, the immense interest which centres in any accident occurring during such periods to such officers is not to be wondered at. It has been my duty to treat two well-known general officers when serving in the field in South Africa. A short summary of their cases may be read with interest.

CASE I.—Major-General N., when he was collecting his division at Landman's Drift, on the Natal border, previous to the advance into Zululand, met with the following accident. He was out, mounted on a fine English horse he had brought from home with him, having a look at the nature of the country. As in most parts of South Africa, numerous ant-bear holes existed amongst the grass, and the native bred horses are very sharp in detecting and avoiding them. In this case the general's horse's foot went down in one, throwing the rider. I found he had broken his fibula, and there was the usual displacement of the foot in such injuries. Newspaper correspondents, staff officers, etc., all wanted information. The division might move any day—what was to be done? My medical chief and I had a consultation, and we kept the secret between us. The general had got a severe bruise.

When the swelling was subdued I put the limb up in plaster of Paris. Fortunately the force did not move for three weeks, and the general was able to transact his office duties in his tent. The order for advance, however, came, and, though in considerable pain, my patient was lifted on to his saddle each day. In this way he continued, and even commanded his division in Zululand and at the battle of Ulundi, with his leg in plaster of Paris. There was a little more callus than would have been thrown out under

less adverse circumstances, and in consequence the ankle was weak and stiff for a long period. However, it got quite well, and he never complains of anything connected with his leg now.

CASE II.—Major-General D. L., who commanded the cavalry in the Zulu war, was afterwards sent out for a like purpose to the Boer war. The peace negotiations had taken place, however, by the time he arrived in the country. When Sir Evelyn Wood was in Pretoria, General D. L. was left in command of the force around Newcastle. Returning on one occasion from the camp at Bennett's Drift to his quarters at the camp near Newcastle in the dark, his horse stumbled, and, being taken unawares, threw the rider, injuring his side. I found the whole of the injured side of the chest very painful, and the fifth rib at its junction with the sternum broken. The cartilage was evidently ossified. The movement, causing constant slipping backwards and forwards on inspiration and expiration, was very painful. I put on a large cork, cut to fit the locality, and secured it along the whole side of the chest with stripes of adhesive plaster. Then a firm broad bandage was put round the chest, with shoulder-straps. This effected a cure. In a month all this constriction was removed, and the bone maintained its position.

THE HOSPITALS IN WHICH THE WOUNDED WERE TREATED.

The wounded from Rorke's Drift, on arrival at Helpmakaar, were accommodated in the end of a corrugated zinc shed. This was one of several, filled with commissariat stores, chiefly bags of maize. Many of them had been exposed to the heavy rains then prevailing before being stored, and were decomposing and giving off the most offensive smell. Long square boxes containing biscuits were arranged along the side of the building, and empty sacks laid over them. This was all the bedsteads and bedding obtainable for more than a fortnight, during which time stores were slowly making their way from the base of operations at Maritzburg. The only medical stores in my possession at this

time, with a garrison composed as stated below, was a field companion, a case containing pills, powders, bandages, and tourniquet, and usually carried suspended from the shoulder of an attendant, and a box containing eight bottles of brandy and ten of port wine. The usual printed label showing the contents of the pills and powders, etc., in the field companion had been removed, so that one had to trust to one's memory alone in using them.

	Officers.	Men.
Royal Artillery,	4	66
1st 13th Regiment,	1	73
1st 24th Regiment,	7	110
2nd 24th Regiment,	0	45
Medical Department,	2	3
Commissariat Department,	1	6
Veterinary Department,	1	0
Mounted Infantry,	4	95
Mounted Police,	3	84
Natal Mounted Volunteers,	4	49
Royal Engineers,	2	2
Mounted Basutos,	4	80
	—	—
Total,	33	613

Thus making a grand total of 646,—with the exception of the garrison at Rorke's Drift, all that remained of the headquarters column,—a large force to find one's self in medical charge of after one of the most unexpected disasters—Isandhlwana—our army ever encountered, and a very trying position for any medical officer to be placed in. This was augmented by about 600 more men a week after, belonging to the 4th Regiment.

The wounded after Ulundi were treated in the admirable double bell tents, and afterwards in hospital marquees. No better hospital could be found for surgical cases, provided they are stationary. However, for more than two weeks the camps were frequently being changed, and in consequence the wounded

suffered not a little from the exigencies of service in such a country as we were operating in. How different is the case in Europe, where, even when an army is forced to retire, the wounded can be left behind in charge of their surgeons with perfect safety. All the cases treated in these tents did well. Personally I would prefer treating cases of severe gunshot injuries in a well-pitched marquee than in a hut with foul walls and uncertain ventilation. In the Boer war, the hospital at Newcastle to which I was appointed consisted of a series of thirteen square huts, the walls of which were formed of sunburnt bricks plastered with the gummy earth procured from ant-hills, so plentiful in the country. The roofs were thatch. The huts were arranged regularly in four lines, three in each, with the odd one some little distance in the rear. These buildings had been used for a long time as the permanent barracks of the garrison, the separate one in the rear as the hospital. This hospital hut was called "No. 10," each of the huts having a number. The station, Newcastle, in the Zulu war had a notoriety for the numerous cases of enteric fever occurring at it, all the cases of which were treated in No. 10 hut. On the break-out of the revolt in the Transvaal the whole of these buildings were placed in charge of the Medical Department, to form their base hospital, and which, as I have said, all the wounded passed through on their way to Natal and England, as well as the majority of the sick at the station who required treatment.

No. 10 hut played an important part in the history of this hospital, being the one to which the most serious cases were removed. The patients in it fell to me as part of my duty. Naturally I had misgivings about it as regards the surgical success of treatment in such a building which had not even been whitewashed since its use as the "general" hospital of the garrison. The groans and agonies heard and witnessed in it were enough to give one an idea of what must have taken place on a larger scale in recent European wars, and made one feel how much we have, in every detail, to learn before we can plume ourselves as too many are apt to do at present. Every case in this hut had subsequently severe

surgical operations performed upon them, but not a single one died. It was indeed a contrast to see the poor fellows, minus a leg, arm, or joint, in about two months afterwards, all up and about, chaffing one another, and singing snatches of cheerful songs. Never did I feel the truth of the words of Goethe more, when he remarks, "It is often said the world is ungrateful. For my part, I have never known it to be thankless when one has discovered the proper mode of rendering it a service."

PLATES.

PLATE I.

*Illustrations of Cyindro-conoidal Bullets extracted from
Soldiers wounded in the Transvaal War.*

1. Bullet extracted from the shoulder, after penetrating the joint.
2. Bullet extracted from the ankle.
3. Bullet extracted from shoulder, after penetrating scapular processes.
- 4 and 5. Two views of the same bullet, extracted from the shoulder, after injuring the clavicle, scapular processes, and head of humerus.
6. Bullet extracted from the shoulder.
7. Bullet extracted from ankle.
8. Portion of bullet extracted from shoulder.
9. Irregular mass of bullet extracted from forearm.



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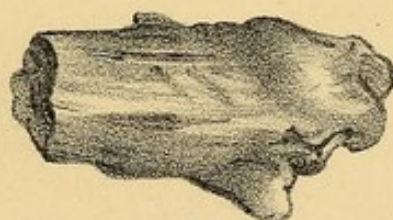
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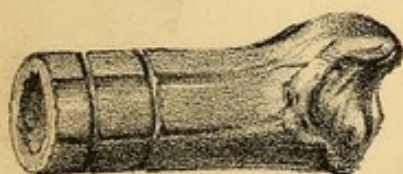
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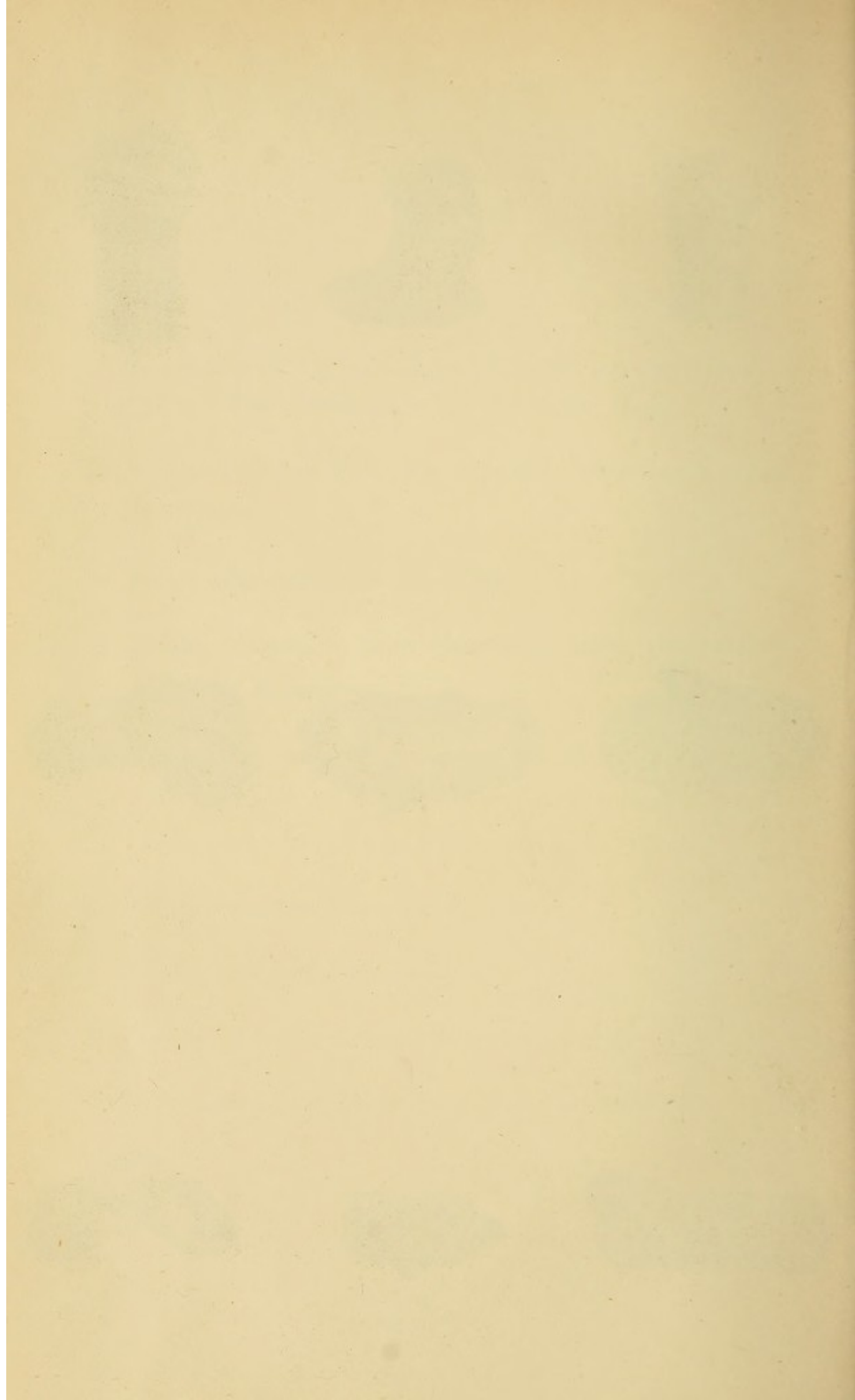


