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Report of the Edinburgh
and East of Scotland
South African Hospital





Presented.

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R E P O R T

OF

The Edinburgh and East of Scotland
South African Hospital



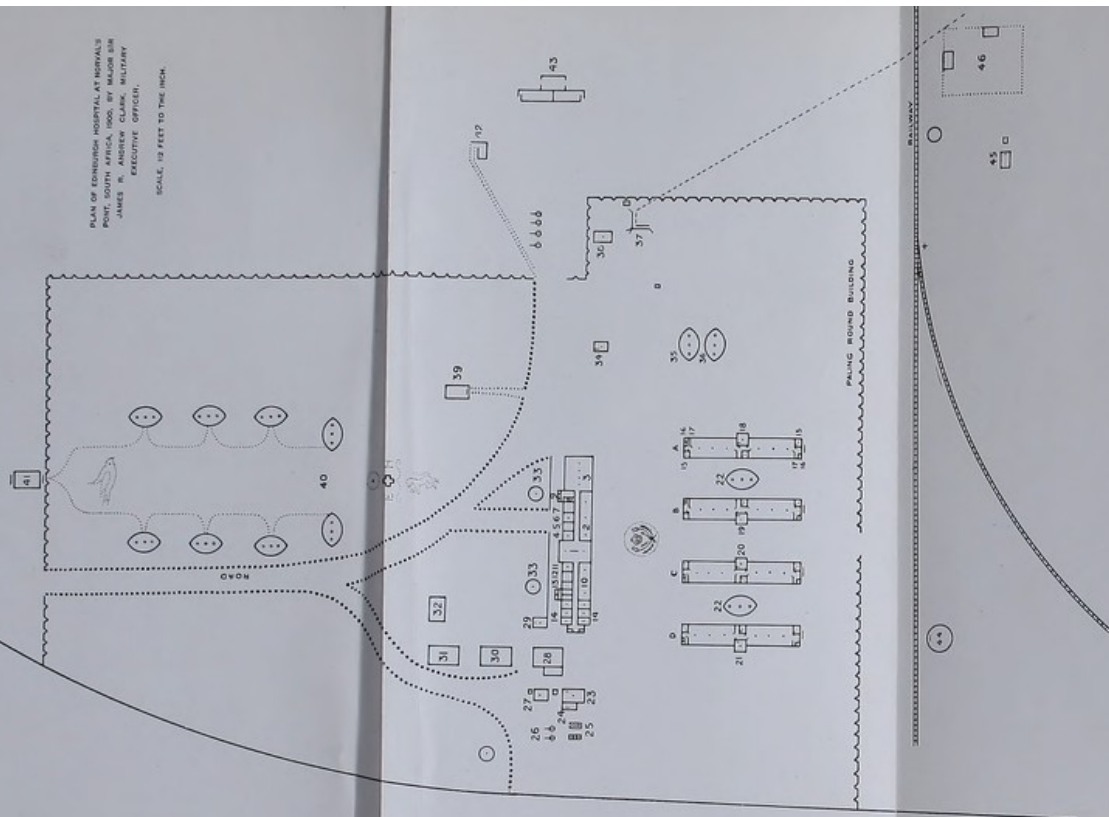
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PLAN OF EDINBURGH HOSPITAL AT MORVAL'S
PORT, SOUTH AFRICA, 1900, BY MAJOR SIR
JAMES R. ANDREW CLARK, MILITARY
EXECUTIVE OFFICER.

SCALE, 1/2 INCH TO THE INCH.



DESCRIPTION OF PLAN

- | | |
|---------------------------------------|---------------------|
| 1. Mess Room. | 31. Linen Store. |
| 2. N.C.O. Barrack Room. | 32. Medicine Store. |
| 3. Officer's Barrack Room. | 33. Store Tent. |
| 4. Military Executive Officers' Room. | 34. Surgery. |
| 5. Office. | 35. Bath Tent. |
| 6. Quartermaster Sergeant's Room. | 36. Bath Tent. |
| 7. Quartermaster Sergeant's Room. | 37. Bath Tent. |
| 8. Quartermaster Sergeant's Room. | 38. Engine House. |
| 9. C. C. Dormitory. | 39. Munitions. |
| 10. Sisters' Dormitory. | 40. Mortuary. |
| 11. Pantry. | 41. Lint. |
| 12. Servant's Room. | 42. Lint. |
| 13. Nurse's Room. | 43. Lint. |
| 14. Medical Officers. | 44. Lint. |
| | 45. Lint. |
| | 46. Lint. |

REPORT

OF THE WORK OF

The Edinburgh and East of Scotland South African Hospital

EDITED BY

DAVID WALLACE, AND FRANCIS D. BOYD,
C.M.G., F.R.C.S. Ed. M.D., F.R.C.P. Ed.



EDINBURGH
OLIVER AND BOYD

1901

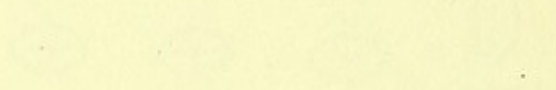
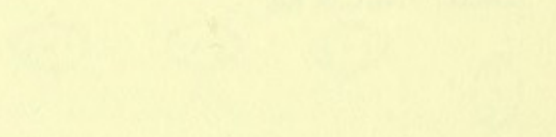
REPORT

ON THE

The Edinburgh and East of Scotland
South African Hospital

BY

DAVID WALLACE, M.D., FRASER D. ROYD,
M.D., F.R.C.S.



EDINBURGH
OLIVER AND BOYD

1901

P R E F A C E

THIS Report to the Committee of the Edinburgh and East of Scotland South African Hospital is presented in the hope that a record of the work may be of some medical interest, and may be available at a future date if a similar hospital should at any time be required. Civil Hospitals working along with the Military Medical Service formed a special feature of the South African War, and it is by a record of the work of these Civil Hospitals, of their difficulties and the way in which those difficulties were met, that guidance may be got for the future.

Considerable difficulties were met in the early history of the hospital. The huts, when once erected, were very well adapted for the treatment of sick and wounded, but the amount of labour and time necessarily expended in their erection was far greater than had been anticipated. Each plank had to be nailed, much of the wood and iron had to be cut to the necessary length, and, once erected, any idea of moving the huts was obviously out of the question.

It is impossible to speak too highly of the able assistance rendered to the hospital by Captain Dumaresq, R.E., and the company of engineers under his command. The engineers being skilled workmen, and working as they did with enthusiasm, rendered help in the building of the huts which cannot be over estimated. At a critical time, when through the illness of the electrical engineer the electric light installation must have necessarily come to a standstill, Captain Dumaresq undertook the work and carried it through with marked ability. The engine was erected under his direction, and the wiring of the hospital carried out under his instructions by the men under his command. Major Burn-Murdoch, R.E., and the 47th Company of Royal Engineers

rendered valuable services in the building operations and in boring so successfully for water. The water supply provided in this way proved of the greatest value to the hospital.

Thanks are also due to the officers and men of the 3rd South Lanarkshire Regiment for much assistance.

Sickness and disease form a sad record in the South African campaign and dealt heavily with those in attendance on the sick. While the sisters of the Edinburgh Hospital were working with No. 6 General Hospital at Naauppoort, Sister Mary S. Boyd was struck down with acute dysentery, and died on 15th May, after a short illness. Though but three weeks on active duty at Naauppoort, her work had been much appreciated, and she had been recognised as an able and devoted nurse, and universal grief and sympathy were shown when she fell a victim in the discharge of duty. On 16th September, Orderly William Dick died of enteric fever. As an orderly his work had always been well and cheerfully done, as a comrade he had gained the respect and affection of all.

In June one of the dressers, Dr W. M'Farlane, was promoted to the position of assistant-surgeon, and other blanks caused by sickness and death were filled from home, the Committee sending out in the end of August an assistant-physician, Dr Pratt Yule, M.R.C.P. Ed., and two additional sisters, Sisters Kemp and Miller.

The Staff wish to place on record how much they appreciated the able services rendered to the hospital by Sir James R. Andrew Clark, Bart., the Military Executive Officer. Much of the success of the hospital was due to his tact and administrative capacity, and it is a pleasure to the Staff to take this opportunity of recording their appreciation of his services.

THE EDITORS.

CONTENTS

CHAP.	PAGE
I. ORGANISATION AND ADMINISTRATION	1
II. REPORT OF SURGICAL CASES	19
III. RÖNTGEN RAY WORK	91
IV. REPORT OF MEDICAL CASES	97
APPENDIX I.—PERSONNEL	175
„ II.—THE SANITATION OF THE HOSPITAL	177
„ III.—STATISTICAL TABLES	179
„ IV.—RÖNTGEN RAY WORK—NOTES OF CASES	188

ILLUSTRATIONS

PLAN OF THE EDINBURGH SOUTH AFRICAN HOSPITAL	<i>Frontispiece</i>
THE EDINBURGH SOUTH AFRICAN HOSPITAL	<i>To face page 1</i>
THE FIRST MORNING AT NORVAL'S PONT—UNLOADING TRUCKS	3
LAYING FLOOR OF BLOCK—ERECTION OF WARDS	4
ENGINE FOR ELECTRIC LIGHT INSTALLATION	6
EDINBURGH HOSPITAL FROM SOUTH-WEST	7
HOSPITAL HUTS	8
INTERIOR OF WARD	9
STOREHOUSES—ORIGINAL COOK-HOUSE	10
COOK-HOUSE	11
DISINFECTING TANK AND HOUSE—BORING FOR WATER	12
FILTERS—SODA-WATER MACHINE	13
ORIGINAL LAUNDRY—LAUNDRY	14
GENERAL STORE—PACK STORE	16
MELANOTIC SARCOMA OF EYEBALL. Section showing Tumour and Fibrinous Exudation	21
VARICOSE VEINS. Large Dilatation of Vein at Saphenous opening	27
MASTOID ABSCESS	28
PHOTOGRAPH OF VARIOUS PROJECTILES	34
POM-POM SHELL, slightly reduced	35
CASE III.—CONDITION ON ADMISSION	36
" —CONDITION AFTER FIRST OPERATION	37
" —PRESENT CONDITION	38
CASE I.—COMMUNUTED FRACTURE OF RADIUS, caused by a piece of Shrapnel	39
CASE III.—FRACTURE OF HUMERUS. Shrapnel Bullet under Deltoid	41
CASE V.—SHRAPNEL BULLET SITUATED IN INNER SIDE OF THIGH	44
CASE VII.—PORTIONS OF SHRAPNEL BULLET IN NEIGHBOUR- HOOD OF WRIST	54

CASE IX.—LOCALISATION OF MAUSER BULLET BY DOUBLE PHOTOGRAPH. Bullet situated to right of Spine in Lumbar Region	To face page 63
CASE V.—FRACTURE OF METACARPALS DUE TO A MAUSER BULLET	65
CASE XI.—COMMUNUTED FRACTURE OF TIBIA AND FIBULA. The Bullet (distorted Mauser) which caused injury, to right of Photograph	76
CASE XVI.—ANTERO-POSTERIOR PHOTOGRAPH. Mauser Bullet in Head of Fibula	79
„ —LATERAL VIEW	79
CASE XVII.—ANTERO-POSTERIOR PHOTOGRAPH OF KNEE JOINT. Lee-Metford Bullet <i>in situ</i>	80
CASE OF PNEUMONIA, WITH GANGRENE OF FEET	167

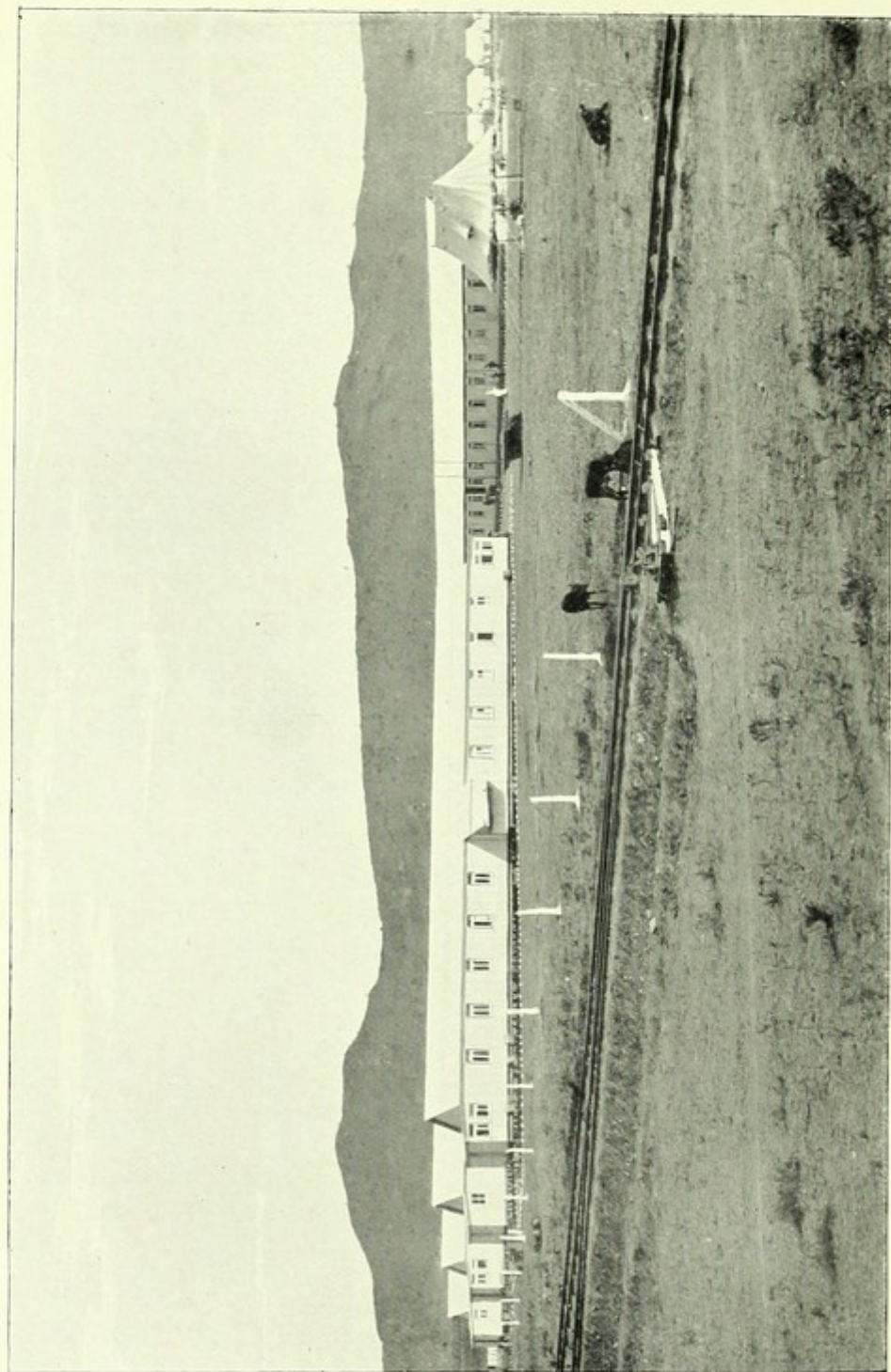
DIAGRAMS

CASE V.	45
CASE V.	48
CASE VI.	49
CASE VI.	53
CASE VII.—WOUND OF ENTRANCE AND EXIT	54
CASE VIII.—WOUND OF ENTRANCE AND EXIT	55
CASE V.	60
CASE VII.	62

TEMPERATURE CHARTS

CASE I.—ENTERIC FEVER. NOT INOCULATED	114
CASE II.—ENTERIC FEVER. NOT INOCULATED	115
CASE III.—ENTERIC FEVER. NOT INOCULATED	115
CASE IV.—ENTERIC FEVER. NOT INOCULATED	116
CASE V.—ENTERIC FEVER. NOT INOCULATED	116
CASE VI.—ENTERIC FEVER. NOT INOCULATED	117
CASE VII.—ENTERIC FEVER. NOT INOCULATED	117
CASE VIII.—ENTERIC FEVER. NOT INOCULATED	118
CASE IX.—ENTERIC FEVER. NOT INOCULATED	118
CASE X.—ENTERIC FEVER. INOCULATED	„

ORGANISATION AND ADMINISTRATION
OF THE HOSPITAL



THE EDINBURGH SOUTH AFRICAN HOSPITAL.

[To face page 1.

EDINBURGH SOUTH AFRICAN HOSPITAL REPORT

CHAPTER I

ORGANISATION AND ADMINISTRATION

THE personnel of the Edinburgh and East of Scotland Hospital embarked at Southampton on the Union Castle S.S. *Briton* on Saturday, 24th March 1900. The hospital material and equipment with stores and medical comforts were also carried by the *Briton*, which sailed on the afternoon of that day. The personnel consisted of six medical officers, and Sir James Clark, Bart., the Military Executive Officer, appointed by the War Office; six sisters and a matron from the Army Nursing Reserve Service; seven dressers and thirty-nine men, together with two women, a laundress and sisters' maid—sixty-two members in all (*v.* Appendix I).