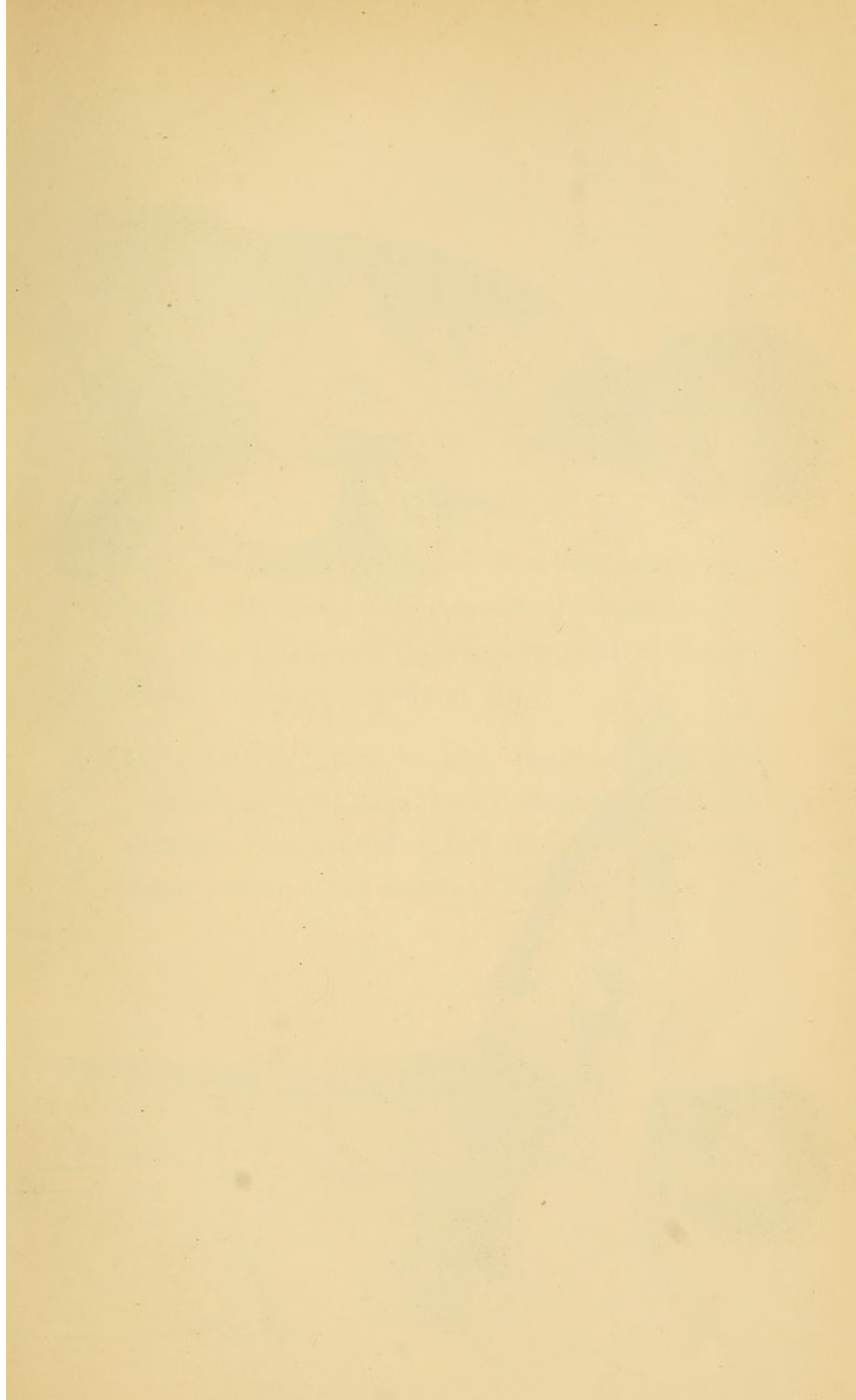
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9.

Plate I.





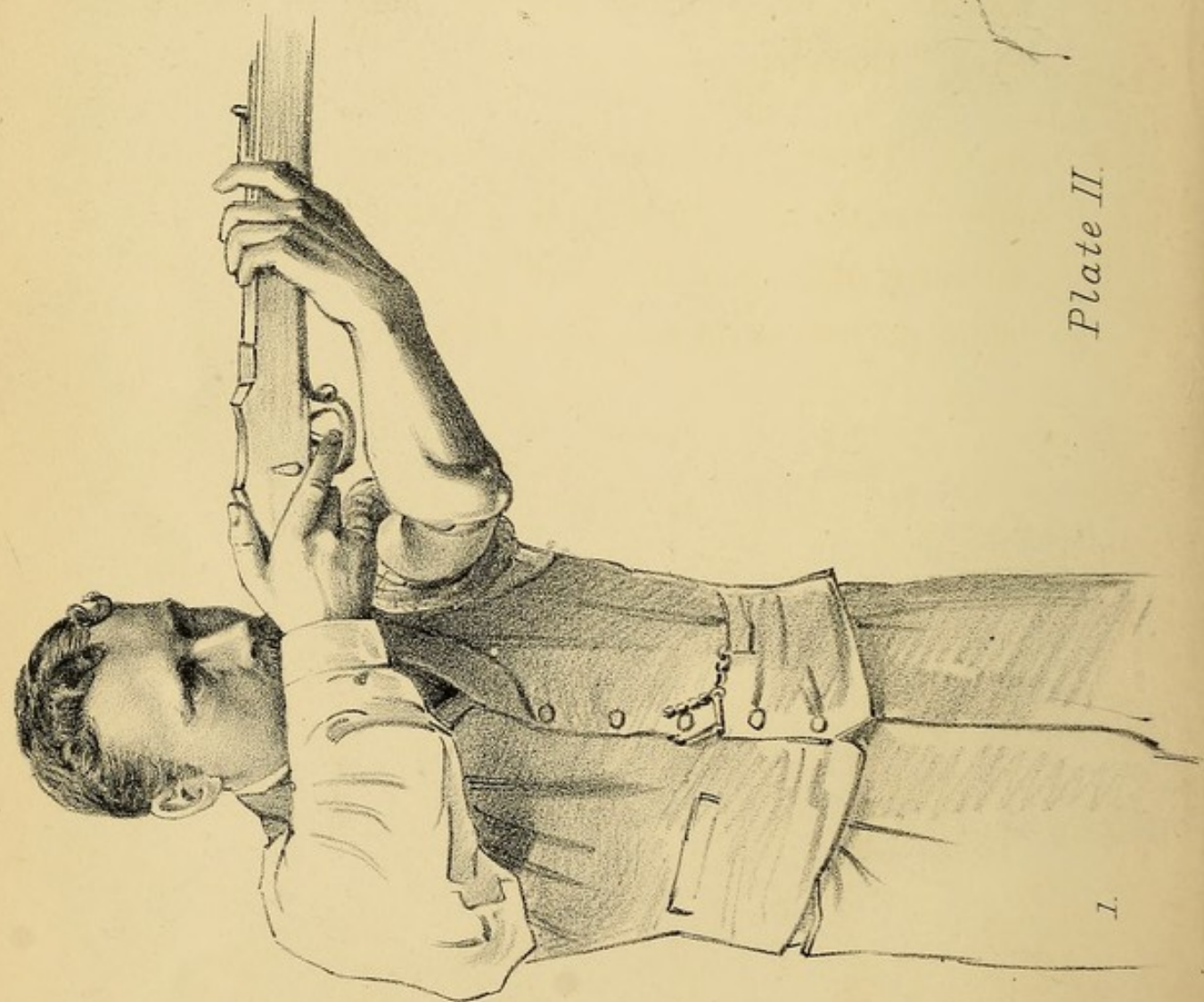


Plate II.

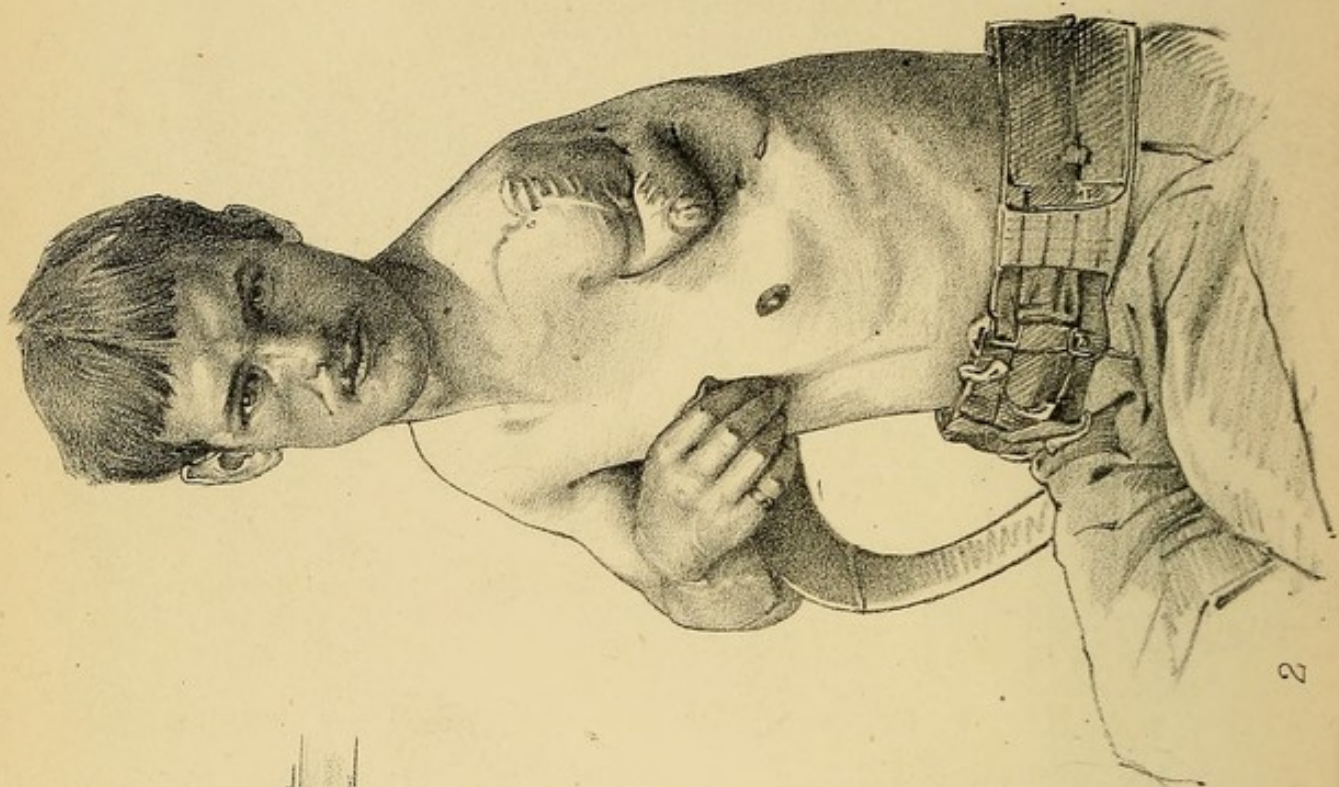


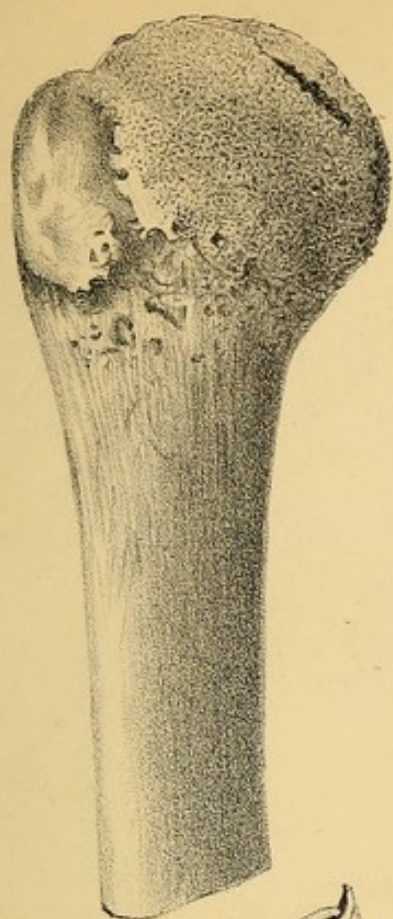
PLATE II.