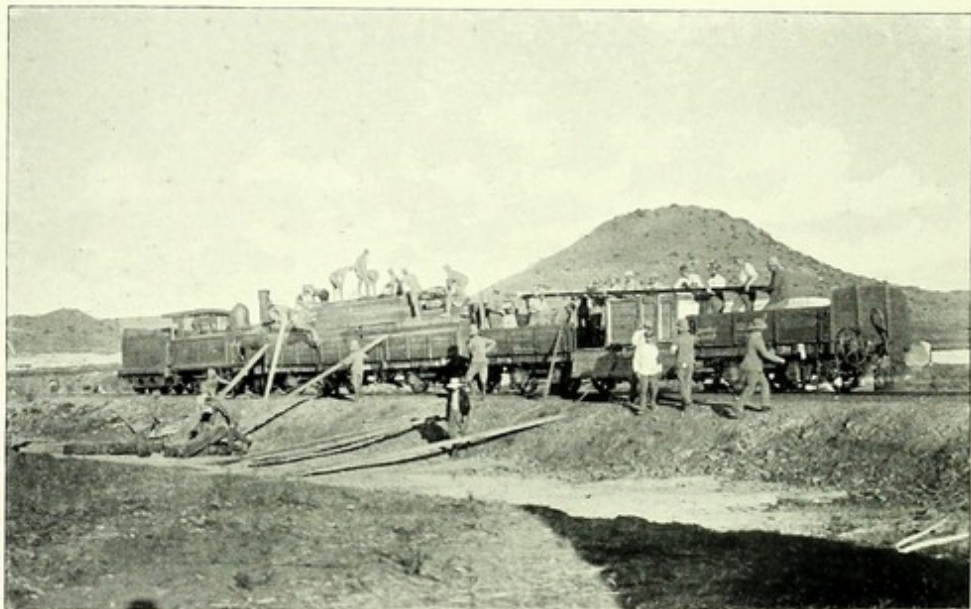
Two of the dressers were graduates and the others medical students of Edinburgh University. Through the courtesy of the commanding officer of the Ed. Co. V.M.S. corps, the instructor of that corps (Staff-Sergeant Lloyd) went as quartermaster-sergeant. Fifteen non-commissioned officers and men from the Ed. Co. V.M.S.C., who enlisted for a year in the R.A.M.C., were taken as first-class orderlies. The other men had St Andrew's Ambulance

certificates, and thirteen acted as second-class orderlies. They were chosen from a large number of applicants, and were skilled artisans, joiners, and engineers, men who were able to assist in the erection of the huts of which the hospital consisted. Two dispensers, a builder, an electrical engineer, three cooks, and three servants, completed the personnel.

Cape Town was reached on the morning of 10th April, and immediately on arrival Sir James Clark and the senior medical officer went to the castle to obtain an interview with Surgeon-General Wilson, P.M.O., South Africa. The surgeon-general was absent, but Major Bedford, R.A.M.C., gave the necessary instructions—that the personnel was to disembark and go into camp at Green Point; the hospital material and equipment, stores, etc., to be unloaded, and at as early a period as possible would be sent to Norval's Pont, where in the first instance the hospital was to be placed. As at first there could be no proper accommodation for the sisters, the surgeon-general desired that they should join No. 6 General Hospital at Naauwpoort, but whenever the Edinburgh Hospital was able to receive them they would be sent to do duty with it. This arrangement for the sisters was carried out and they left Cape Town by the mail train on the evening of 11th April, and worked at Naauwpoort until the 17th May, at which date they were sent on to Norval's Pont. Major Bedford was unable to say how soon the personnel and hospital could be forwarded from Cape Town as the railway was much congested, and all the rolling stock required for troops, remounts, and supplies, and it was therefore suggested to him that the hospital might get up quicker from Port Elizabeth, at which port the *Briton*



THE FIRST MORNING AT NORVAL'S PONT.



UNLOADING TRUCKS.

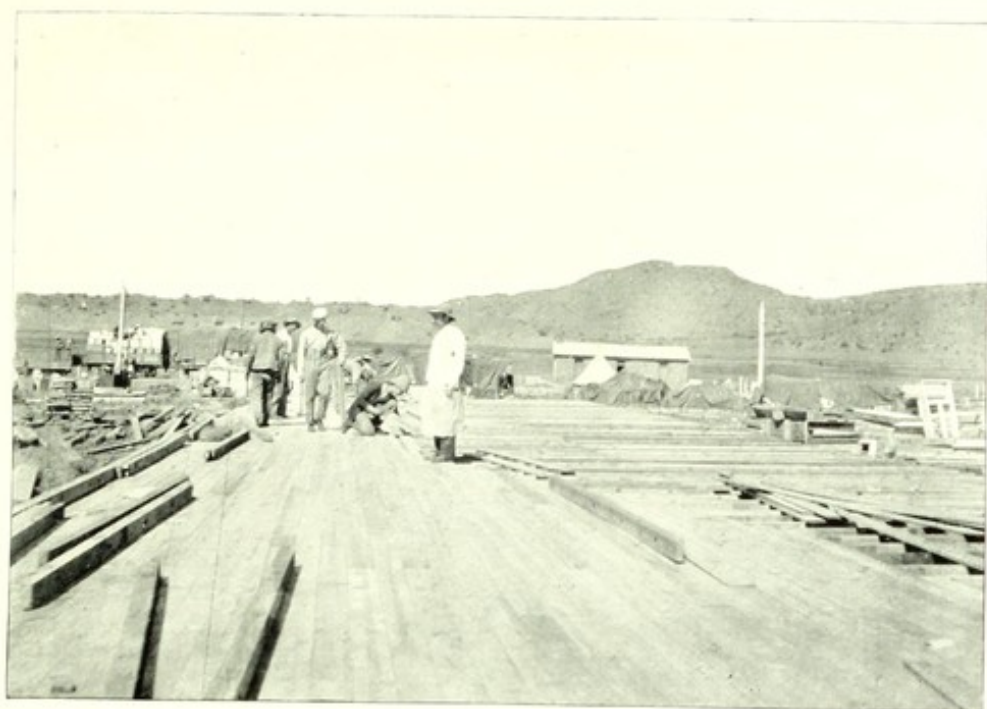
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would call; and that instead of disembarking the personnel, and unloading the hospital material at Cape Town, they should be allowed to remain on board to go north by sea. To this he offered no objection, but pointed out that permission to adopt this course had to be obtained from the transport authorities. The chief of that department was accordingly seen, and sanction to remain on board was at once given. The *Briton* left Cape Town on the 14th of April and reached Port Elizabeth on the 15th. On arrival the hospital equipment was unloaded into lighters, and from them transferred into trucks on the quay. This occupied two days, during which time the personnel remained on board. Late on the afternoon of the 18th the men disembarked, and one night was spent at Port Elizabeth in tents at the Military Hospital.

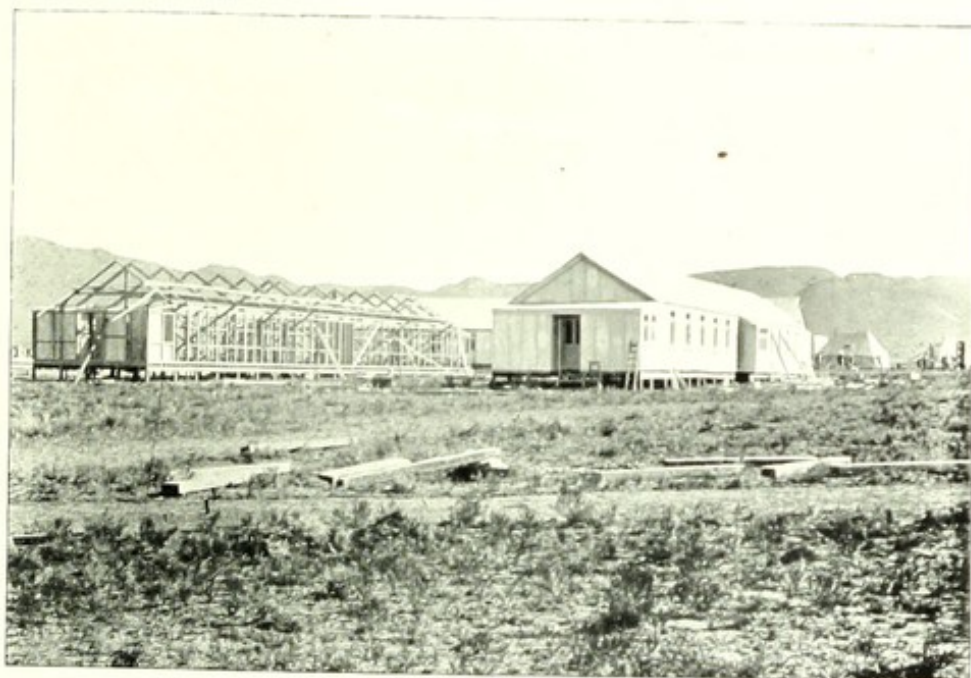
Arrangements had in the meantime been made with the R.S.O. that the personnel and material should go up-country by special train at 2 P.M. next day. When, however, the station was reached, it was found that the personnel were to go by one train and the material by another. The explanation of this was the large quantity of material, and the order of the Chief of the Staff, Lord Kitchener, that only supplies were to be sent up-country. After a thirty-six hours' journey, Norval's Pont was reached at 2 A.M. on 21st April, and the men detrained. The morning was dark, but dry, and not very cold. The hospital was expected by the authorities, but no special arrangements for the men had been possible, as no tents were available, and it was necessary, therefore, to do as the troops generally did—lie on the ground without blankets or mackintosh sheets. Next day it was seen that the suggested site for the hospital was

wholly unsuitable for the purpose. It had previously been used as a camping ground for troops, and in some parts for horses, and the soil was much polluted; further, latrines which had not been filled up were close to the suggested lines, and an open conduit with stagnant, polluted water was quite close. This was pointed out to the Commandant, who gave permission for a suitable site to be selected, and one was chosen on the west of the railway, some distance from the camp, and yet not too far from the railway station. It was a part of the veldt which had not been used as a camp, and the surface of which was covered by short scrub (Karoo scrub). The ground had a gentle slope towards the Orange River, which was two miles distant. A hard sandstone cropped out at places, but there was a few inches of soil covering it, as a rule. Tents were got, and blankets supplied by the Ordnance Department, none of the hospital material having arrived. In reply to a telegram sent to Port Elizabeth it was learned that the greater part had left that town, but was probably detained at Naauwpoort. From the R.S.O. at Naauwpoort the information was got that only by a special permit from the Chief of Staff could it be forwarded from that place. A request was therefore sent to Lord Kitchener for permission to have it sent on, and an order for it to be sent up was immediately given.

On 24th April the first trucks arrived, and unloading was at once begun, the hospital personnel being assisted in this work by a fatigue party of a hundred men from the South Lancashire Militia. The ground had previously been laid out from the plans of the hospital (*v.* plan), and as the material which had arrived was mainly that of the administration block, that part of the building was in the first place



LAYING FLOOR OF BLOCK.



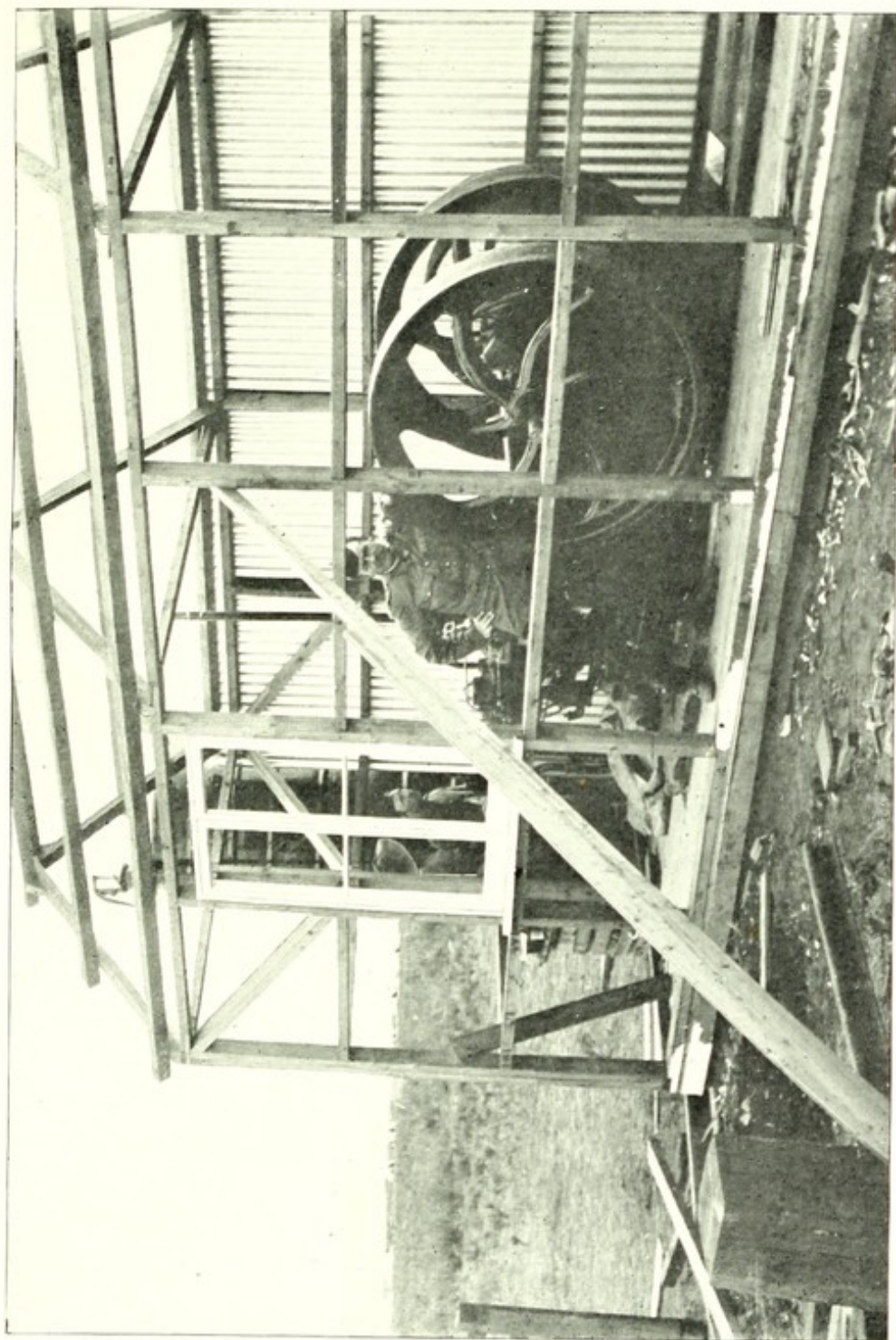
ERECTION OF WARDS.