1. Case of excision of the elbow, in which nearly one-third of the forearm was removed. Corporal C., of the King's Dragoon Guards, wounded at Lang's Neck. Complete use of arm.
2. Case of Private H., of the 58th Regiment, wounded very severely at Lang's Neck. Amputation at the shoulder, and removal of half the clavicle and the major portion of the scapula. Recovery.

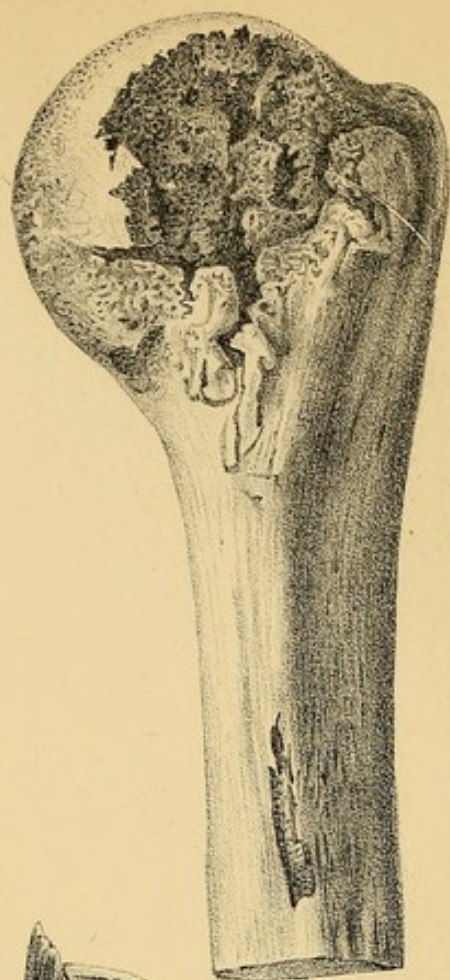
PLATE III.

1 and 2 show the anterior and posterior views of the head of the humerus in the case of Corporal E., of the 3rd 60th Rifles, hit at the Ingogo.

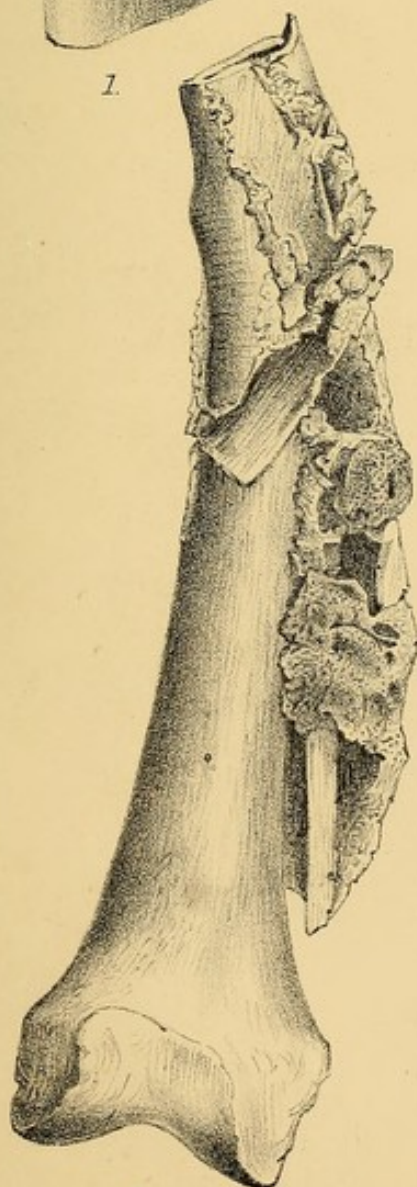
3 and 4 show the condition of the femur found in the case of Private D., of the 58th Regiment.



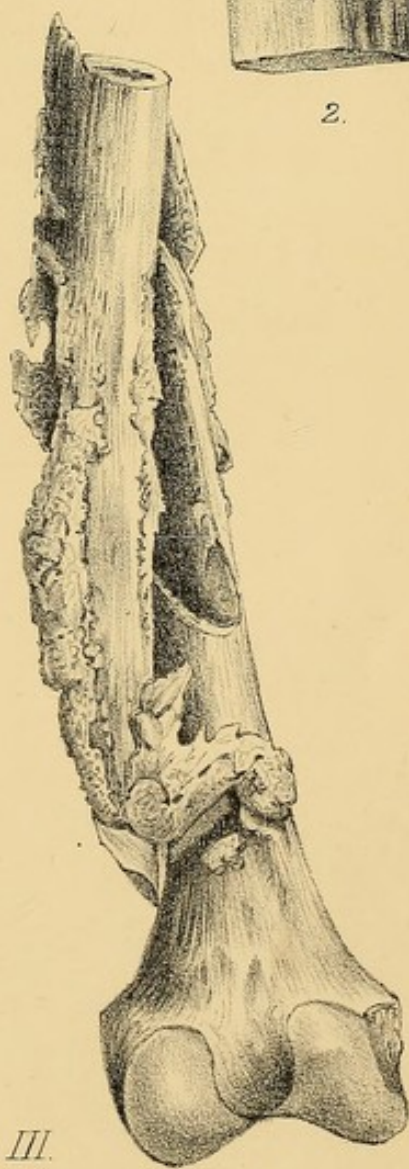
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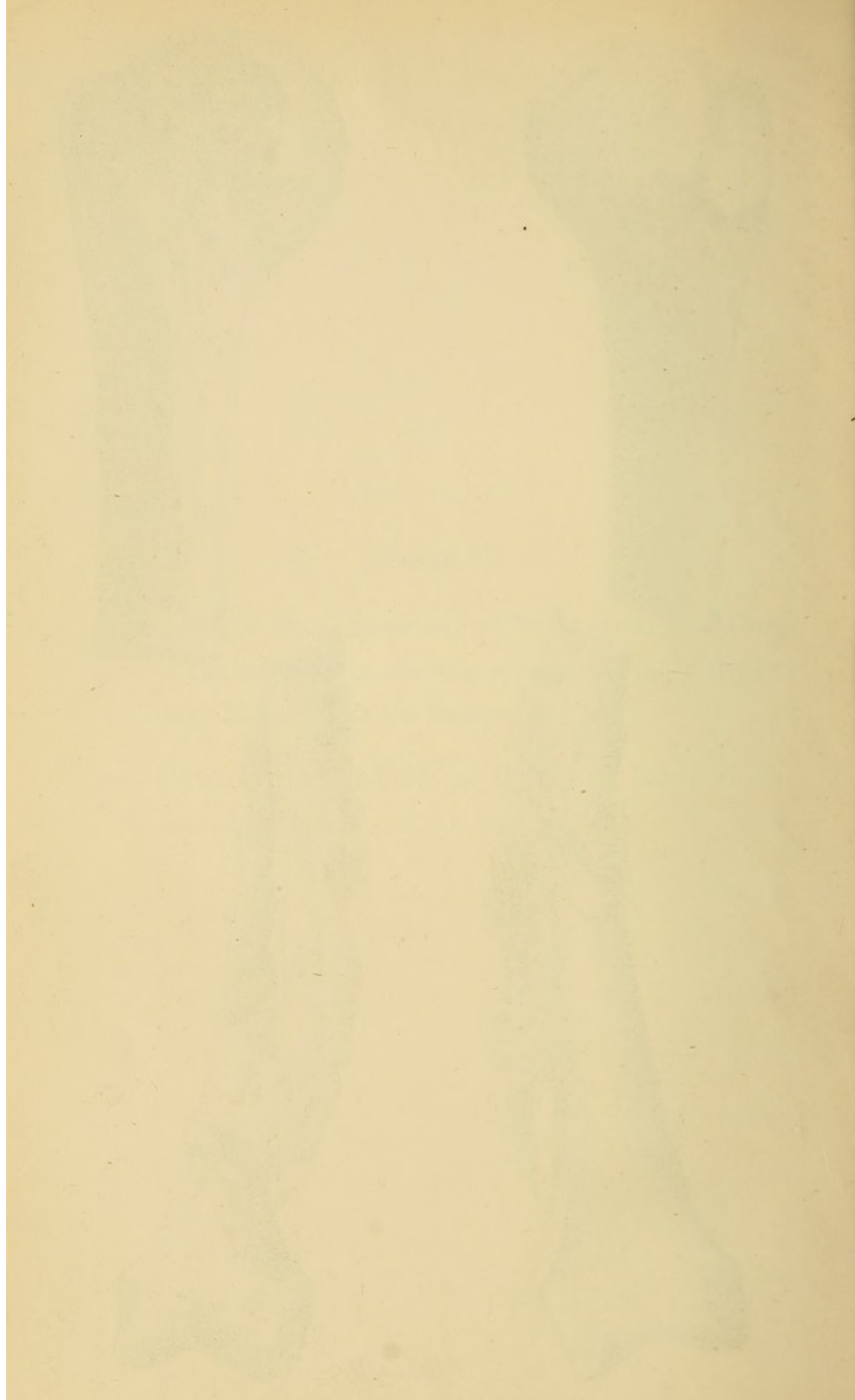