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begun. To avoid carrying the material further than absolutely necessary, the trucks were unloaded on the embankment opposite the hospital ground, but as the railway consisted of a single line the trucks had to be unloaded at certain hours between the passing of trains up and down the line. This delayed the unloading, and as the material of the hospital was not assorted in the trucks, and these only came at intervals of some days, considerable difficulty was experienced in getting the special parts required at a given time, necessary parts not being present. The fatigue party was directed to assort the material as far as possible, and place the portions at convenient places, and in this way the work, on the whole, was expeditiously carried out. All men able to do joiner work were put on the actual building under the supervision of the builder. Later some of the necessary lengths of wood-work were discovered to be absent. The flooring had not been squared and this necessitated much sawing of wood. The tools were limited in number, and all the men capable of doing good work could not be utilised. Fortunately, however, a detachment of Royal Engineers under Captain Dumaresq was at this time stationed at Norval's Pont; these men were skilled workmen, and eleven of them were detailed to assist in the erection of the building, and proved of the greatest assistance. They had their own tools and did not diminish our meagre supply. Hammers and saws were got later from a store at the station and from Cape Town, and before long every one able to use them was hard at work nine hours a day, seven days a week. By 13th May the administration block was completed, and on that date the personnel went into it. It consisted of a barrack-room for thirty-four men, and two dormitories—one for fifteen men,

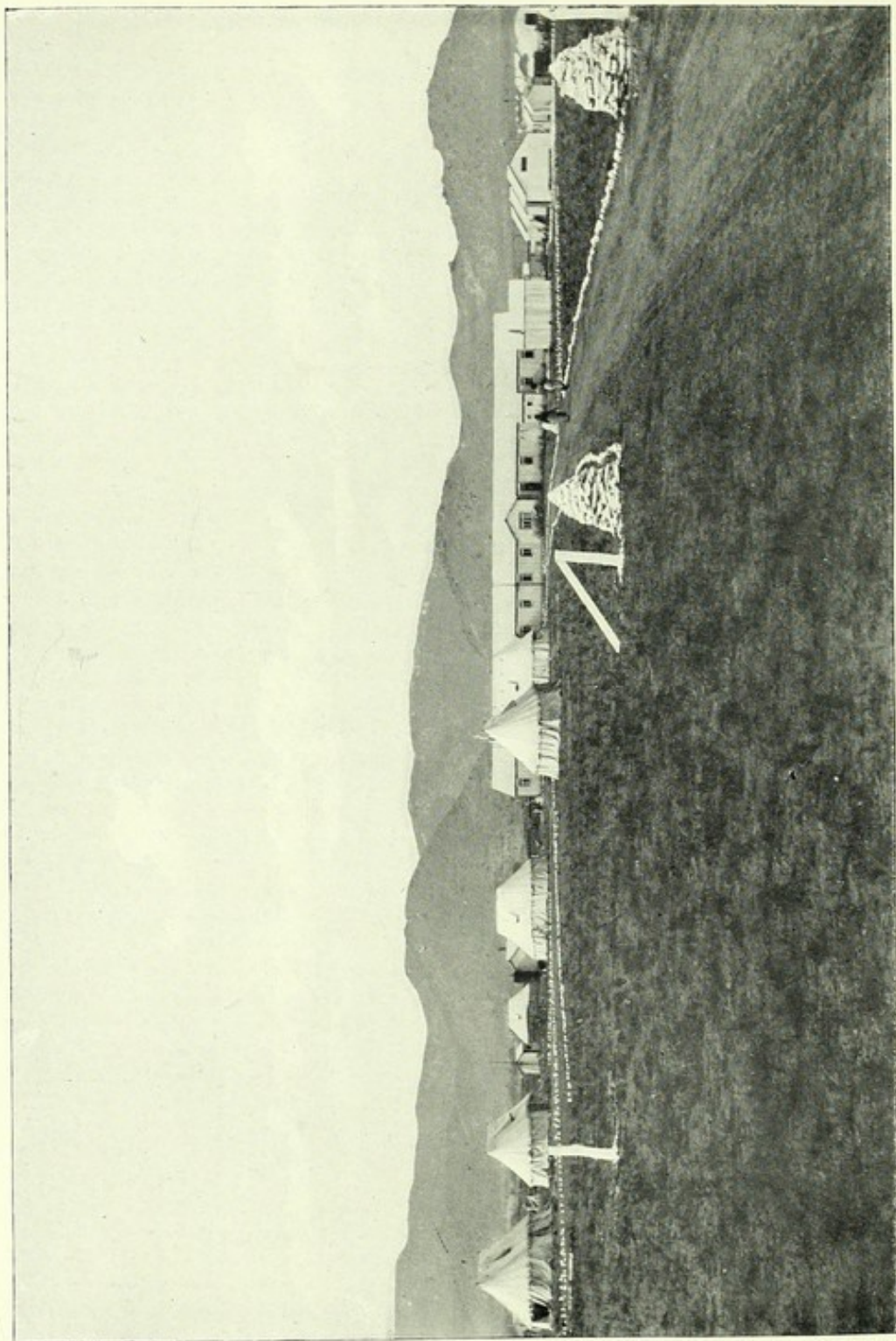
and one for six sisters. The dressers and senior non-commissioned officers and dispensers occupied the larger dormitory. There were separate rooms for the members of the staff, matron, quartermaster-sergeant, and a messroom (*v. plan*). Two wards were also at this date almost finished, and one of these was completed and equipped by 16th May. On 3rd May thirteen men from the Railway Pioneer Regiment, which was at this time rebuilding the bridge at Norval's Pont which had been blown up by the Boers in February, were sent over to assist in the erection of the hospital, and the work very rapidly advanced, so that by the end of May, in addition to the administration block and two wards having been completed, three store sheds and the engine house had been erected; and at this date also the electric light installation was in use in the administration block and one ward.

In the last week of April, half of Field Hospital No. 4 was stationed at Norval's Pont, and in it the sick of the camp were treated, while the R.P.R.'s and South Lancashires had each their regimental surgeon. On the arrival of the Edinburgh Hospital it was requested by the authorities that it should undertake the work of the field hospital, as the latter was urgently required at Bloemfontein, but as there were no stores or equipment, not even tents, this request could not be assented to. On 1st May ten marquees came from East London, and it was again urged that work should be begun at once. Without any of the necessary stores or medicines this was impossible, and further, to have opened the hospital for the treatment of in-patients would have taken away the men erecting the huts; it was therefore again pointed out that the regular hospital work could not be begun. An arrangement was, however, made



ENGINE FOR ELECTRIC LIGHT INSTALLATION.

[To face page 6.



EDINBURGH HOSPITAL. (FROM SOUTH-WEST).

[To face page 7.]

whereby the sick of the camp were treated, and those cases requiring indoor treatment sent down to Naauwpoort by the mail train daily. A detention marquee and dispensary were equipped, and another marquee with seven beds arranged for those patients who were too ill to travel or who came in at night. By the 14th of May, 390 sick had been treated, and at that date a telegram was sent to the P.M.O. at Bloemfontein, stating that 50 beds were vacant. This telegram was repeated daily until 21st May, when 65 beds were reported vacant. It was, however, only on 27th May that a telegram was received asking if 96 patients could be admitted. Being extremely anxious to begin regular work an affirmative reply was sent. The extra beds and equipment were got ready in time, and on the arrival of the hospital train with its complement of 96 patients, every necessary was ready for their admission and treatment.

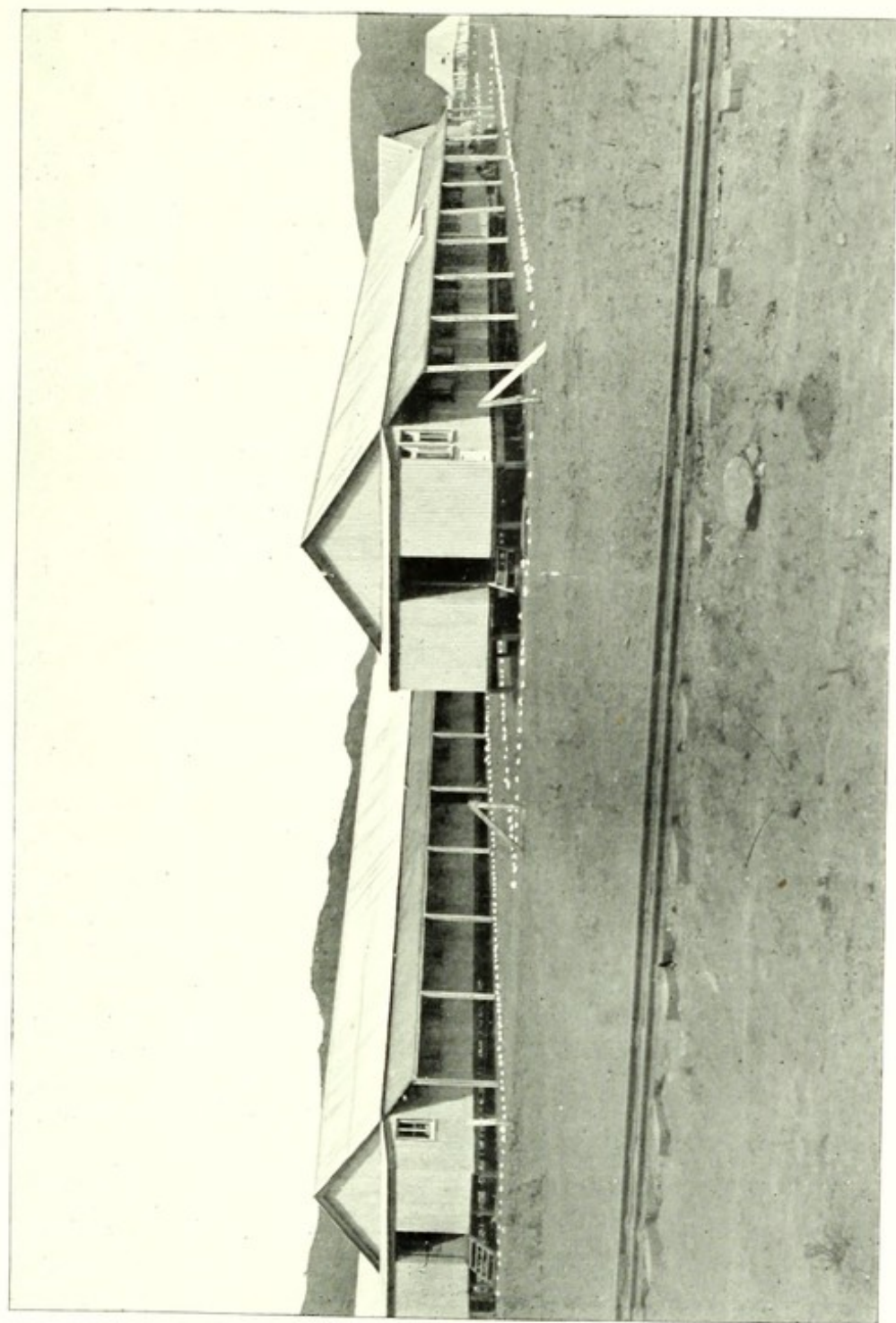
These dates and figures are important, as it has been stated that the Edinburgh Hospital was slow in opening, and the date mentioned is given as 29th May, by which date 830 patients had been treated as out-patients; and for fourteen days it had been reported to the P.M.O. at Bloemfontein that there were fifty or more vacant beds.

On the evening of 29th May the first train of sick arrived, containing 16 officers and 75 men. Of those cases 2 were surgical cases in a convalescent state; 61 were enterics who were very seriously ill. They had spent two days in bullock waggons before reaching the hospital train, and several were not expected to survive the night. The enterics were all treated in the marquees which had been equipped with beds and other necessities. The detraining

of the patients was carried out expeditiously, for a special siding had been built to the hospital, which enabled the ambulance train to come close to the hospital huts.

A few of the patients in the train were in a more or less convalescent state, and as some who had not enteric fever had more or less mild ailments, it was possible to transfer a number to the base, early in June. The number of vacant beds was daily telegraphed to the P.M.O., Bloemfontein. No patients arrived, however, and the number of beds gradually increased. It was heard unofficially that it was exceedingly improbable that the military authorities would send a smaller convoy than 93 to 96 patients, that being the complement of a hospital train. It became apparent, therefore, that to work a 100-bed hospital, taking in 93 to 96 patients at a time, was impossible. Application was accordingly made to the authorities for another 50 beds with equipment. The extra beds arrived early in July, and the hospital then became a hospital of 150 beds. As the building of the huts progressed it was found impossible to complete the fourth block of building with the material on hand, as there was a considerable shortage, the material either having been lost in transit or never having been dispatched. The Military Executive Officer accordingly proceeded to Cape Town to procure the necessary material, and as this arrived the hospital huts were completed with the aid of civilian workmen, and the engineers. As the huts were completed, the marquees were gradually abandoned for hospital use; they were used as night orderlies' sleeping tents, storerooms, etc.

The hospital as completed consisted of an administration block, four hospital huts, two cook-houses, general store, pack



HOSPITAL HUTS.

(To face page 8.)



INTERIOR OF WARD.

[To face page 9.]

stores, linen store, medicine store, laboratory, engine house, and laundry.

Each hospital hut contained two wards, 51 ft. \times 19 ft., and a side room, 10 ft. \times 10 ft. (*v.* plan). The floor was of match boarding, the walls and roof of galvanised iron, lined with canvas, the wall green canvas, the roof white canvas. Between the iron and the canvas was a considerable air space which helped to regulate the temperature of the ward. The ward was lit at night by electric light. On the sunny aspect of each ward was a verandah, which was a great boon in moderating the temperature of the ward during the heat of the afternoon. In the centre of the hospital hut, between the two wards, was a side room, and small room used by the sister for keeping medicines, lotions, etc., and a side entrance to the hut. The side room of the hut was used in block A as an officers' private ward; in block B as a surgical theatre; in block C as an X-ray room; and in block D as an officers' private ward. At the end of each ward was an annex. The annex contained a pantry or small kitchen where the orderly kept mess utensils, crockery, etc. On the opposite side of the passage was a lavatory and an earth-closet.

The blocks were at first designed to hold 25 patients each, but it was found that there was a very considerable spare space with only 12 or 13 beds in each ward. Accordingly, when the hospital increased the number of beds was increased, the blocks having 37 to 38 patients in each. There was no over-crowding. There was sufficient space between the beds for bed-side tables, and for all nursing purposes. The ventilation was good, being carried on partly through the window, and partly by a system of

ventilation by the roof. During the cold weather the temperature in the wards fell considerably at night. It had been intended to heat the wards by means of paraffin stoves, but those had gone amissing. Coke stoves were got up from Cape Town, but were never used. The cold in the wards at night was not extreme, and did not appear to justify the use of such stoves in a ward where the building materials were of such an inflammable nature as very dry canvas and wood. The electric light in the wards was a great comfort, not only being a better light than could have been obtained from paraffin lamps, but also an additional protection against fire.

After the epidemic of enteric fever had diminished, the class of patient changed; the surgical and medical cases began about to equal each other, and a rearrangement had to be made. The blocks A and B were used as surgical blocks alone; block C for medical cases, as distinct from infectious cases; block D for enteric fever cases.

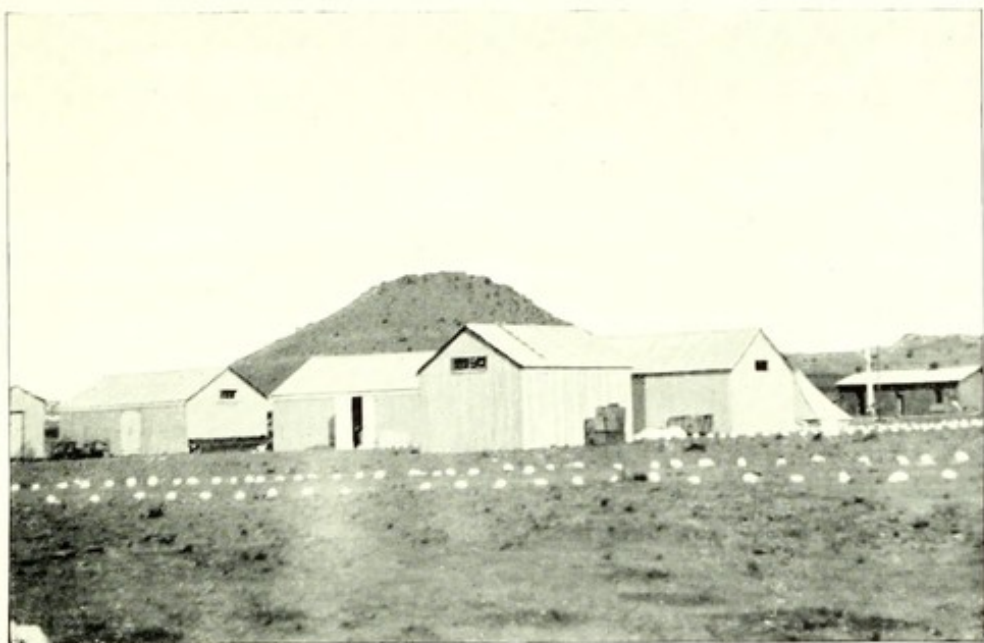
Surgical Theatre.—The operating-room was in block B. The floor and walls and roof were match boarded, the match boarding being varnished to allow efficient washing. There were electric light fittings suitable for night work.

The X-ray Room.—The side room, Ward D, was under the charge of Dr Miller.

The *Laboratory* was a small isolated building. In it all bacteriological and pathological work was done.

The *Mortuary* was at the upper end of the grounds, outside the hospital enclosure. It was built of galvanised iron, and had an entrance from the hospital grounds and an exit without the grounds.

Storehouses.—The storehouses consisted of general store,

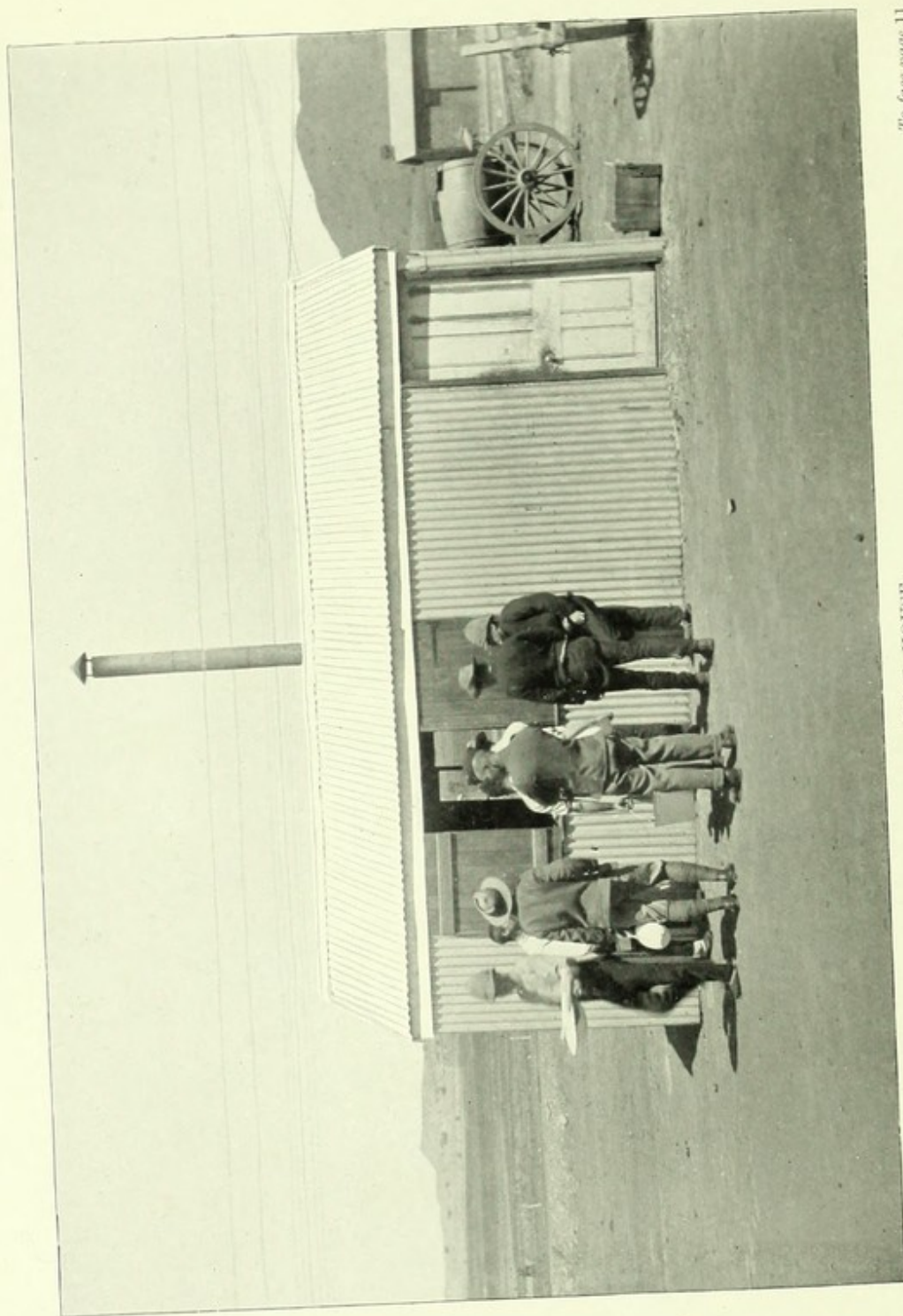


STOREHOUSES.



ORIGINAL COOK-HOUSE.

[To face page 10.



COOK - HOUSE.

To face page 11.

pack store, linen store, and a medicine store. They were built of galvanised iron, unlined. The general store contained such things as medical comforts, groceries, and new clothing to be served out to patients. The linen store and pack store were under the charge of Corporal Murray, R.A.M.C. The linen store contained the usual supply of necessary linen, etc. The pack store, as in all military hospitals, was used for the patients' kit and arms, which had to be kept in proper order and returned to them when they were discharged or transferred.

Cook Houses.—The cook houses were two in number; one under the charge of Head Cook Mitchell, with an assistant and a native boy; the other under the charge of Corp. Willis, R.A.M.C. In the first, the hospital diet and extras and the food of the staff was cooked. The cooking for the personnel, dressers, orderlies, etc., was undertaken in the second. The diet of the patients was ample and of good quality. Frozen meat was obtained from the Army Service Corps. A supply of fresh milk was arranged for. At times the milk supply was somewhat short, but only at times; it was then supplemented by sterilised or condensed milk. Eggs and vegetables could be obtained from the surrounding farmers, who were encouraged to bring their produce to the hospital; and latterly an agent was appointed in Colesberg who bought large quantities of eggs, butter, etc., at current market prices. Fresh fish, when obtainable, was sent up from Port Elizabeth on ice.

A *Dispensary* or *Surgery* was placed between the administration block and the laundry. It was thus at a convenient distance from the wards, and was easily worked by the two dispensers who were on duty alternately.

Water Supply.—When the personnel first arrived at Norval's Pont, water was a difficult question. Water-carts were, however, obtained, and good water got from a spring some two miles away. This, of course, entailed considerable labour. The carts were worked by native boys, but with every water-cart a white man had to go to see that the boys drew the water from the proper place. When the hospital was settled for some little time, boring operations were begun by the engineers, and an inexhaustible supply of water was got about a hundred feet below the surface. This was a great convenience, as, being about a quarter of a mile from the hospital grounds, the labour of carting the water was greatly diminished. The water used for drinking purposes was all filtered through Pasteur-Chamberland filters. The filters were fitted up in a large tank which was filled every morning. They worked automatically, and a pipe conducted the water through the wall of the soda-water house where it was made into aerated or soda water, and served out for the patients' use. In addition, each ward had a large vessel which was kept filled with filtered water for drinking purposes.

Disinfection of the Linen, etc.—The disinfection of the linen, etc., was carried out a considerable distance outside the hospital grounds. A tank was there fitted up (*v. plan*). All soiled or infected linen from enteric and dysenteric cases was disinfected. It was steeped for 24 hours in a solution of perchloride of mercury, 1 in 2000, or carbolic, 1 in 20. It then went to the laundry for washing. Mattresses and bedding which could not be subjected to disinfection in this way—soldiers' kits and other articles—were treated with formaldehyde vapour. A small house was built of galvanised iron. It

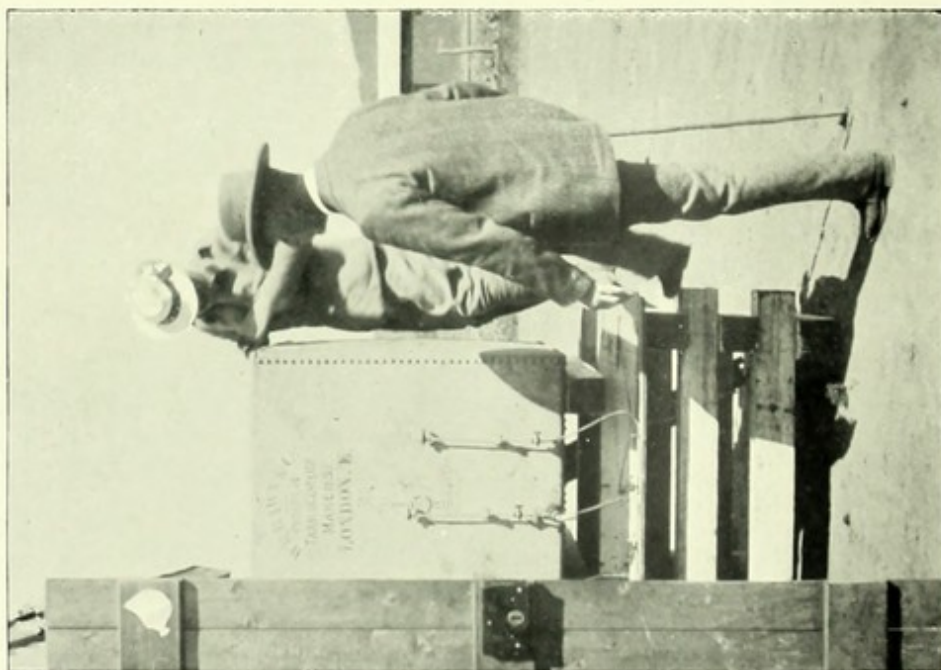


DISINFESTING TANK AND HOUSE.



BORING FOR WATER.

[To face page 12.]



FILTERS.



SODA-WATER MACHINE.

[To face page 13.]

was lined with canvas, and floored with canvas. On the canvas was pasted paper, and the whole was closely painted inside to render it entirely air-tight. Mattresses, etc., were placed in this chamber and formaldehyde vapour generated from formalin lamps. This disinfection was carefully checked by bacteriological observations. Linen was soiled with enteric stools; it was then exposed to the vapour of formaldehyde gas for twelve hours. Several cultivations were made, and in every case the tubes remained sterile. It was evident therefore that disinfection was efficient. The disinfecting house was found very useful for the disinfection of the kits and clothing of the patients, a very necessary proceeding in a country where lice are so prevalent.

Laundry.—The laundry was under the charge of the matron. A Scotch laundress and numerous native women were employed. The laundry was at first somewhat primitive, the native women washing on empty packing cases. This, however, was not satisfactory. Accordingly, a laundry was designed and built. Bricks and cement were commandeered, and a cemented floor was laid out and two cauldrons obtained and built into fixed fires with the bricks. The waste water was conducted from the cemented floor by a pipe which passed down over the veldt about a hundred yards and ending in a spruit. The finer laundry work was done by the Scotch laundress in a small house built for the purpose. The washing was thus all done within the hospital grounds. The comfort and benefit of having a laundry attached was inestimable, and was a considerable saving from a financial point of view when the prices charged by contractors in the country are taken into

consideration. When washing was given out (from the experience of some other hospitals), it was always a difficult question to say when it would be returned.

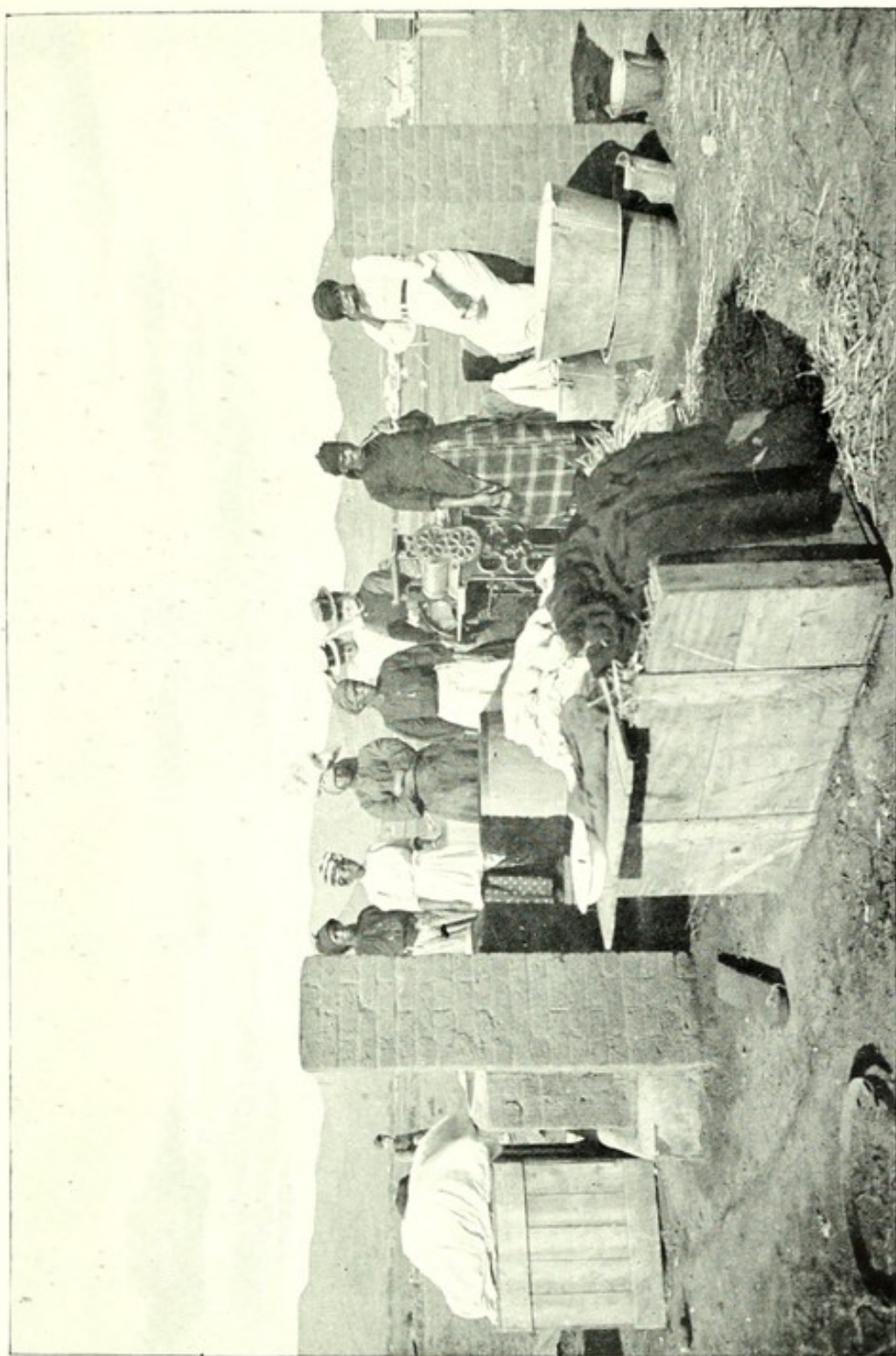
Nursing.—At first, before the hospital was completed, with a large number of fever patients in the marquees, there were difficulties from a nursing point of view. Marquees, when used as hospital tents, have many advantages, but from a nursing point of view they have disadvantages, the patients being separated, the limited space, the proximity of the beds, but chiefly the division of the patients in charge of one nurse into isolated groups, all make the problem of efficient nursing more difficult. The wards, when completed, were well adapted for their purpose, and the nursing became easier. Each block, containing two wards, was under the charge of a sister, and there were two orderlies to each ward—regimental orderlies and natives being also employed to do the rougher work.

As regards night work, the hospital was at first worked on military lines, that is to say, there were no regular night orderlies appointed. Certain orderlies were detailed for night duty. An orderly would thus be on duty during the day, he would have a few hours off, and would then be expected to go upon night duty. Such a system does not work well if patients are acutely ill. One cannot expect efficient attendance during the whole night from an orderly who has already done his day's work. The staff found that the nursing by the orderlies could not be efficiently carried out on those lines; accordingly, regular night orderlies were appointed. Those orderlies had a marquee assigned to them, where they slept during the day. They came on



ORIGINAL LAUNDRY.

[To face page 14.



LAUNDRY.

[To face page 14.]

duty at 5.30 P.M. and remained on duty till relieved by the day orderly in the morning. One orderly was appointed to each block. The work of the orderlies was thus simplified, and our experience was that instead of the work being rendered harder it was made easier. Total night duty was in fact easier than day duty plus one or two nights' duty in the week. In cases of serious illness, when it was thought necessary by the medical officer in charge, a sister was available for night duty. The proportion of sisters to patients in the Edinburgh Hospital was rather above that of most military hospitals. This tended to make the nursing more efficient.