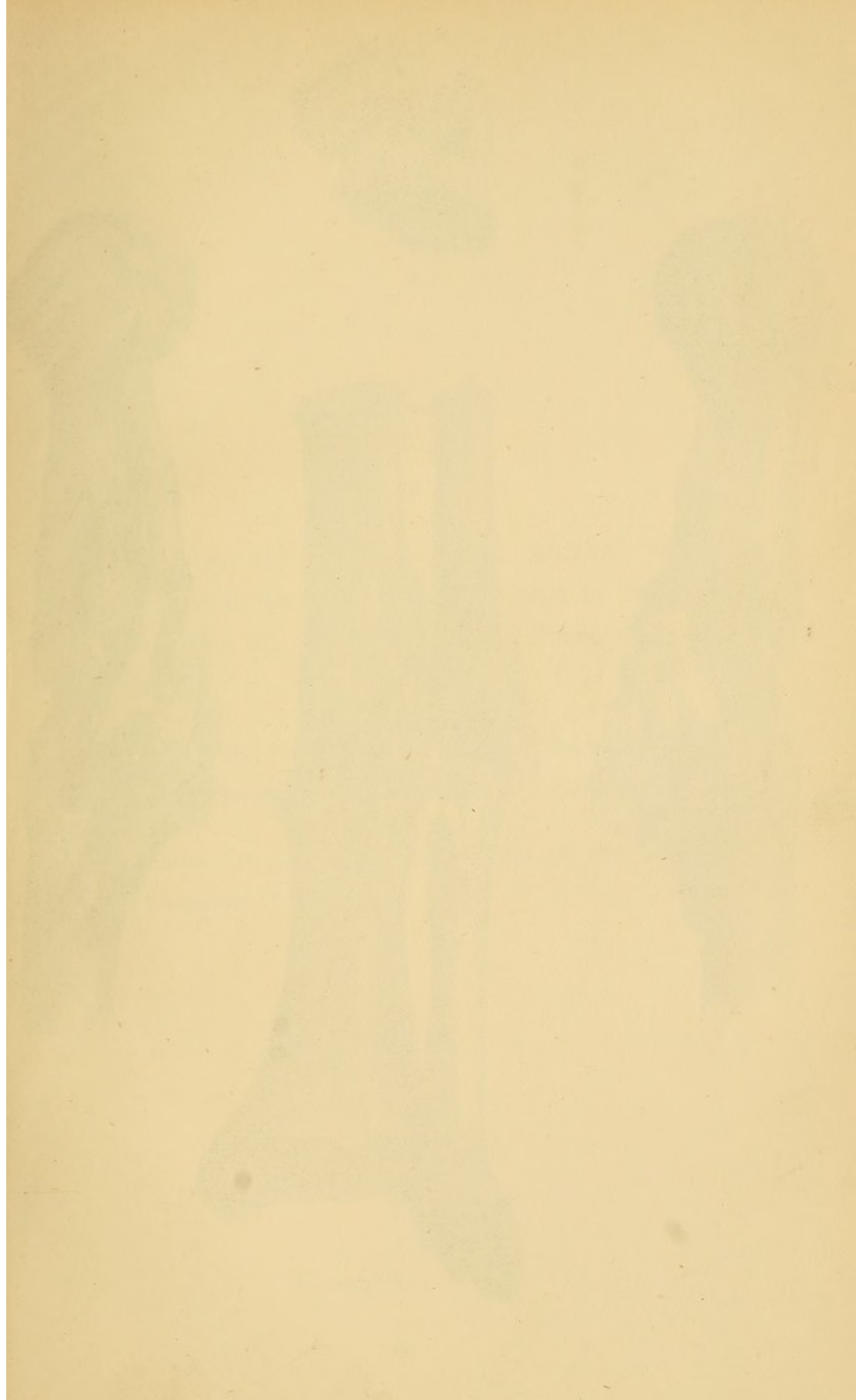
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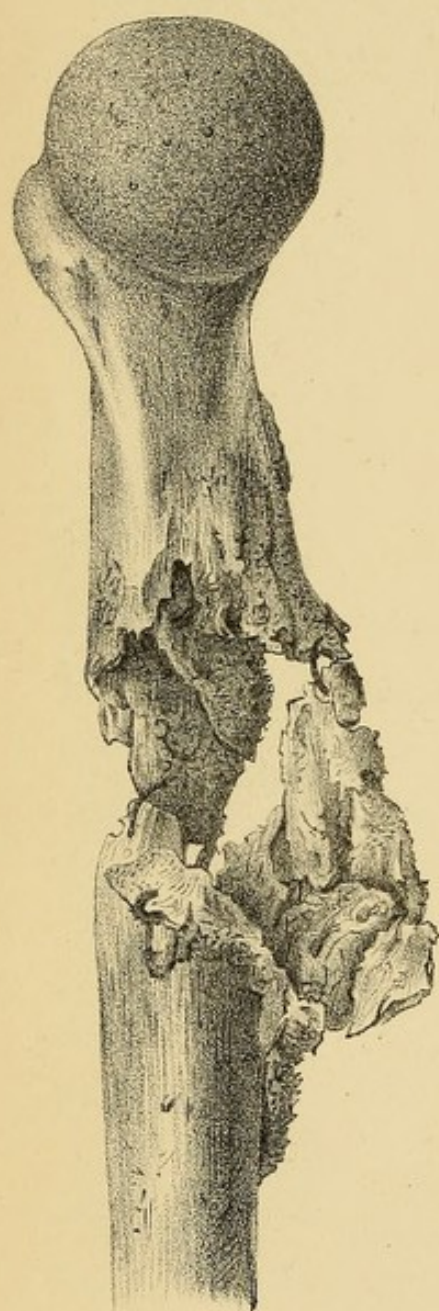


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Plate III.



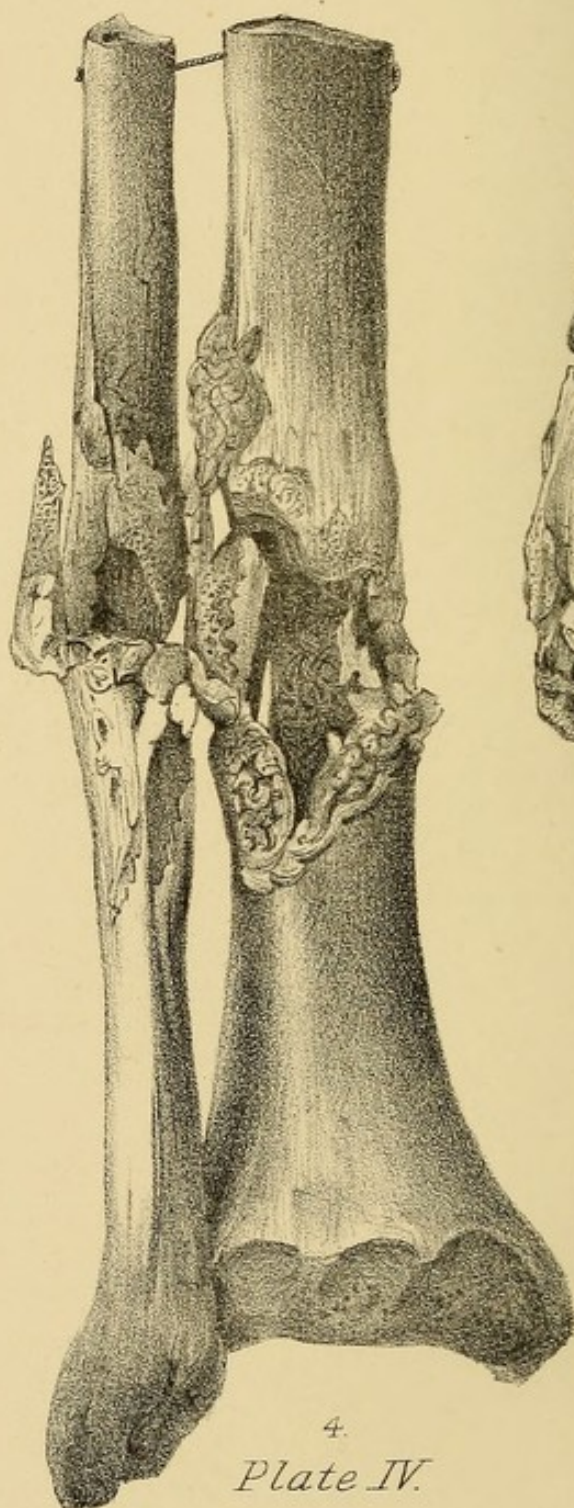




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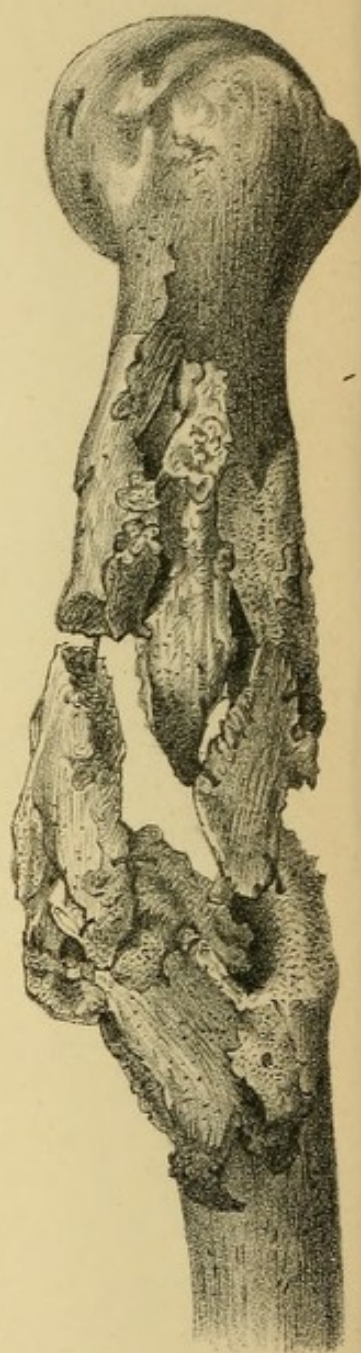


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Plate IV.



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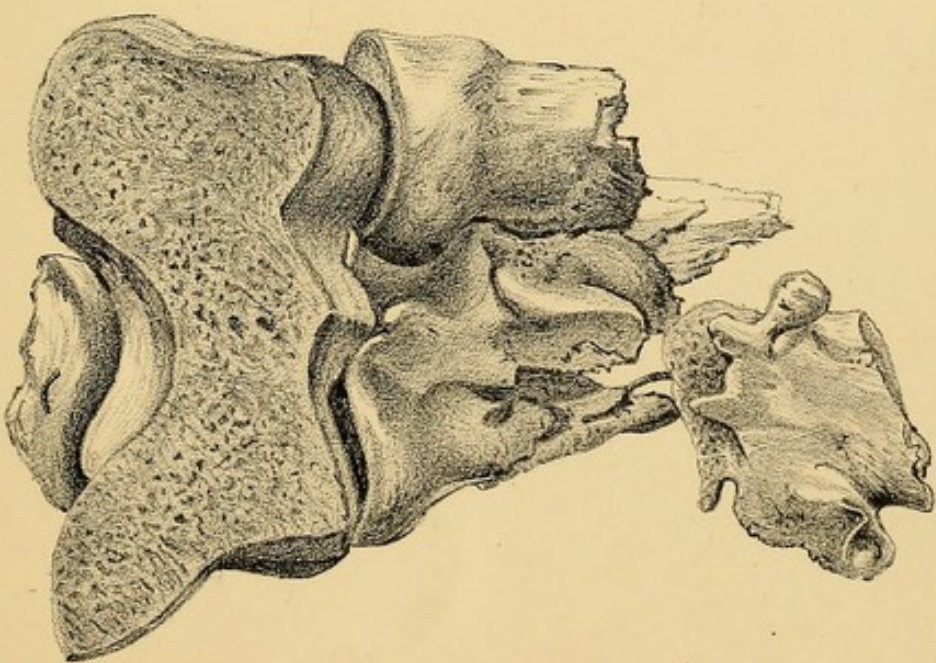
PLATE IV.