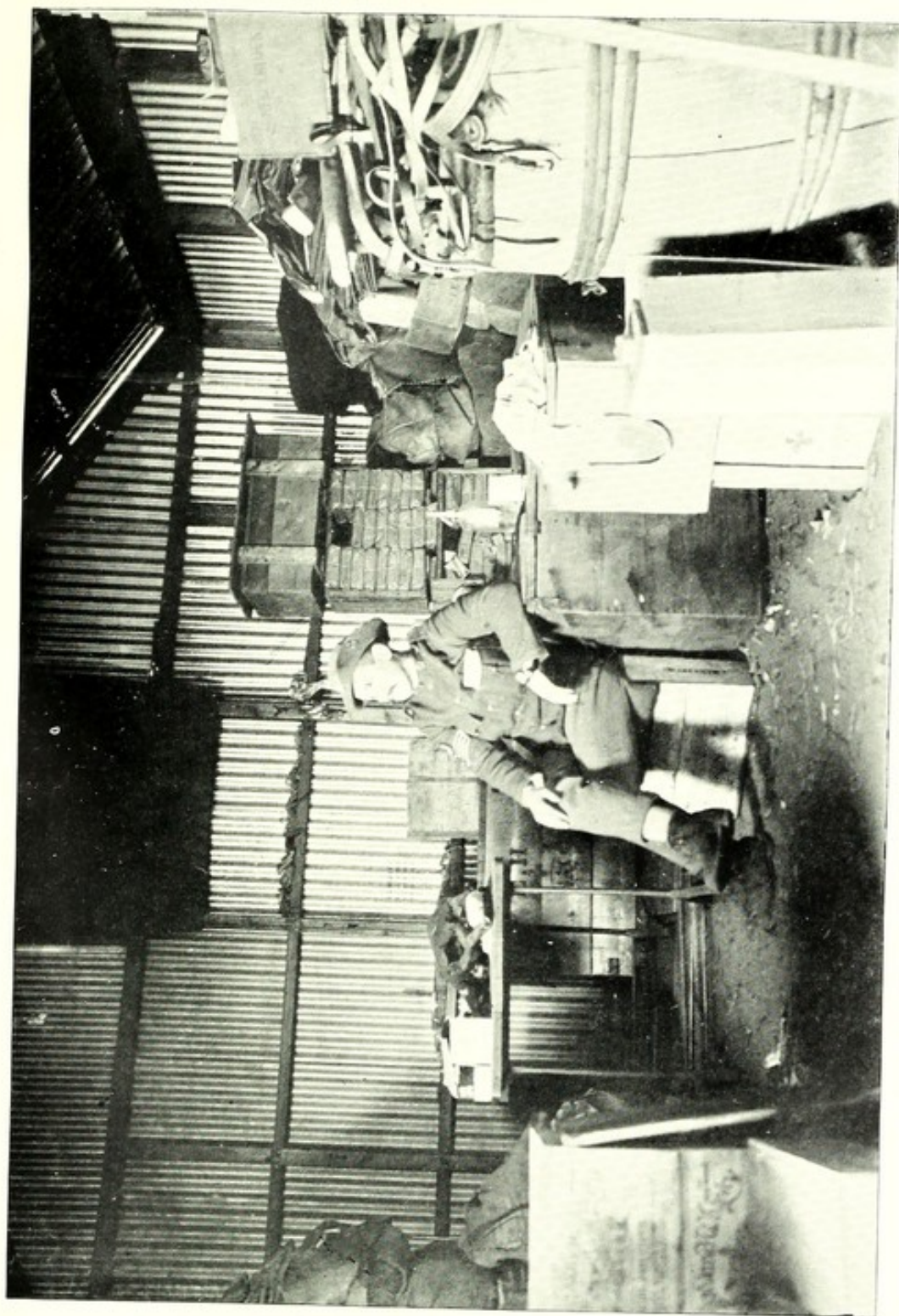
The soldiers made very good patients. The greater number had only been in a field hospital before being admitted to the Edinburgh Hospital, and they fully appreciated the comfort of their new surroundings, and were very grateful for all that was done for them. When the Edinburgh Hospital was first opened the nursing was very heavy, as most of the patients were suffering from enteric fever and many were very ill. In August, as losses had been sustained by the nursing staff by death, and by illness necessitating the invaliding home of one of the sisters, two additional nurses were sent out by the committee.

After the increase in the number of beds the work of the hospital was more brisk. The first train of patients had been almost entirely enteric fever, but subsequent convoys contained more surgical cases. As the enteric fever epidemic diminished, the proportion of wounded to sick became more equally balanced. With the method of sending patients adopted by the military authorities, the work in the hospital

varied much. An ambulance train full of patients was sent, 93 to 96 were admitted; the energies of all were taxed to the utmost to overtake the work. Some of the patients convalesced rapidly and were transferred; the work then became easier. Thus the time alternated between periods of overwork and periods when the work was very light. Such an arrangement is not of course entirely satisfactory. During September and the early part of October the work became very light. The cases admitted were with few exceptions of a mild nature, and required merely rest and good feeding.

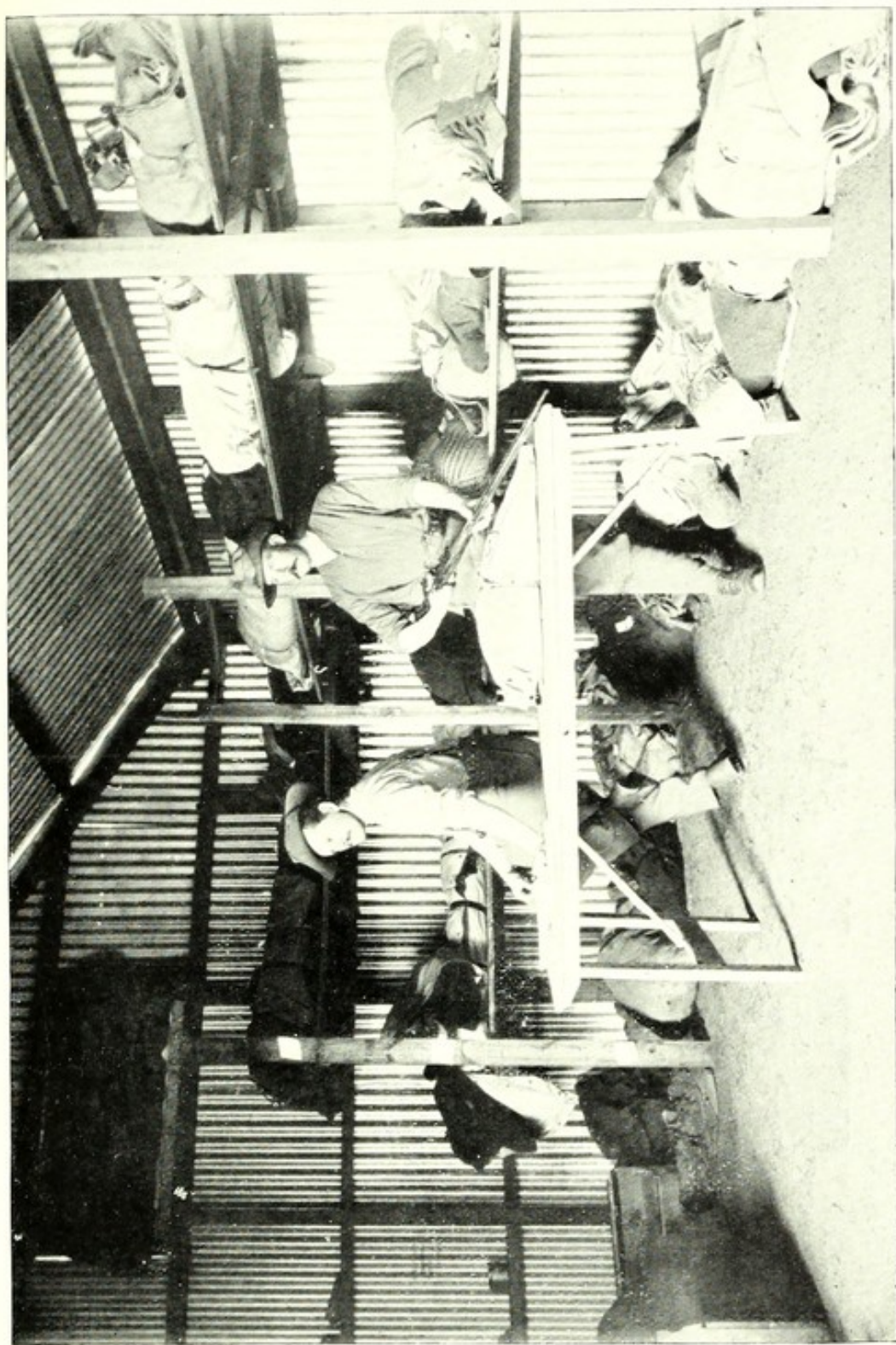
In the beginning of October cabled instructions were received that the hospital, having been gifted to the nation, was to be handed over to the authorities on 15th October. The hospital was at that date a complete unit in first-class working order. The equipment was very complete, as complete, indeed, as is seen in a first-class hospital at home. Of drugs, surgical instruments, medical comforts, etc., there was an ample supply. The buildings were in first-class order. On 15th October Major Moffat, R.A.M.C., and staff, who were in charge of the stationary hospital at Norval's Pont, took over the hospital on behalf of the military authorities.

The staff and personnel of the Edinburgh Hospital proceeded to Cape Town, and on the urgent request of the medical authorities, the staff consented to undertake the care of a sick transport on the voyage to England. Sailing on the troop ship *Dilwara* with 600 sick, Southampton was reached on 22nd November, when the sick were disembarked, and the personnel proceeded to Edinburgh, where they were disbanded.



GENERAL STORE.

[To face page 16.]



PACK STORE.

[To face page 16.]

REPORT OF SURGICAL CASES.

BY DAVID WALLACE, C.M.G., F.R.C.S. Ed., AND GEORGE L.
CHIENE, M.B., C.M., F.R.C.S. Ed.

COMPILED FROM CASES UNDER THE CARE OF

GEORGE L. CHIENE, M.B., C. M. COOPER, M.B., M.R.C.S., JAMES
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F.R.C.S. Ed.

CHAPTER II

REPORT OF SURGICAL CASES

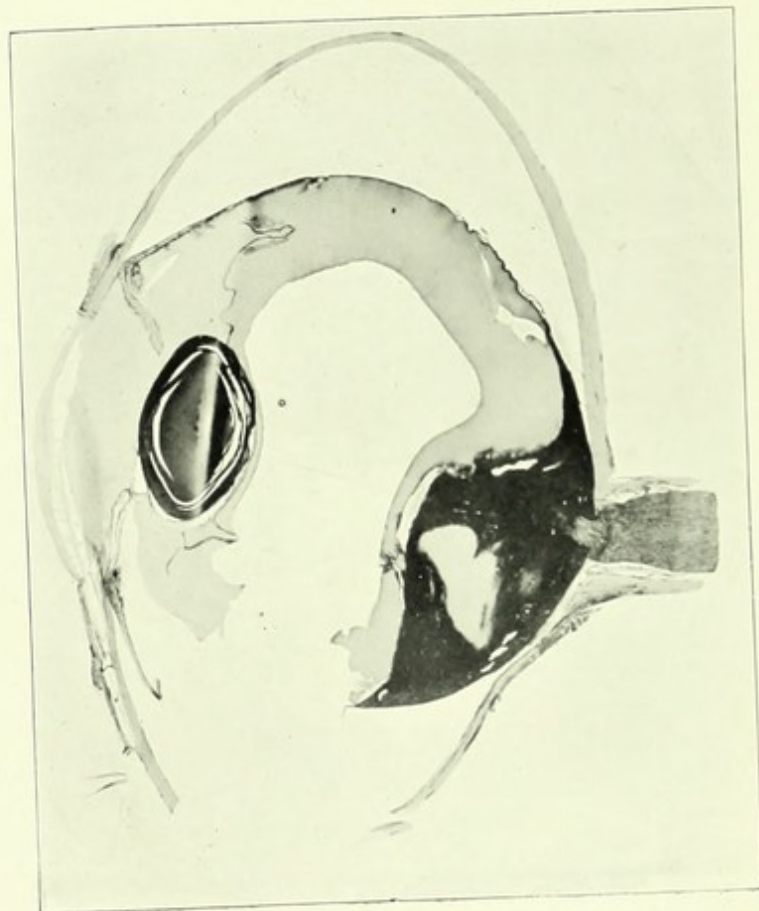
THE Edinburgh and East of Scotland South African Hospital was originally equipped and sent out as a surgical hospital, but its experience coincided with that of most other hospitals, in that disease was more common than wounds. On arrival at Norval's Pont, and for some time after, we were ready to receive and treat surgical cases, but there was practically no fighting, so that with a few exceptions the work of the hospital was of a medical nature up to the 26th of July, on which date there was admitted the first large batch of surgical cases. Previous to that date there were only ten surgical cases requiring operative interference. These included two laparotomies, a hernia, two varicocoeles, and the enucleation of an eye. Up to that time there were treated as in-patients only three cases of bullet wounds: one of the abdomen, and two through the chest. On 26th July, 24th August, and 17th September, large batches of wounded men were admitted. The total number of surgical cases treated was 166. This does not include out-patients, of which there was a large number. Of the above cases, 75 were bullet or shell injuries, 65 due to bullet, and 10 due to shell wounds.

The great majority of the above were wounds of the extremities, as is seen from the following table:—

Head and neck,	8
Thorax,	10
Abdomen,	8
Extremities,	49

Numbers of these cases were wounded in two or more places. The surgical cases may be conveniently divided into two groups: those suffering from injuries due to bullet or shell wounds; and those which may be combined under the head of general surgery, the majority of which in some way were directly or indirectly due to the campaign. Any notes of cases included under general surgery will have special reference to their close association with the patient's work in South Africa. We will first mention shortly some of the cases of general surgery, and then pass to a more detailed account of the more interesting cases due to bullet and shell wounds.

Before passing to the notes of the cases, it should be mentioned that the X-rays were invaluable, not only in cases of bullet or shell wounds, but also in cases of fractures and as an aid in making a definite diagnosis in cases where fracture was doubtful. There was no necessity to use the various bullet probes, *e.g.*, telephone probe supplied to the hospital, as in every case in which we had to remove the bullet the patient had been wounded ten or more days previous to being sent to us, and consequently the majority of the wounds were closed.



MELANOTIC SARCOMA OF EYEBALL.

Section showing Tumour and Fibrinous Exudation.

Dr J. V. PATERSON kindly prepared and reported on this Specimen.

[To face page 21.]

CASES OF GENERAL SURGERY.

Tumours.—We treated three cases suffering from tumours, and although they cannot be traced to the campaign they are worthy of a short note.

The first was a case of melanotic sarcoma of the eyeball. The history is shortly as follows: Eighteen months ago the patient first noticed that the sight of the right eye was failing. On admission there was complete loss of vision in the right eye, the left eye remaining perfectly healthy. The patient arrived in South Africa last November, and up till five days ago he had no pain in the eye. He said he caught cold at that date, and since then there has been great pain. He was admitted on 7th June, and on 8th June the eyeball was removed. A fortnight later he was discharged, and has not since been heard of. The root of the nerve was carefully examined at a later date, and there was no infection of it by direct continuity of tissue.

The second case was a fatty tumour of the thigh, and was of interest from two points of view: first, that the patient was unable to do his work; second, the apparent cause of the tumour. The patient was a reservist, and a year previously was working in a shipbuilding yard. At that time he first noticed a swelling on the front of his thigh. He thinks it was caused in the following way: He used to hold iron bars, 3 or 4 cwt. in weight, across his thighs, while another man punched holes in them. Since coming to South Africa the tumour has grown, and has caused him pain while walking. The tumour was removed;

the wound healed by first intention; and the patient left hospital in a fortnight.

The third case was one of nasal polypi. The original cause was apparently a broken nose thirteen years previous to the time patient was seen. He had been operated upon at least thirteen times for polypi, the last operation being no later than a week before his admission to the Edinburgh Hospital. At the operation numerous polypi were removed, and also parts of the middle and inferior turbinated bones. At the same time the naso-pharynx, which was blocked with adenoid growths, was cleared out. For some hours afterwards bleeding was troublesome, but this soon ceased.

Tubercle.—Of the six cases of tubercle treated, two were treated medically; two by operative interference; and two by the injection of iodoform emulsion, and rest, the last two being respectively cases of disease of the wrist joint and of the knee joint. Both were greatly improved by treatment. One of the cases requiring operation was a tuberculous testicle. There was a distinct history of injury a year before. A fortnight previously the patient again injured himself while riding. Before admission to the Edinburgh Hospital the case was treated as one of specific disease, but without improvement. The testicle was excised along with a portion of the cord, and was typically tuberculous. The wound healed, and the patient was discharged five weeks later.

The last case, a patient aged 22, was admitted on 1st June. The following notes were sent with him: "Patient has been on active service for six months, during

which time he has never been well. On two occasions he has been in No. 6 General Hospital, Naauwpoort, having only returned to his regiment about ten days ago. Since his return he has not been able for duty. On admission to the Convalescent Hospital on 31st May—about midnight—patient was very weak and exhausted; temperature 102° , pulse, 120. Ordered brandy. June 1: temperature 102.4° , pulse, 118. The tongue was furred and dry. Restless night. No diarrhoea since admission. Heart and lungs healthy. Slight tympanitis. Spleen can be distinctly felt. *Diagnosis.*—Enteric fever. Evening temperature, 104° ; not so restless and more sensible; has tried to get out of bed occasionally. Surgeon called up at 11.30 P.M. to see him. Patient next to him says he began to groan as if in acute pain about an hour ago. He has vomited clear fluid once. Temperature, 100.6° ; pulse, very rapid and wiry. Patient is lying on his back with his knees drawn up, and at intervals is seized with paroxysms of pain, which appear to be very severe. Perforation being diagnosed, the patient removed to Edinburgh Hospital at 1 A.M." As soon as possible after admission the patient was chloroformed, and the abdomen opened in the middle line below the umbilicus. No evidence of peritonitis was found. The lower end of the ileum felt thicker than normal. The small intestine was carefully examined, but no perforation was found. The gall-bladder was enlarged and full of fluid. No calculus was felt. Some warm saline fluid was introduced into the abdomen, as the patient was very collapsed, and the abdomen was then closed. After getting the patient back to bed, strychnine was administered, and subcutaneous injections of normal saline fluid introduced under the left mamma. The patient revived

somewhat, but afterwards gradually sank, and died at 12 o'clock mid-day. *Autopsy.*—No general peritonitis. Several enlarged glands in the mesentery close to the ileo-cæcal junction; on opening these they were found to be softened in the centre. There was much matting in the region of the head of the pancreas, and here also several glands were enlarged, and the cystic duct was occluded. The gall-bladder was distended to about the size of a large pear. At the fundus two patches of gangrene which had not separated were present. Evidence of not very recent peritonitis was got all round this part. On opening the bowel an ulcer was found at the ileo-cæcal junction. Its edges were thickened and raised. The floor was not much thinned. It was probably tuberculous in character.

Specific Disease.—Five cases were admitted for specific disease, and were suffering from no other trouble. They were of no special interest, and all were in the secondary stage. They improved under the usual anti-specific treatment.

Hernia.—Four cases of hernia were treated, all of the inguinal variety. Three were directly due to the fatigue and hard work of the campaign. In one case the hernia was noticed for the first time after a fall from a horse. In another, the patient "felt something give" while helping to pull a gun up Coleskop. In a third, the patient first noticed the swelling while digging trenches. Three of the cases were operated on. The other was recommended to wear a truss. The notes of one case may be given somewhat more fully. *History.*—The patient was in Ladysmith during

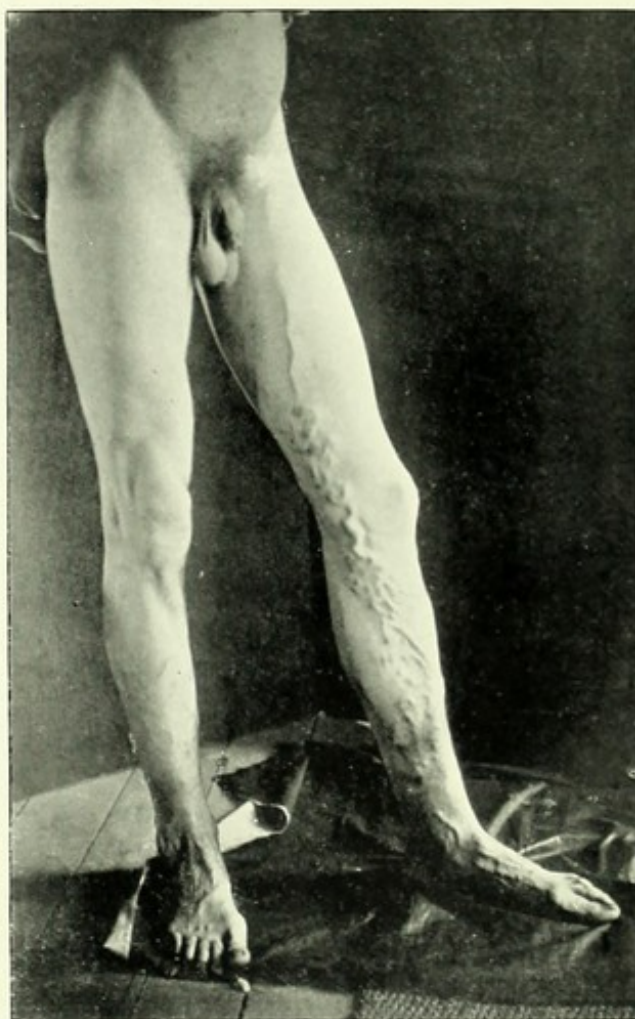
the siege and was wounded in the shoulder by a Martini bullet. He afterwards took part in the relief march to Mafeking. On 15th May, three days before reaching Mafeking, the patient got a chill. He had a severe attack of diarrhoea, and on the 18th he passed some blood in his stools. He went into hospital in Mafeking, but there were no medicines available. His diet consisted of meat and siege bread. Soon after taking the latter, the patient began to vomit, the vomiting coming on a few minutes after taking food. This continued for nearly a week. Pain in region of stomach and constant diarrhoea; motions yellow, liquid, and very offensive. The temperature was normal. There was no cough. Patient was admitted to the Edinburgh Hospital on 16th June. *Previous illnesses.*—When twelve years old, the patient had dropsy. Has suffered from hernia for some years. *Family history.*—Has a brother who has been operated upon for hernia. *State on admission.*—Patient is thin and rather dyspeptic; falling off in weight; distension after food; considerable flatulence; no pain; bowels regular; abdomen distended, especially in epigastric region; dulness in flanks, which alters with position; fluctuation evident; stomach dilated; liver not enlarged. A large left inguinal hernia which descends into scrotum is present. The inguinal canal admits the finger easily. The hernia contains fluid as well as intestine. The patient wears a truss which controls the hernia.

Up to 24th July the patient was treated medically. On 27th June, 130 ounces of chyliform fluid were withdrawn from the abdomen by means of Southey's tubes. 24th July, operation; radical cure by Kocher's method; when the sac was opened one and a half pints of chyliform fluid escaped;

the sac was apparently healthy. The wound healed by first intention, and six weeks later no reaccumulation of fluid had occurred.

Genito-Urinary Cases.—Of those, four were cases of varicocele. In three, the varicocele was only noticed after the patient came out to South Africa; and in the fourth, although it had been present for some years it had never troubled him. In all the cases the history was distinct that the painful symptoms associated with varicocele were aggravated by marching. In one, the patient had been operated on before he was admitted to the Edinburgh Hospital. In another, the patient was advised to delay operative interference, owing to cardiac and lung complications, and was invalided home. In the other two cases, operation was performed. In both cases, the external ring was exposed by a small incision above and parallel to Poupart's ligament. The cord and its surrounding structures were then drawn upwards, the veins separated, ligatured above and below, and the cut ends tied together. By this method one is less liable to septic infection than when the incision is made in the scrotum, which is difficult to purify satisfactorily. The result in both cases was entirely satisfactory.

Disease of the Rectum.—Considering the hardships which the majority of the troops had to undergo, and also the somewhat trying diet, there were comparatively few rectal cases to treat. There were two cases of hæmorrhoids, one of which required operative interference. The other case was treated by medicine and regulation of diet, no



VARICOSE VEINS.

Large dilatation of Vein at saphenous opening.

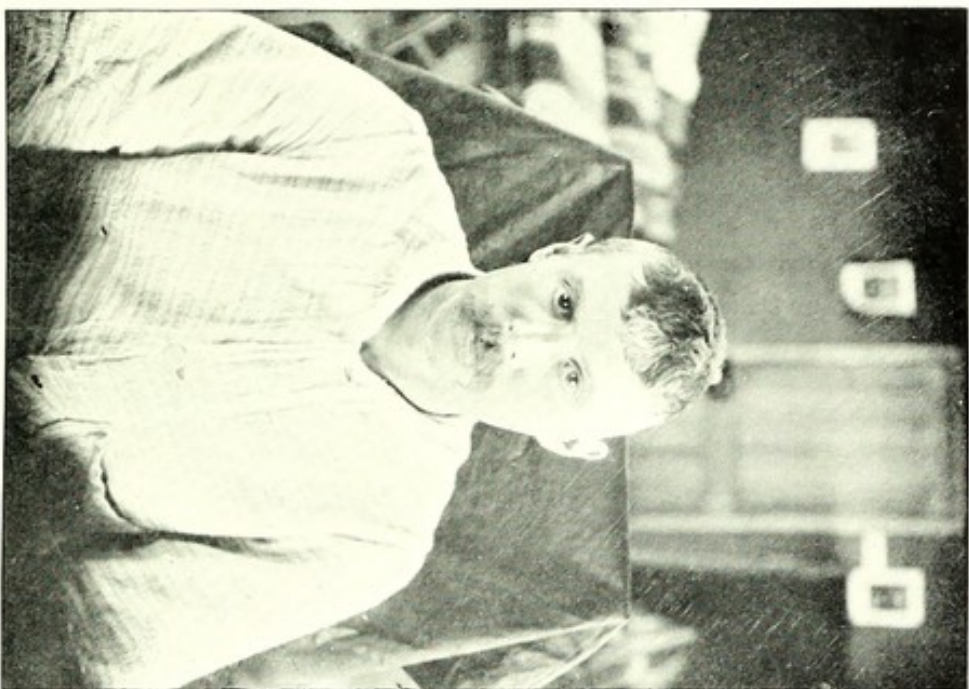
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operation being required. There were two cases of fistula in ano: one of which was operated on before admission. The other patient had transposition of viscera, an observation which was confirmed by an X-ray photograph. Lastly, there were two cases of ischio-rectal abscess, both of which required incision.

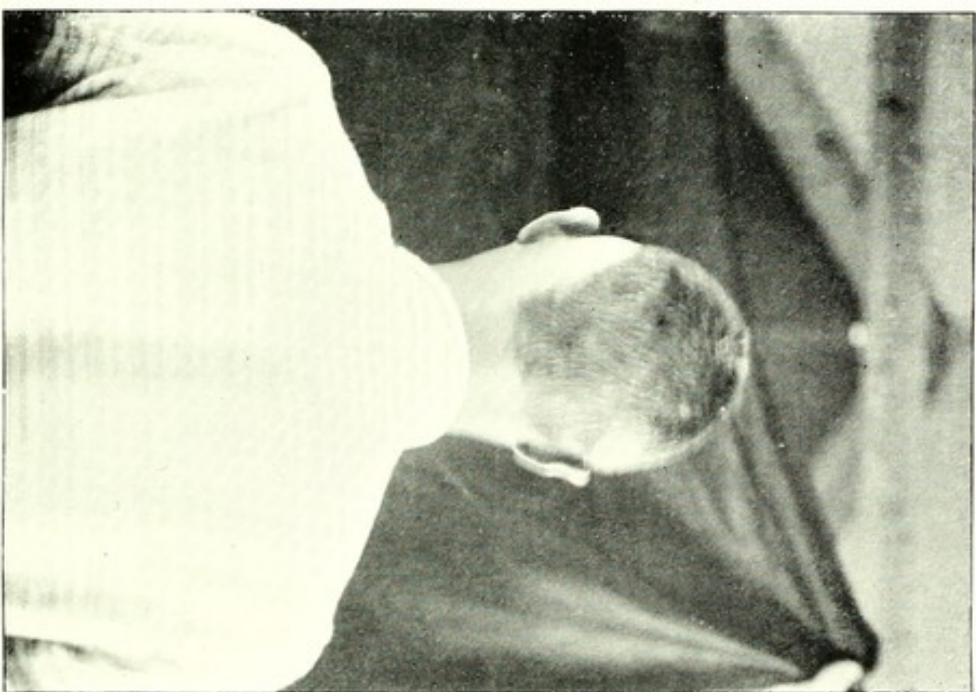
Varicose Veins.—There was one case of varicose veins. The patient was perfectly certain that up to three months before admission he did not suffer from varicose veins. At that time he was digging trenches near Bloemfontein, when a piece of stone fell on his leg and cut it. He then developed an ulcer. After this he was in Bloemfontein for fourteen days, and then marched to Vet River, remaining there six weeks, during which time the ulcer partially healed. He then marched to Wynberg, where the ulcer got larger and he reported sick. When at Wynberg the ulcer healed, although patient states he was on duty all the while.

Local condition.—There was a healed varicose ulcer at the lower third of the front of the left shin; the internal saphenous vein and its branches were markedly dilated. At the saphenous opening there was a dilatation of the vein about the size of a pigeon's egg. Owing to the severity of the case operation was advised, and the patient readily consented, as he wished to rejoin his regiment. After ten days' rest, with the leg in the elevated position, the operation was performed, portions of the vein being excised in four different places. The wounds healed by first intention, and the patient was enabled to rejoin his regiment some weeks afterwards.

Enteric Fever.—Three cases of enteric fever required operative interference. One required tracheotomy; a second suffered from an acute condition of the mastoid antrum, which came on during the patient's convalescence. Previous to that time he had had no ear trouble. This case was operated on two days after admission, and left hospital five weeks afterwards with the wound completely healed. No attempt at permanent drainage was made at the time of the operation as the case was not considered to be a tubercular one, but rather an acute condition following enteric. The third was a case of perforation of the intestine, which was operated on. The patient had been in hospital for ten days when symptoms of perforation were manifested. The pulse became very feeble, and the breathing rapid. He was semi-conscious, but capable of being roused; and complained of some pain in the right iliac fossa; the right leg was drawn up, and the abdomen in the lower right quadrant did not move with respiration. On palpation there was some rigidity of the lower half of the abdomen, especially on the right side, and considerable tenderness in the right iliac fossa. No redness or oedema of skin. Patient very collapsed. The patient was chloroformed, and the abdomen opened by a mesial incision between the umbilicus and the pubis. On opening the abdomen some turbid fluid escaped, but there was no faecal odour and no gas. The small intestine about the lower end of the ileum was examined. There were some recent flakes of lymph upon it, also one or two hæmorrhagic spots, and in places the wall was very dark and thin. The peritoneum was washed out with weak, warm boracic solution, which had been previously boiled. Upon intro-



MASTOID ABSCESS.



[To face page 28.]

ducing a drainage tube into the pelvis, a large quantity of turbid fluid, containing flakes of lymph with a strong faecal odour, escaped. The patient was very collapsed, and no further search for the perforation was attempted. The patient was put back to bed. The pulse slightly improved, but this improvement was only temporary, and the patient died four hours later. *Autopsy.*—Two very minute perforations were found within three inches of the lower end of the ileum; the bowel was very thin and much ulcerated. There was some turbid fluid in the pelvis; the spleen was much enlarged and softened. A scraping from the spleen showed numerous typhoid bacilli.

Deformities.—Among the cases of deformities treated, there were two cases of hallux valgus. In both cases the condition was present before the patient arrived in South Africa. But in both the condition was greatly aggravated by marching, and after a time became complicated with bunion. In one the condition was bilateral; and in both cases the bunions were septic. The patient in whose case the condition was bilateral suffered from cardiac trouble; so palliative measures were adopted. The other case was operated on, osteotomy being performed; the bunion having been first treated and cleansed. There was a case of hammer-toe, which incapacitated the patient for his work. The case was sufficiently aggravated to necessitate amputation of the toe. A short time afterwards he went back to duty at Mafeking.

Acute Infective Diseases.—Veldt Sores. As these have created considerable interest, and also as they seem to be

peculiar to South Africa, we may be allowed to give our experience in some detail. Only six patients were admitted suffering from veldt sores, and no other injury or disease; but numerous patients admitted for injury or disease also suffered from them, and a large percentage of the out-patients were treated for these somewhat intractable sores. The theories and reasons given for this condition have been numerous. In one paper, the common horse-fly was considered to be the cause. Others think they are a local manifestation of a general disease.

In the subjoined table (page 31) the history of the six in-patients is shortly given.

Regarding the length of time the above patients had been in the country, the table, as far as it goes, shows that veldt sores may develop in a very short time. But among the out-patients that were treated there were two or three very intractable cases; these patients had been in the country for a year or longer. Regarding the previous life and habits of the patients, all the cases above mentioned were undergoing hardships which they were unaccustomed to endure, and their diet was not that to which they were usually accustomed.

The second patient mentioned thought that he had developed the sores by his trousers becoming engrained with sand while he was a prisoner in Pretoria. The condition seems to be a form of septic ulceration which requires a lowered condition of the system before it develops. The actual cause of the sore is probably the staphylococcus pyogenes albus. In several of the cases above noted, and also from some of the out-patients, films of the pus were examined and cultures made, and in every

HISTORY OF SIX IN-PATIENTS WITH VELDT SORES.

	Length of time Patient was in S. A.	Patient's idea of Cause.	Previous Life and Habits.	History since coming to Country.	Duration of Sores previous to Admission.	Situation of Sores.	Treatment.	Time they took to Heal after Treatment began.	Result.
I.	10 weeks.		Undergraduate at Oxford.	Hard marching and fighting.	2 weeks.	Sacrum, buttock and thighs.	Antiseptic poultice, followed by creasote, salicylic acid, and collodion mixture.	(?) Complicated with influenza.	Cure.
II.	11 months.	Sand.	Life of a private soldier.	Prisoner in Pretoria for some months.	7 weeks.	From knees downwards.	Washed with lysol, antiseptic poultice, lanoline, vaseline, and boracic ointment.	16 days.	Cure.
III.	2 months.		Exceedingly hard life.	Fortnight's marching afterwards in camp.	2 weeks.	Shin and sacrum.	Antiseptic poultice, followed by dry dressing.	8 days.	Cure.
IV.	6 months.		Life of a private soldier.	Hard marching and fighting.	4 months.	Hands, legs, and head.	Antiseptic poultice, followed by blue ointment.	22 days.	Cure.
V.	4 months.		Do.	Some marching and fighting.	10 days.	Legs and back.	Antiseptic poultice, followed by creasote, salicylic acid, and collodion mixture.	16 days.	Cure.
VI.	8 months.	Tight boot.	Do.	(Mounted) irritation of boot, aggravated by riding.	2 months.	Shin.	Antiseptic poultice, followed by creasote, salicylic acid, and collodion mixture.	20 days.	Cure.

case the same organism was found. The organism may be conveyed to the part either by horse-flies, sand, or other media. The treatment should be constitutional and local; the constitutional, including attention to diet, mode of living, as well as the usual tonics. Locally all that is required for ordinary cases is cleanliness and rest, which can readily be obtained by applying an antiseptic poultice for twenty-four hours, and afterwards a gauze and collodion dressing, which gives rest and protection to the part. In the more chronic and intractable cases it was found that the substitution for the gauze and collodion of the following mixture :

Creasote,	25 parts
Salicylic acid,	50 parts
Collodion,	75 parts

often readily cured the cases which defied all other treatment. Latterly this mixture was generally used in the hospital for nearly every case, the initial treatment being first to get the sore in a healthy condition.