- 1 and 2 show the conditions found anteriorly and posteriorly in the shaft of the humerus in the case of Corporal H., of the 3rd 60th Rifles, shot at the Ingogo.
- 3 represents the portion of the shaft of the humerus taken out in the case of Private B., 94th Regiment.
- 4 illustrates the condition of the bones of the leg found in seaman H.'s case.

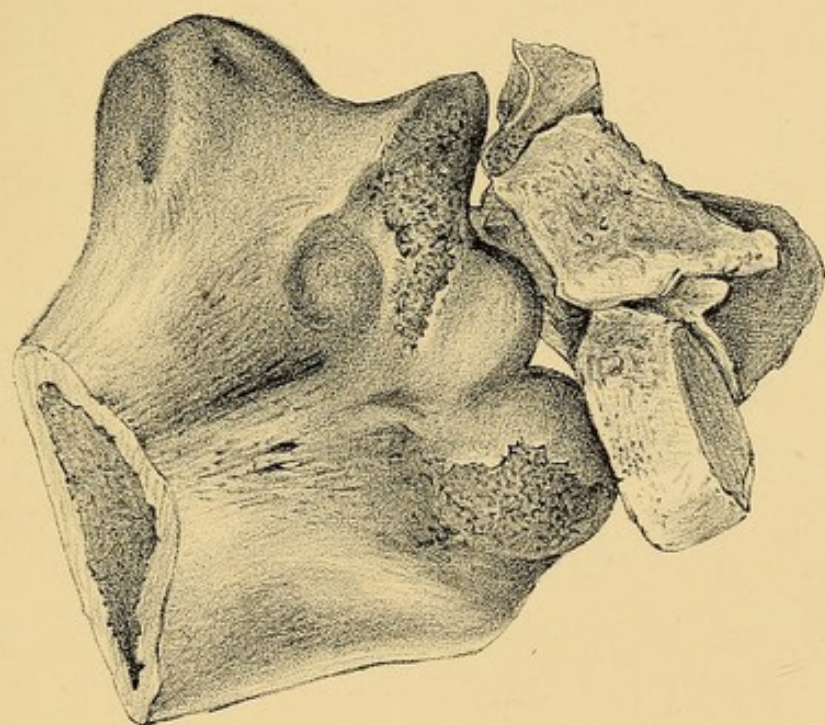
PLATE V.

1 and 2 represent the anterior and posterior views of bones forming the joint of Corporal C., King's Dragoons, wounded at Lang's Neck. The rest of the ulna and radius removed in fragments.

3 shows the conditions found and the amount of bone removed in the case of Private Q., 94th Regiment, wounded at Brunker's Spruit.

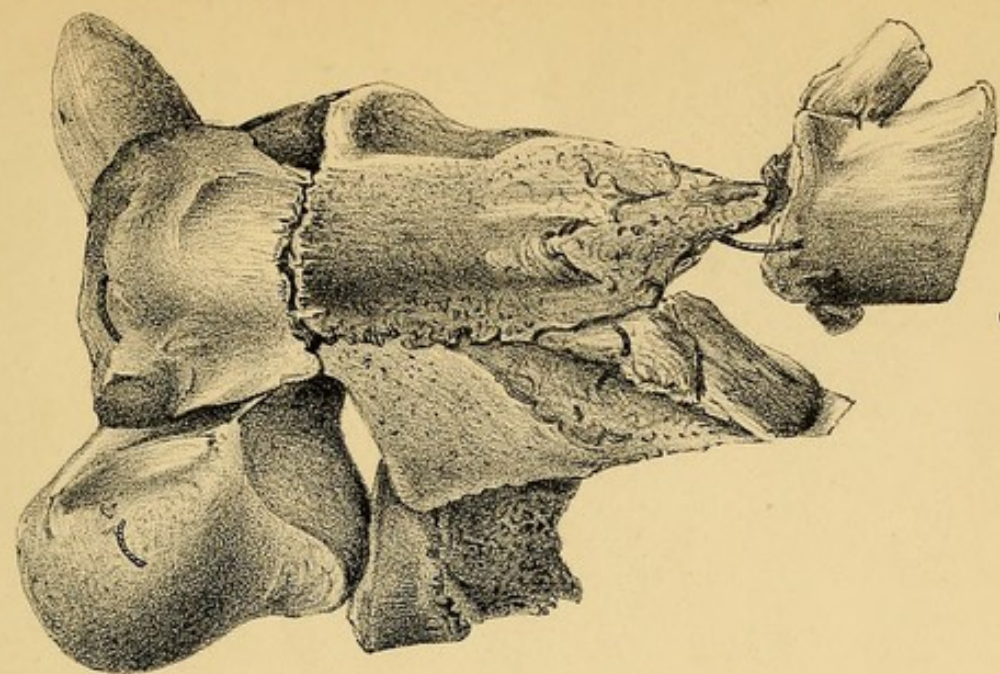


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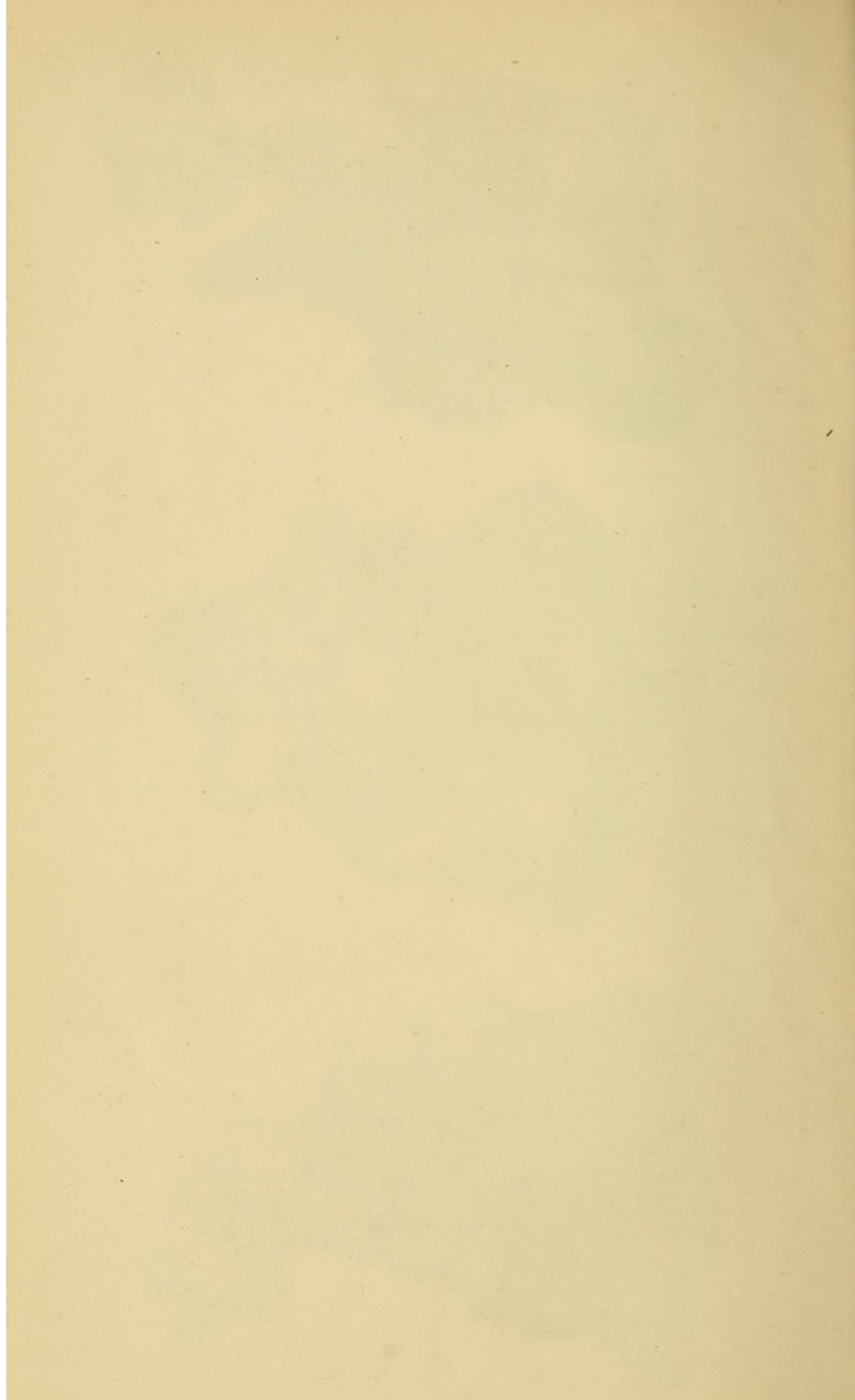