There were three cases of burns, but in only one was it due to gunpowder. This patient was burning some gunpowder, which went off rather unexpectedly and burnt his face and hands. The other two cases are not worthy of note. We saw no cases of burns due to the veldt fires.

Among the other acute inflammatory conditions were numerous cases of whitloe, in two of which amputation of the affected digit was necessary.

Another case was one of severe cellulitis of the arm, which rapidly improved with rest and boracic fomentations, the temperature dropping to normal in three days.

All these acute infective conditions, as well as the septic wounds due to bullet or shell injuries, were found to be very amenable to treatment, and in almost every case rapidly yielded after a day or two of antiseptic poulticing, followed by dry dressings.

Injuries of Soft Parts and Joints.—We were struck with the comparatively numerous patients that were admitted to hospital for synovitis of the knee-joint. In three cases the synovitis was due to a loose internal semilunar cartilage; all the patients had been previously troubled. In one, a reservist, the condition had lasted for ten years. Operation was advised, but the patient was going back to civil life and was able to do his ordinary civil work without trouble, so palliative measures were adopted. In another, which was operated upon, the cartilage had been loose for five years. At the same time he was operated on for hammer-toe.

Numerous other cases of synovitis of the knee-joint were treated, and in every case there was a history of an injury either from falling from a horse or from twisting the knee while climbing a kopje, or some other accident due to the patient's work as a soldier.

Among the other injuries of the soft parts, sprains and bruises were numerous, the bruises being generally seen in mounted men whose horses had fallen with them. There was one case of dislocation of the ankle, one of a severe periostitis, which was incised, and several cases of blistered feet, which soon improved with rest, cleanliness, and some mild antiseptic dusting powder.

Fractures not due to Bullet Wounds.—Seven cases of

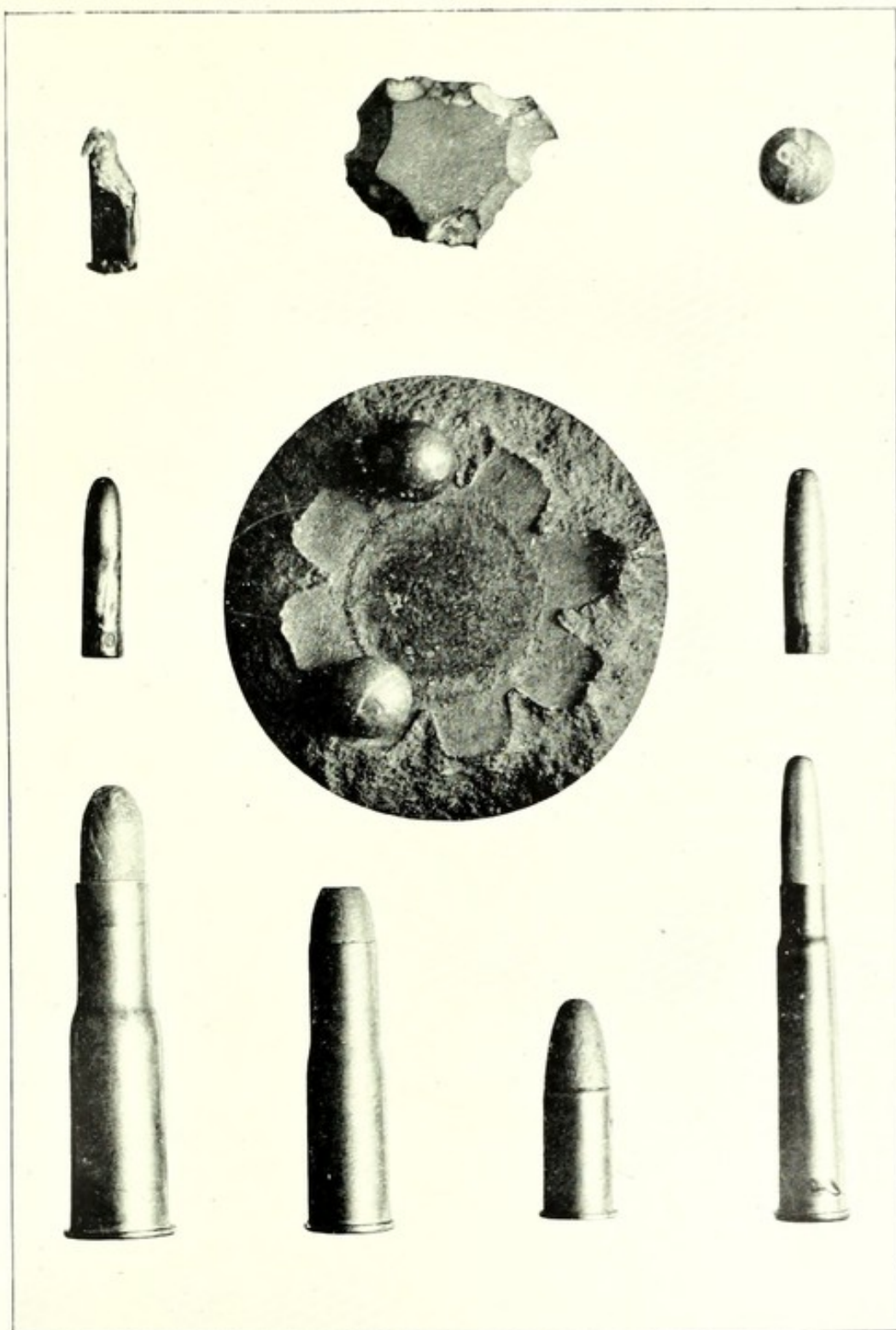
C

fracture not caused by bullets were treated: one of the ribs, two of the clavicle, and three of the fibula, and one a fracture of the base of the skull and double compound fracture of both legs; those of the ribs and clavicle were caused by the patients being thrown owing to their horses falling. In one of the cases of fractured fibula, the patient was travelling on the top of a horse-box; the train took a sudden turn and he was thrown off. In another, the wheel of a waggon passed over his leg. The last case was that of a private in the R.P.R. The Norval's Pont bridge had been blown up by the Boers, and the railway pioneers had reconstructed it for traffic. During the whole time they were working at the bridge there was no case of severe accident until the last day, when, unfortunately, this man while on the bridge was struck by a falling plank. He lost his balance and fell a distance of about 30 feet on to rocks. On admission he was found to be suffering from a double compound fracture of both legs, and fracture of the base of the skull. The compound fractures of the legs were thoroughly purified, dressed, and put up in box-splints; the posterior tibial arteries were intact, and sensation in both feet was good. The patient's temperature gradually rose, and the following day he died.

The post-mortem examination showed a compound fracture of the base of the skull, with extensive laceration of the brain.

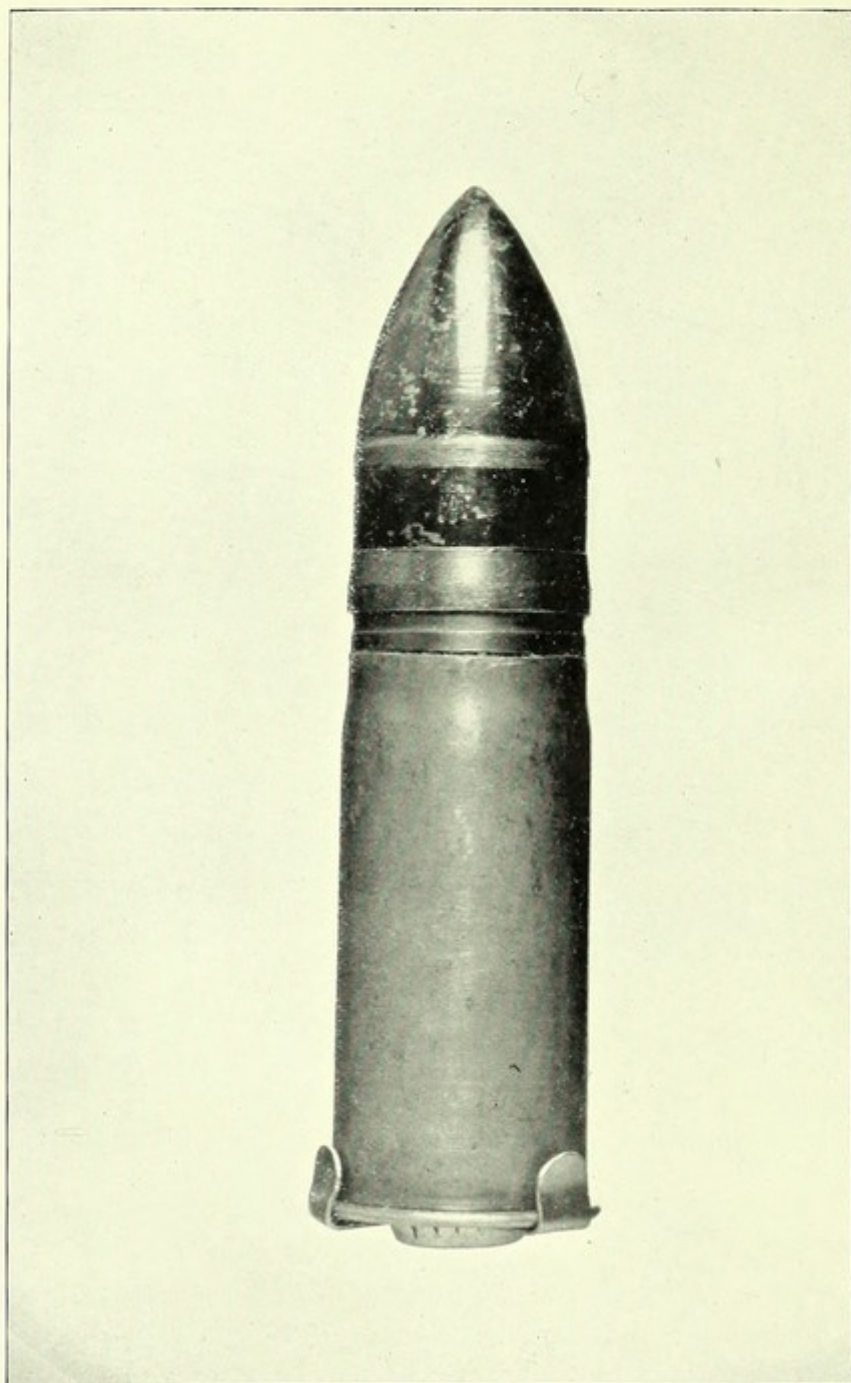
SHELL AND BULLET WOUNDS.

The cases admitted suffering from the result of shell wounds were all septic except two: one being a super-



PHOTOGRAPH OF VARIOUS PROJECTILES.

[To face page 34.



POM-POM SHELL.
Slightly reduced.

(To face page 35.)

ficial bruise and abrasion of the skin, which could hardly come under the heading of a wound; the other a case of a shrapnel bullet in the thigh, which was removed during the patient's stay in hospital. There were three cases of injury to the head; one to the thorax; four of the lower limb; and four of the upper limb. Two of those cases also suffered from bullet wounds in other parts.

Head Injuries due to Shell Wounds.

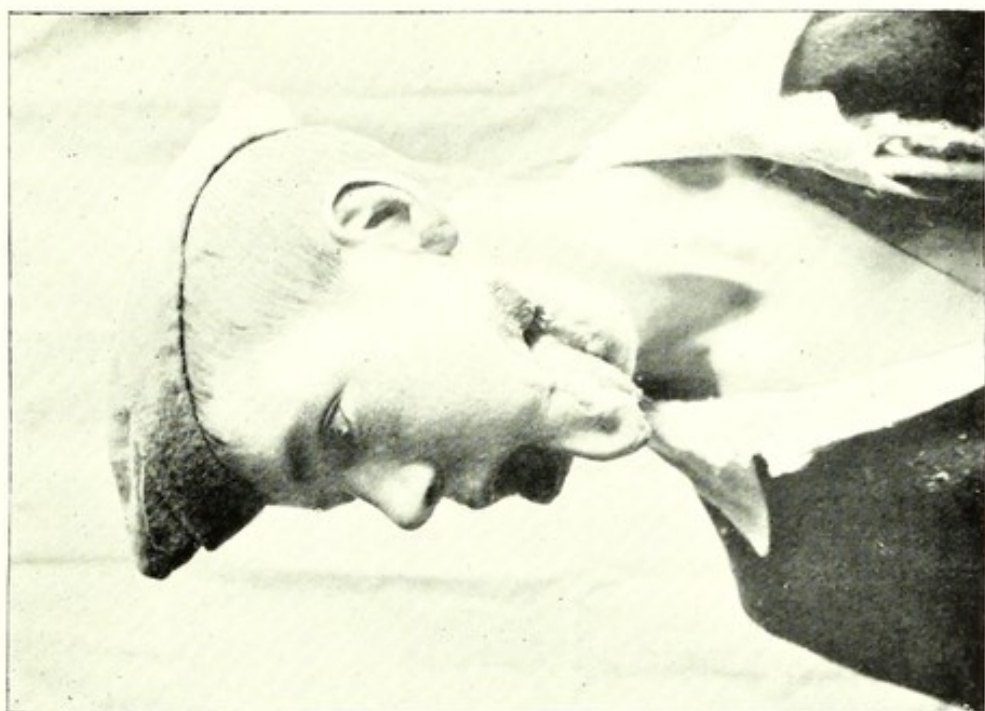
Two of the cases—Private C., No. 6025, 1st R.M.F., and Private G., No. 2025, 1st H.L.I.—of head injury were scalp wounds. In neither could a fracture of the skull be made out. In one of these there was a history of a splinter of shell being still in the wound, but when X-rayed nothing abnormal was found. The treatment consisted of simple dressings, and both in a short time healed without evil effects.

The third case was a specially interesting one Private D., No. 6745, 1st H.L.I., had his lower jaw carried away by a pom-pom ten days previous to his admission. He was climbing a kopje at the time. He never lost consciousness; he had no pain, but lost a considerable quantity of blood before the first-aid dressing was applied. Without assistance he walked down the kopje for about ten yards after being wounded. The first-aid dressing having been applied he was taken on a stretcher to a Boer farm. He stayed in the Boer farm all night, and the next morning was taken to Heilbron, where he remained until admitted to Norval's Pont Hospital. While there, he was kept in bed; his mouth was washed out, and the wound was dressed twice daily.