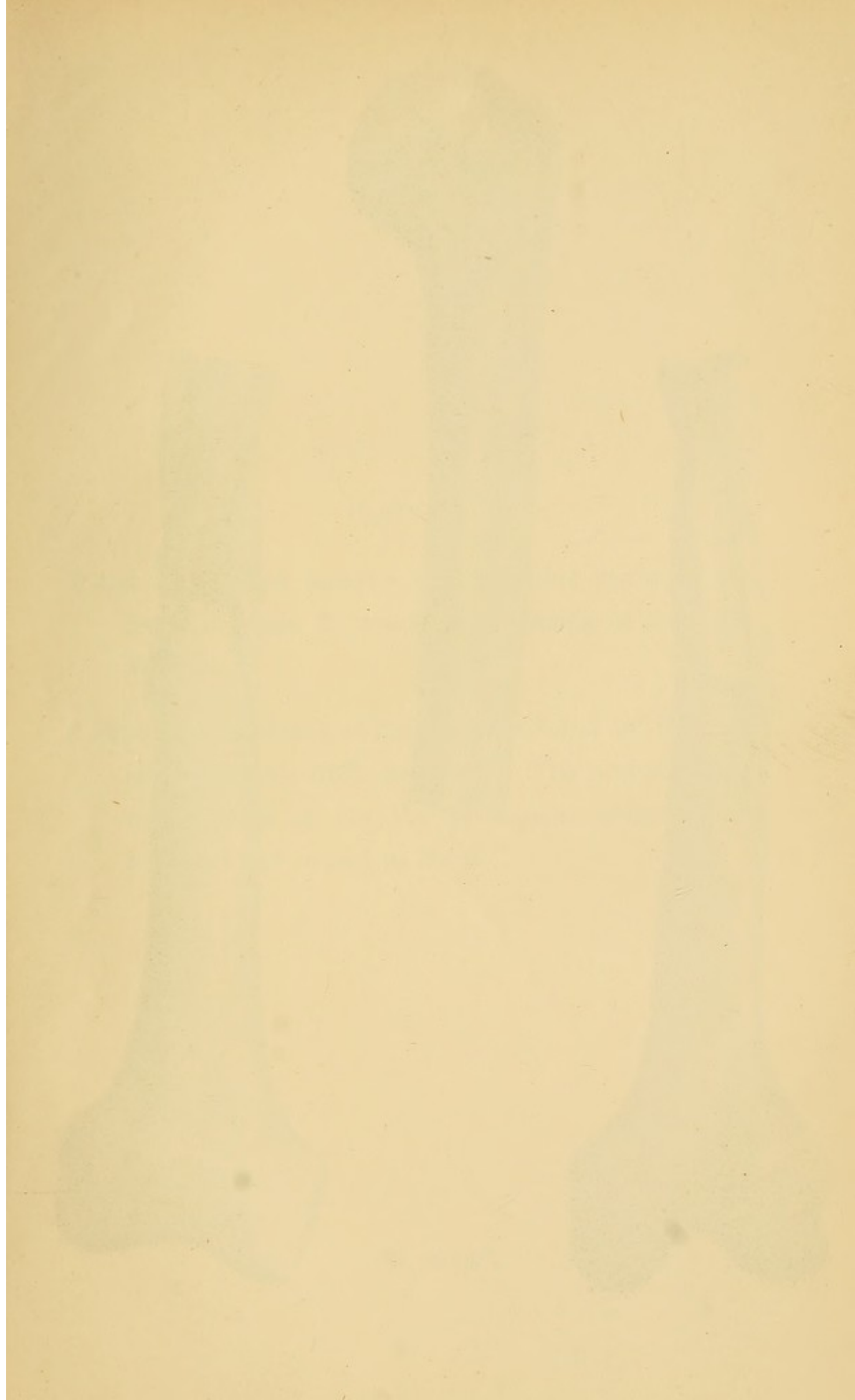
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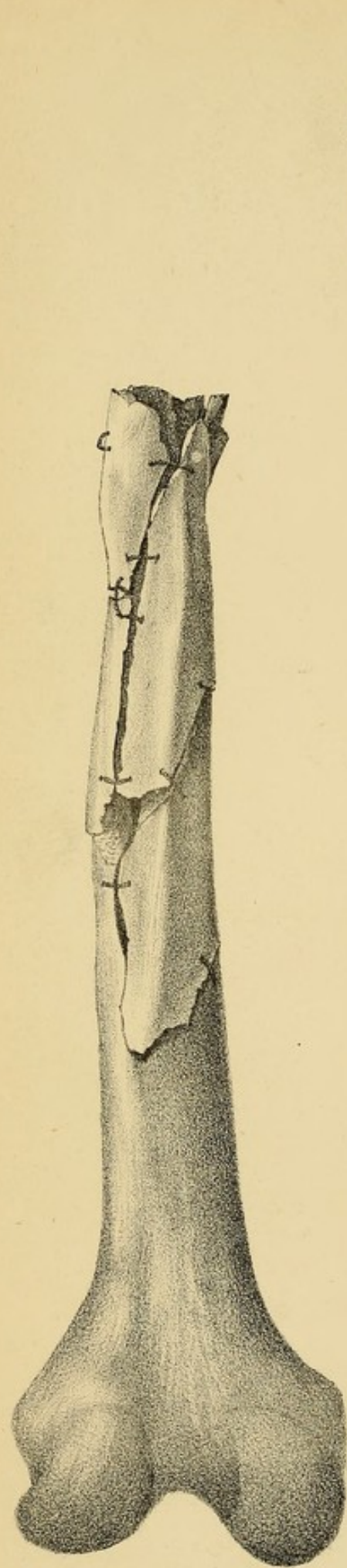
Plate V.



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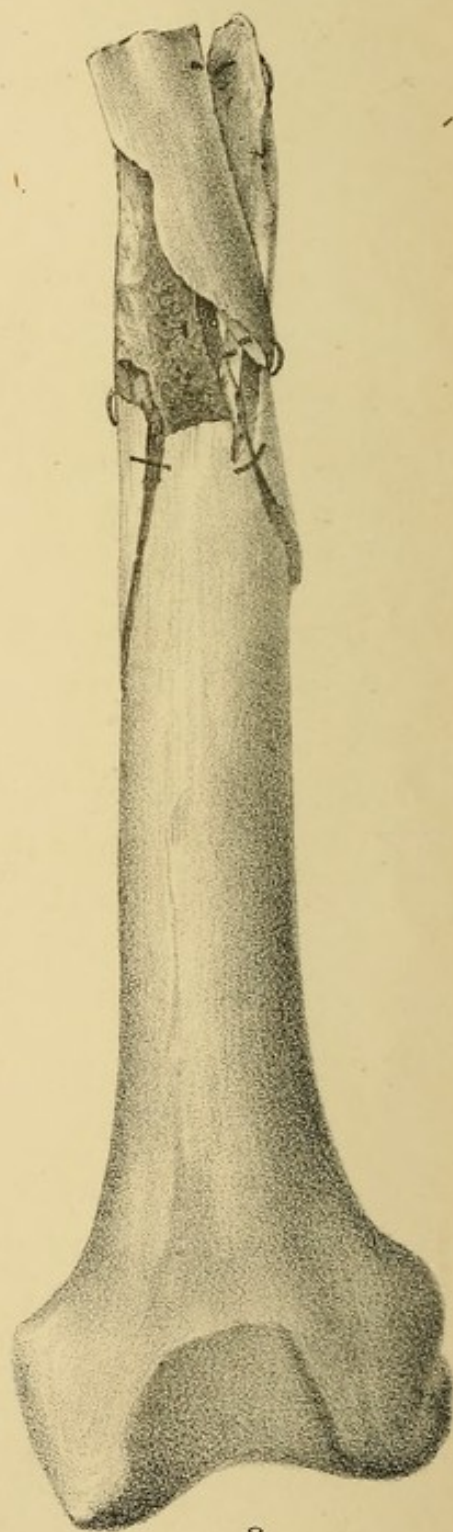




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Plate VI.

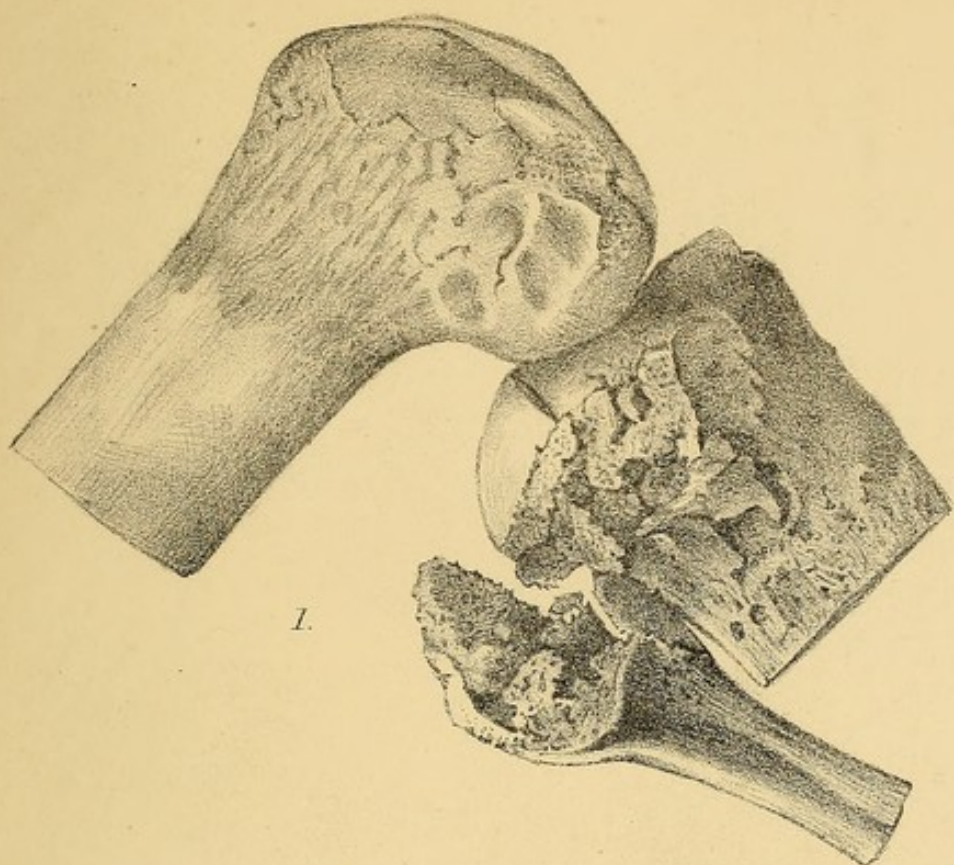
PLATE VI.

1 and 2 represent anterior and posterior views of the femur of Lieut. P., wounded at Ulundi, in the Zulu War.

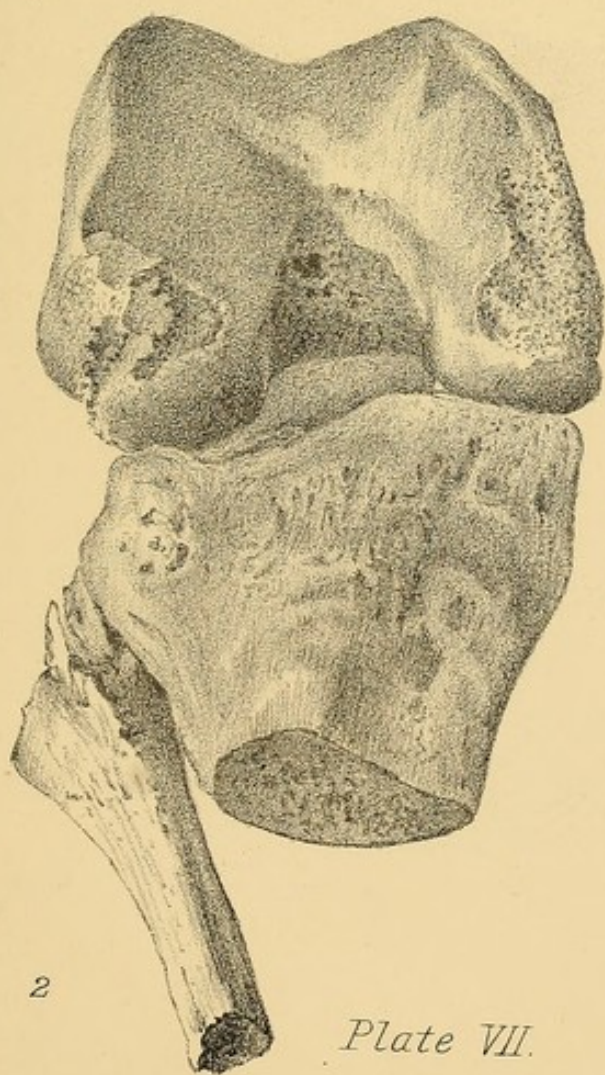
3 shows the condition of the humerus found in the case of Private C., 58th Regiment. The projectile had not touched it, but the subsequent inflammatory processes had caused its death.

PLATE VII.

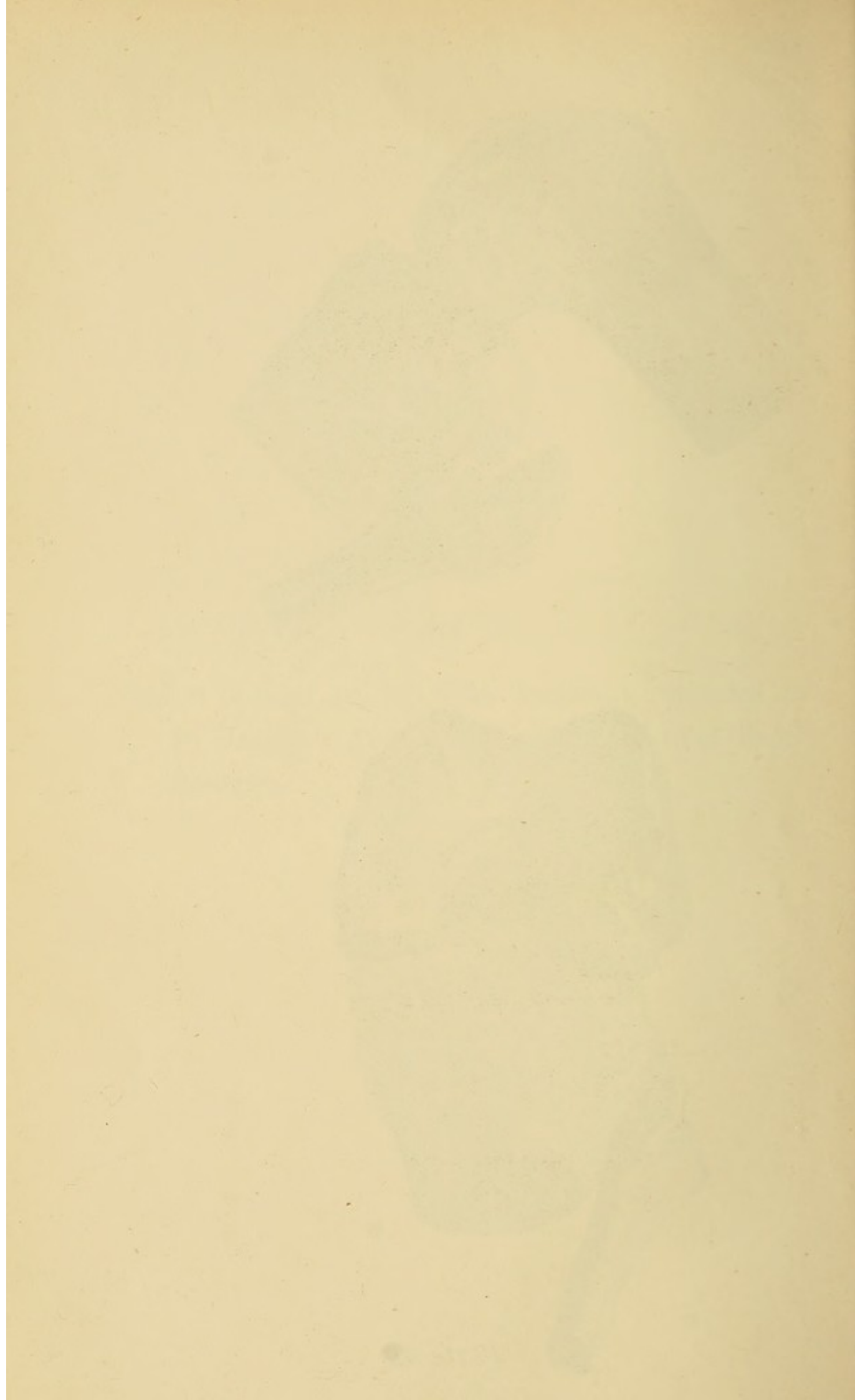
Case of Private B., 3rd 60th Regiment, wounded at
the Ingogo. Amputation at lower third of thigh.
Recovery.

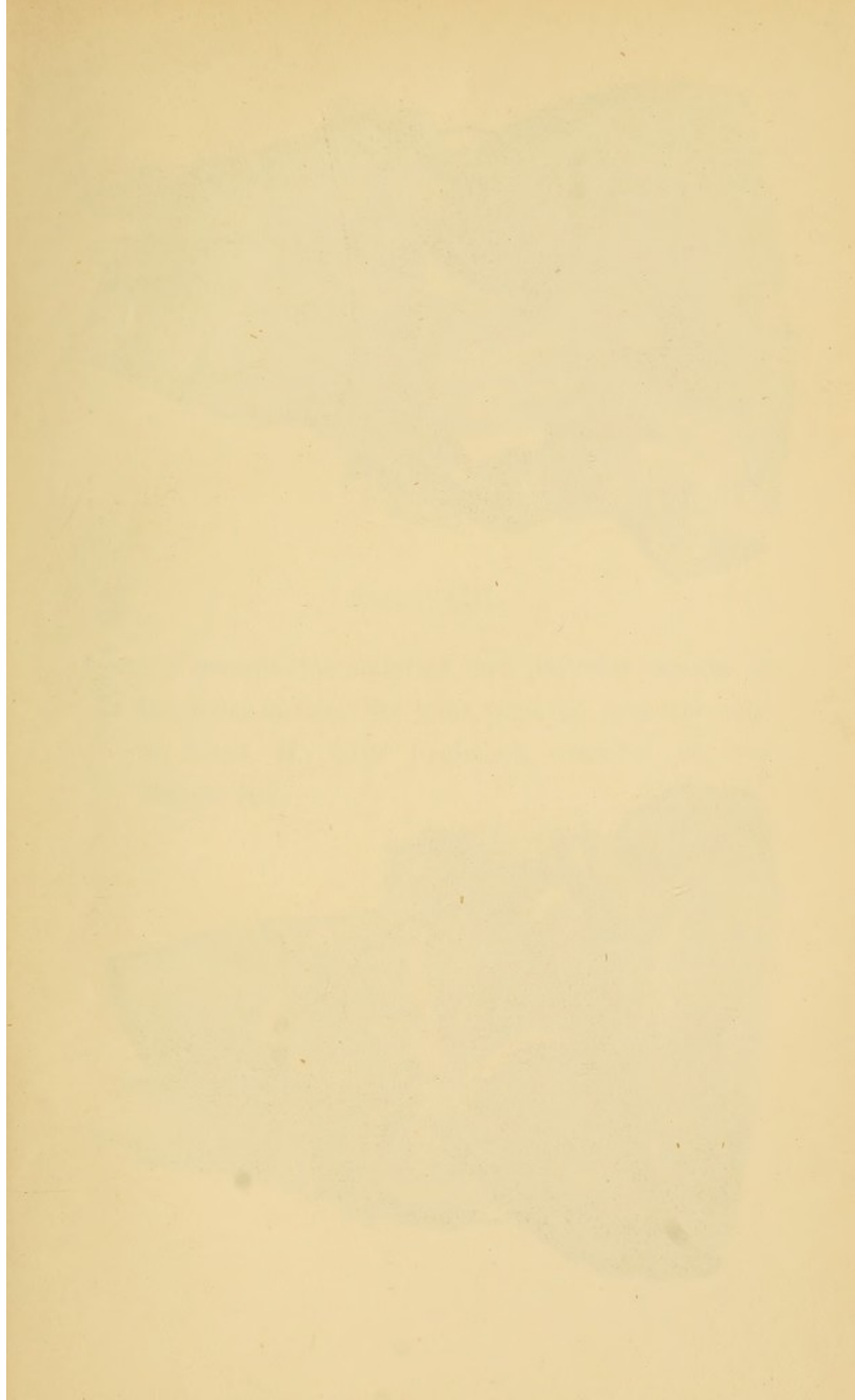


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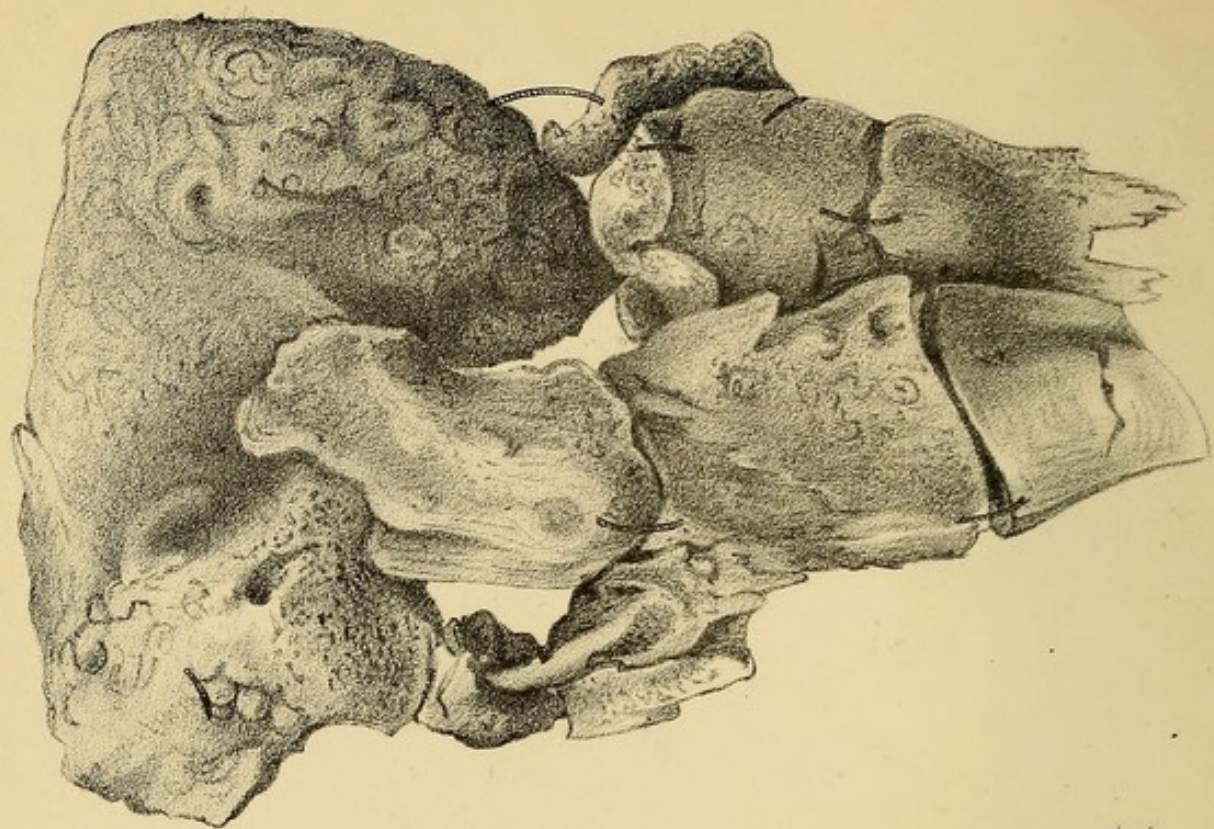


Plate VIII.

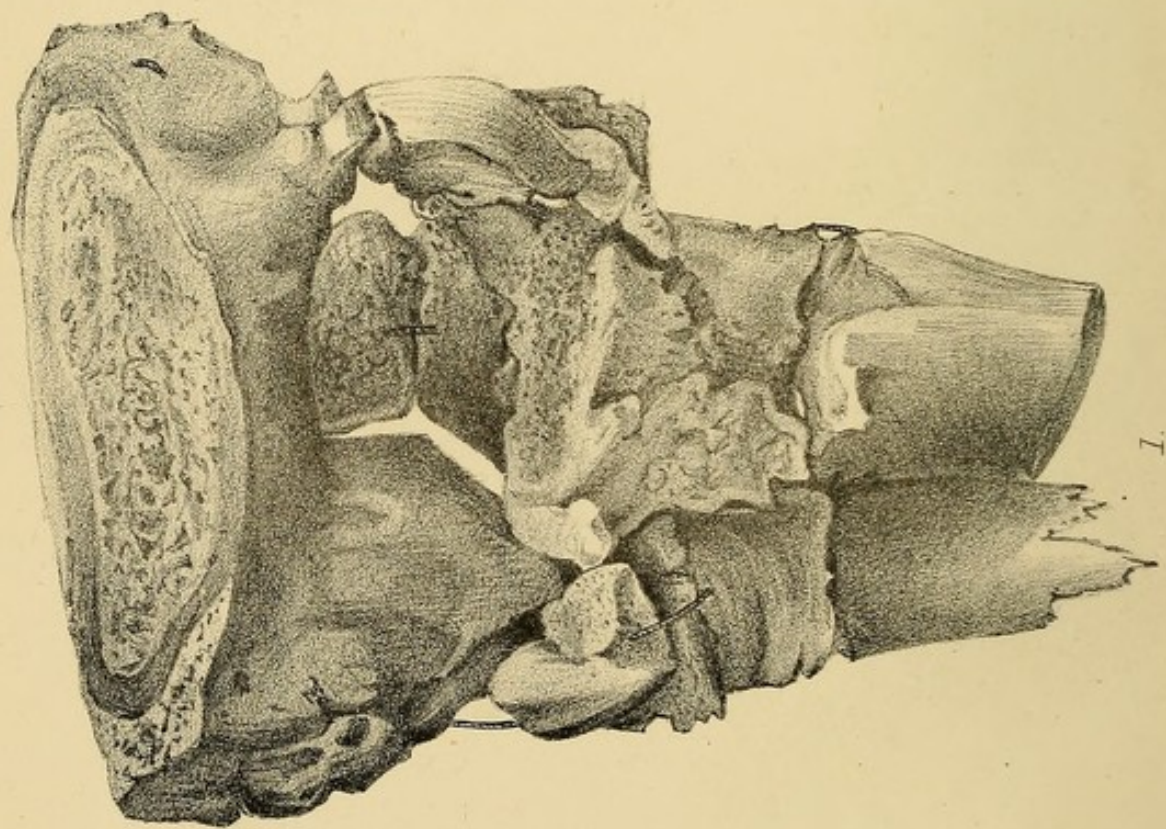


PLATE VIII.

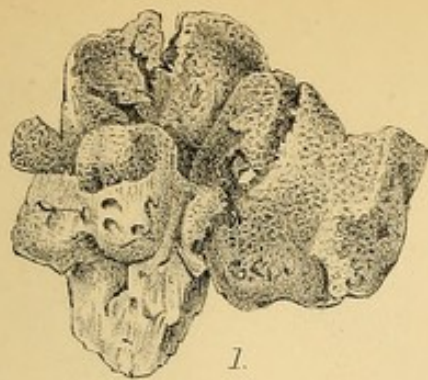
1 and 2 present the anterior and posterior aspects of the bones forming the joint removed from the arm of Lieut. H., 58th Regiment, wounded on the Majuba Hill.

PLATE IX.

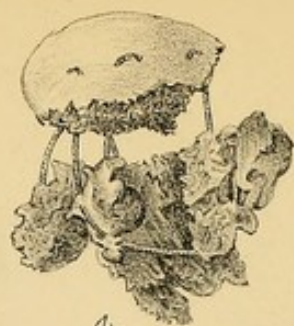
1, 2, and 3 show portions of the ulna and radius removed, along with the rest of the carpus and joint, in the case of Captain H., 92nd Highlanders. The whole of the bones were not preserved.

4 and 5 represent the fragments of the head of the humerus found in the glenoid cavity at the time of operation in the case of Private S., 94th Regiment.

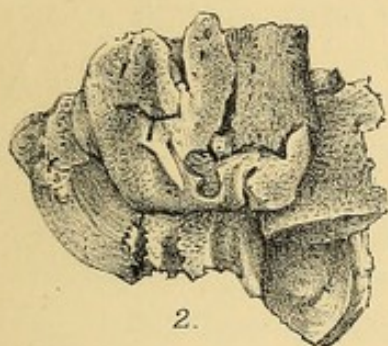
6 shows the bones of the foot of Private W., 58th Regiment, removed by amputation.



1.



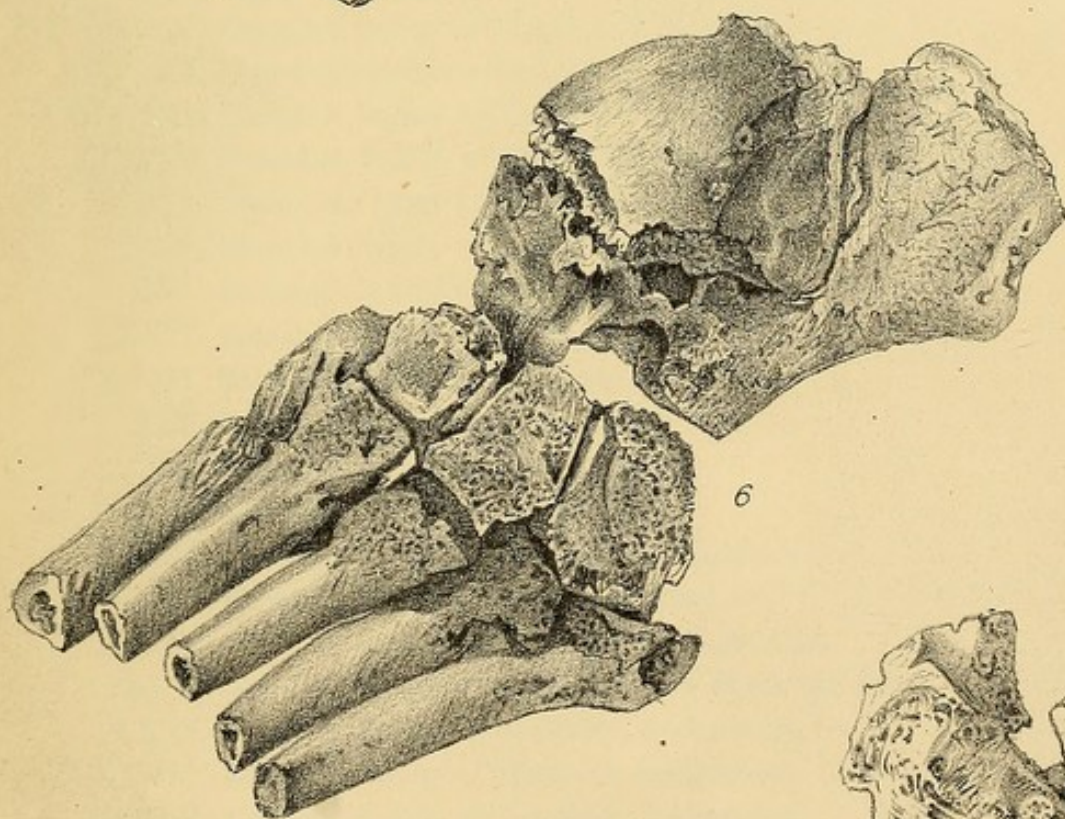
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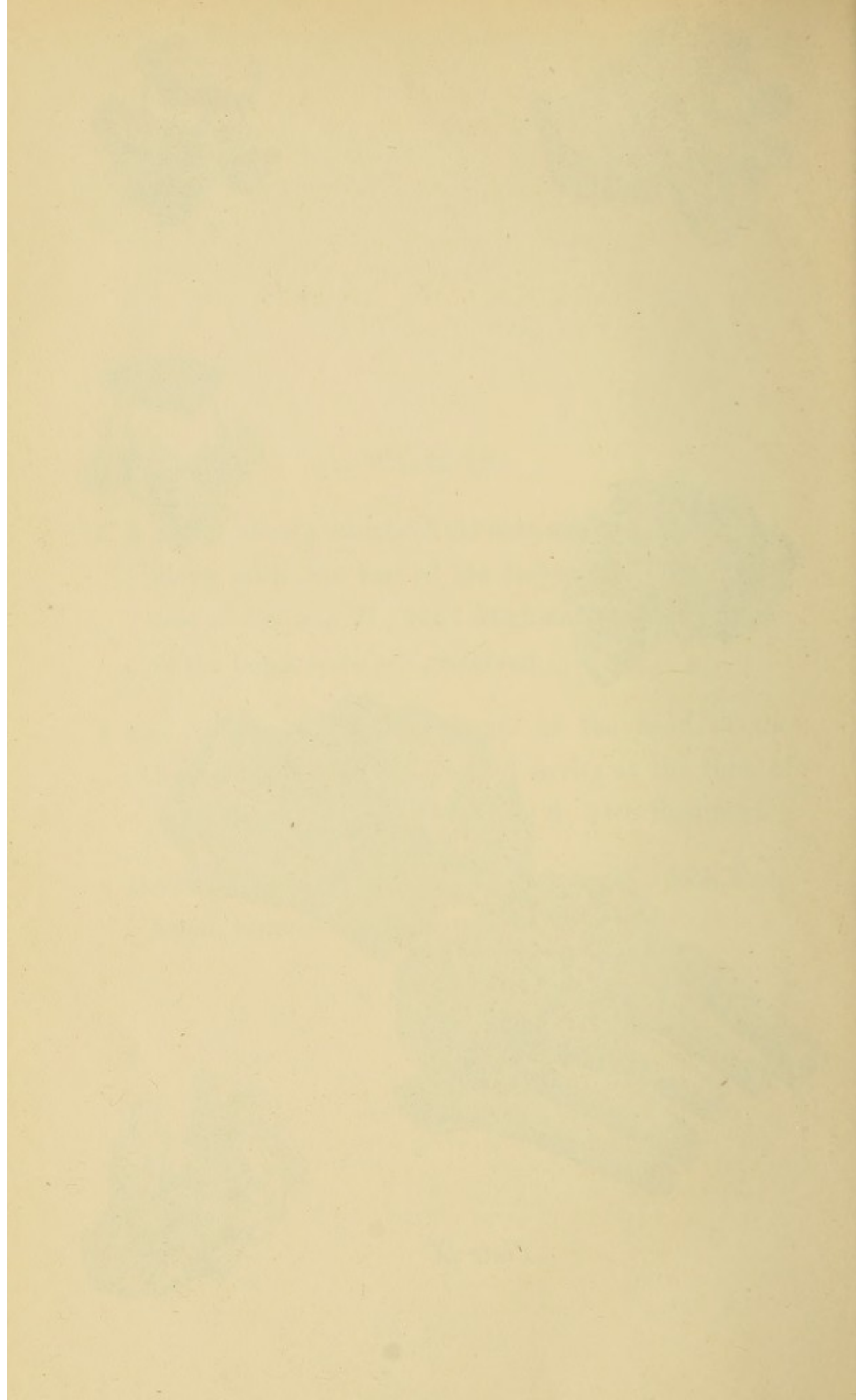


6.



3.

Plate IX



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