On admission to the Edinburgh Hospital the body of

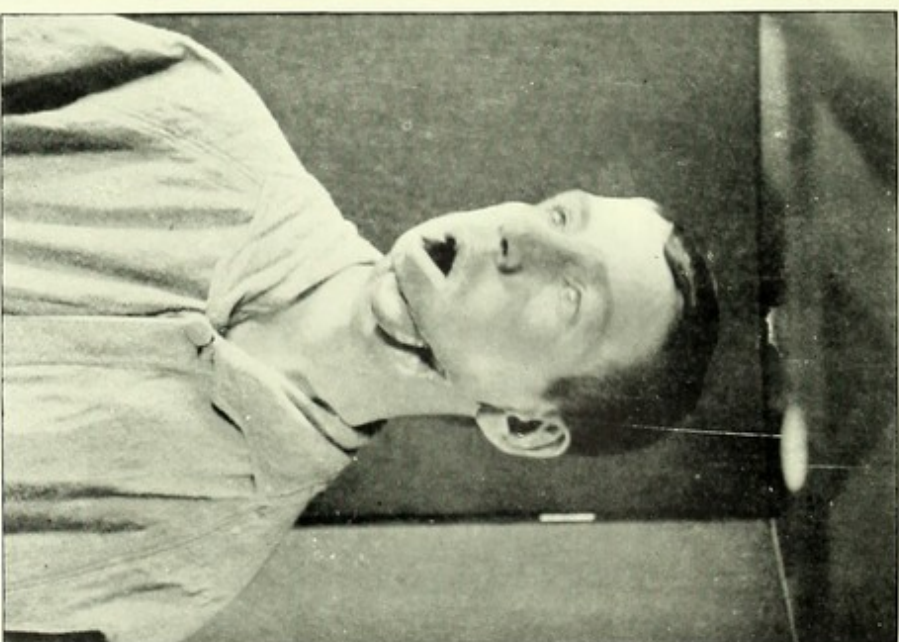
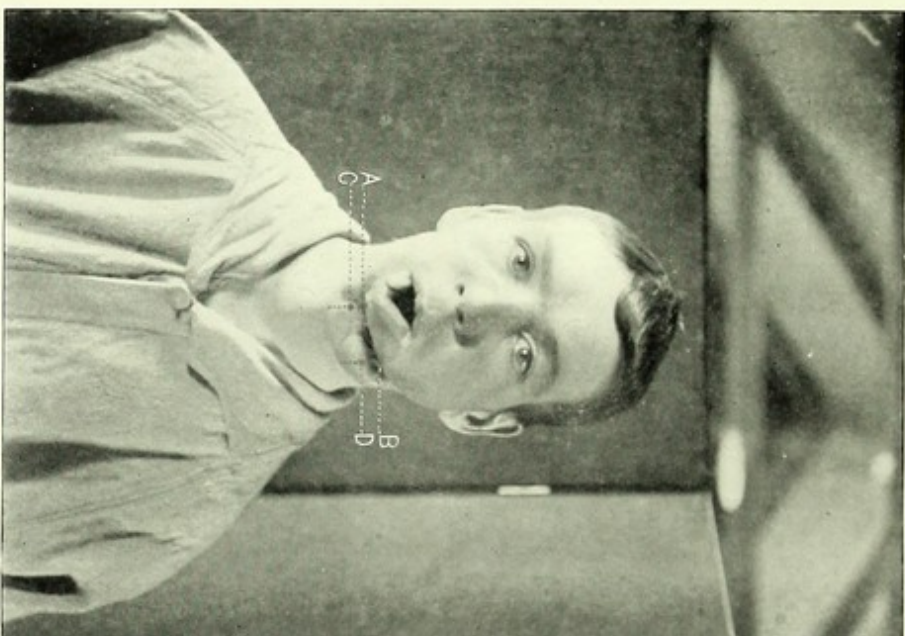
the lower jaw was found to be completely shot away on the left side. On the right side, the posterior part containing the last molar tooth was intact. In front of this there was an inch of necrosed bone containing two more teeth which, on examination, was found to be freely movable and entirely separated from the ramus and posterior part of the body of the jaw. This portion was removed. The lower lip and the skin over the chin were completely divided about half an inch from the right corner of the mouth. The tongue was protruded and hanging down in front of the patient's neck, the left side of the lower lip hanging down in a similar way; a large ulcerated wound ran up the side of the cheek; saliva continually dribbled from the mouth; the tongue was oedematous, and the raw surfaces of the wound were in an ulcerated and filthy state. The treatment, to begin with, consisted in getting the mouth into as healthy a condition as possible. Then plastic operations were performed to close the gap. The closing of the wound and the joining of the lower lip was done in three stages, it being thought that a better result would be obtained if too much was not attempted at one time. Notwithstanding every precaution, it was extremely difficult to keep the mouth in even a fairly clean state.

The first operation was performed thirteen days after the patient was admitted. Previous to this, photographs 1 and 2 were taken. The operation consisted in rawing the torn surfaces of the lower lip for about an inch and a half, and bringing them together. The lower part of the wound was not touched, and the tongue was allowed to remain hanging down over the neck. In this way drainage from below was obtained, while the wound of the



CASE III.—CONDITION ON ADMISSION.

[To face page 36.]



CASE III.—CONDITION AFTER FIRST OPERATION.

[To face page 37.

lip was allowed to heal. No dressing of any sort was applied, but the mouth was washed out at regular and frequent intervals. Five days afterwards complete union of the parts was obtained, and the stitches were removed. Ten days later the second operation was performed. This consisted in replacing the tongue into the mouth, rawing A B and C D, bringing them together by making vertical incisions downwards from C and D, which were afterwards stitched up. In this way two openings, one at each side of the face, were still left, but the main portion of the gap was closed. It was found difficult to get accurate apposition of the two surfaces. As is well seen in the photograph, the skin of the lower surface had a marked tendency to grow inwards and, as is also seen in the photograph, there was a considerable amount of unhealthy tissue on the inferior surface of the lower lip which had to be freely cut away. This portion completely healed. Care was taken that the patient lay on one side or the other, so that the saliva ran out from the openings which were left; and in this way the wound was kept as dry as possible. No dressings were used.

Twelve days later, the third and last operation was performed. It consisted in rawing the surfaces of the two open wounds on either side of the neck, and by the aid of suitably placed incisions these were afterwards drawn together and stitched. One side healed perfectly well, but six days later it was necessary to put more stitches on the other side. After this there was no leakage, and the wounds completely healed. By this time the raw ulcerated surface on the left cheek had been covered over by new skin. Shortly after the third operation the patient was encouraged

to smoke in order to exercise the muscles of the lower lip. To begin with, he had difficulty in doing this, so a piece of lint was rolled round the end of his cigarette, and in this way he was enabled to get his first satisfactory draw for many weeks. He was greatly delighted; and in passing through the ward the next afternoon during smoking hours, we found him peacefully smoking a cigarette passed through a central hole in a round piece of bread. This latter method he considered to be superior to the lint. To prevent contraction of the soft tissues, there being no bone to keep up the normal contour of the chin, we melted down a golf ball and moulded a temporary gutta-percha jaw for him. By this time the patient was able to eat soft puddings; to enjoy biscuits soaked in tea; to speak fairly distinctly, and also to enjoy a smoke and the usual bottle of beer or stout. This patient was invalided home some two months afterwards, and Dr Guy kindly fitted him with a useful lower jaw and false teeth. The last two photographs show the patient as he now is.

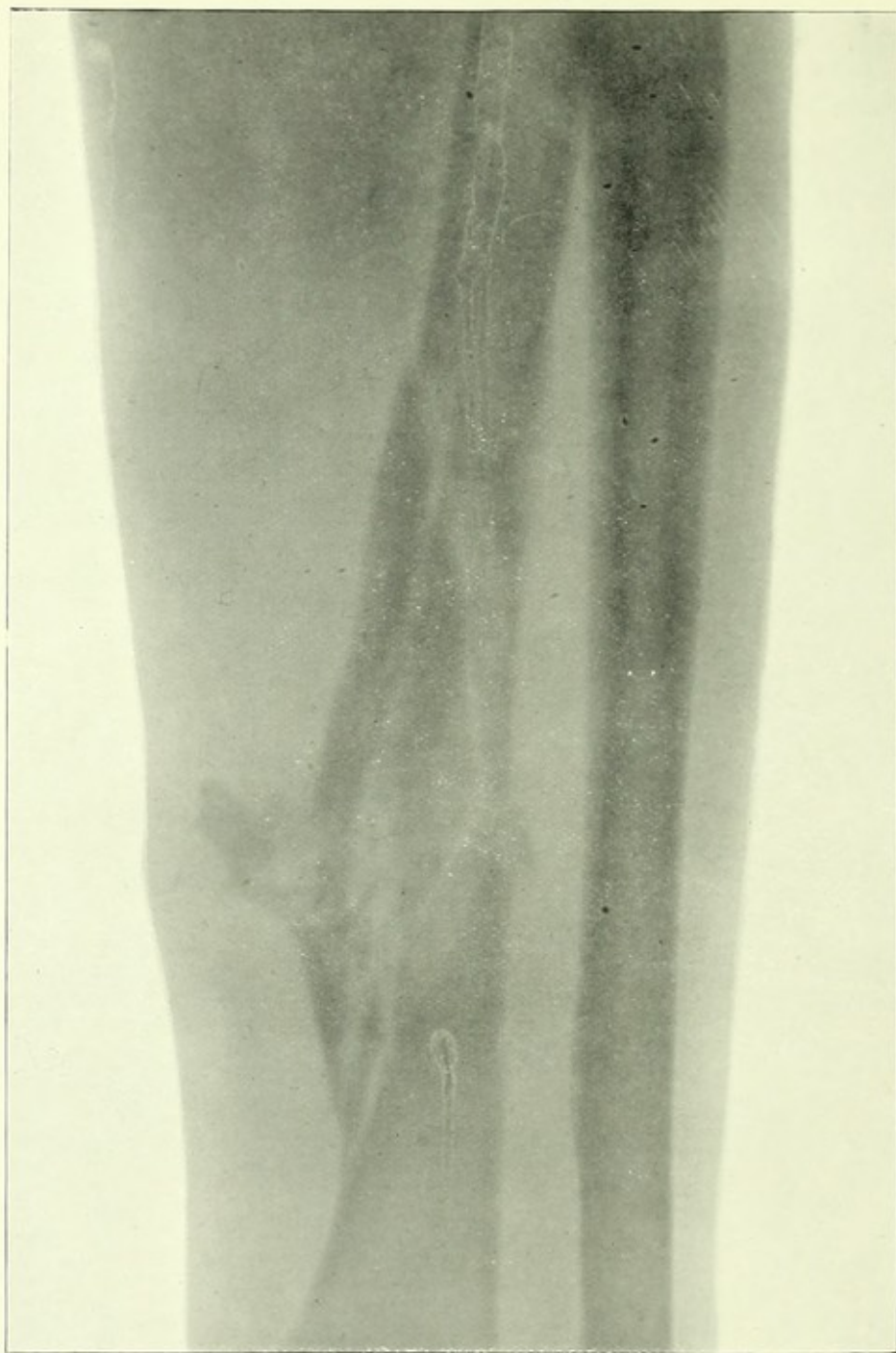
The only case of shell wound of the thorax was one in which the bullet was removed in the train on the way down to the Edinburgh Hospital.

PRIVATE T., No. 3640, *H.L.I.*, ten days previous to admission was wounded by a shrapnel bullet. The bullet entered the right axilla, and was evidently deflected by the ribs forwards and upwards. The patient was treated in Heilbron Hospital for some days before being sent to Norval's Pont. While in the train, the patient complained of great pain in the chest. The medical officer stated that a small abscess had formed an inch below the middle of the right clavicle, which he opened by a small incision and



CASE III.—PRESENT CONDITION.

[To face page 38.]



CASE I.—COMMINUTED FRACTURE OF RADIUS CAUSED BY A PIECE OF SHRAPNEL.

[To face page 39.

extracted a shrapnel bullet. The wound of entrance was septic, but a fortnight after admission both wounds were healed and the patient was discharged. There was no further chest trouble.

Shell Wounds of Upper Extremities.

Of the shell wounds of the upper extremity, one was in the region of the scapula; one a compound fracture of the radius; another, a compound fracture of the humerus in its upper third; and the last, a compound fracture of the lower end of the humerus, involving the elbow joint. In the second case, the bullet had been removed before the patient was admitted; while in the two last cases operation was necessary for extraction of the bullets.

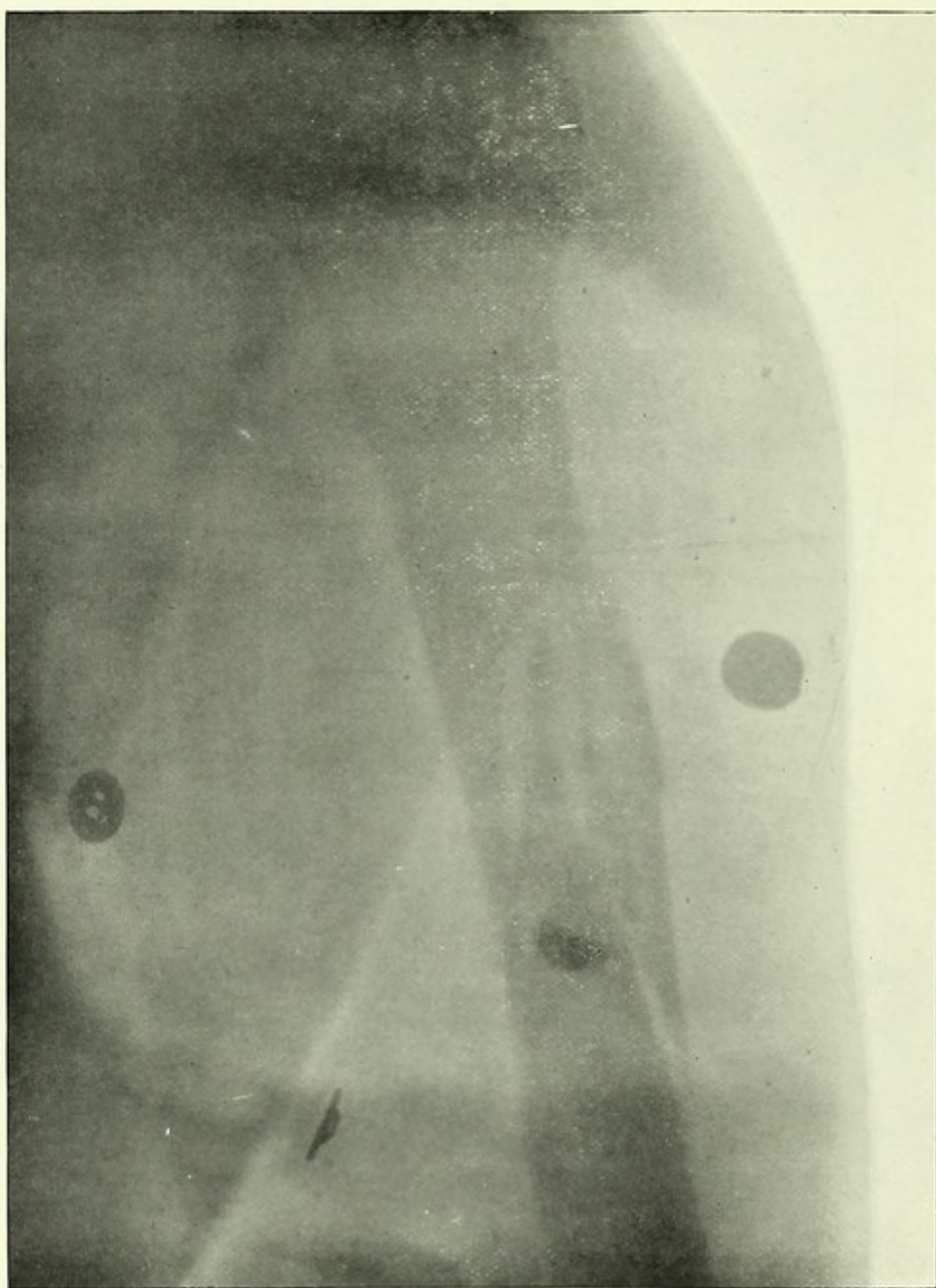
CASE I.—Private M., No. 1824, *H.L.I.*; fourteen days before admission, while advancing, the patient was struck in the forearm by a piece of a shrapnel shell. This caused two wounds in the forearm and fractured the radius. When the patient was admitted the right forearm was tied up in antero-posterior cane splints, and dressed with boracic lint. The arm was considerably swollen, but the bones were in good position. The wounds of entrance and of exit were both septic, and the tissues in the region of the track of the bullet were much lacerated and torn. As the arm was very septic, painful, and swollen, it was put in a boracic bath and covered with lint. This gave great relief, and the wounds quickly became much cleaner. After a week, all that was required was a dry dressing. When the patient left hospital three weeks after admission, union of the bones

was present; sensation in the fingers supplied by the median nerve was still impaired, but had been gradually improving; the dorsal wound was completely healed, and the anterior wound was all but healed. Movement in the fingers was fair, and there was no pain.

CASE II.—Trooper L., No. 1157, *Robert's Horse*, was wounded in the region of the shoulder; the wound of entrance was about the size of a shilling, and situated posteriorly four and a half inches from the middle line at the level of the upper border of the scapula. From this wound the sinus ran outwards for about two and a half inches under the skin to an incision, through which the bullet had been extracted before the patient was admitted. The wound of entrance was discharging pus freely. No bones were injured. The patient says the shell burst over his head. Treatment consisted of rest and drainage. Three weeks later, the patient was discharged with the wound healed, and with the full use of his arm.

CASE III.—Trooper M'L., No. 8915, *Lovat's Scouts*, was wounded ten days before admission. He was struck by a shrapnel bullet on the right arm, about the junction of the middle and upper thirds. He was treated at Heilbron Hospital for eight days.

On admission the temperature was 100°. In the region of the insertion of the deltoid muscle of the right arm there was a wound the size of half-a-crown. The wound was septic and discharged freely. There was a fracture of the humerus, and a drainage tube passed down to the bone. No evidence of paralysis of the musculo-spiral nerve. The X-ray photograph showed a comminuted fracture of the



CASE III.—FRACTURE OF HUMERUS.
Shrapnel Bullet under Deltoid.

[To face page 41.]

humerus, with a shrapnel bullet lying underneath the deltoid muscle. Five days later the patient was operated upon. The original wound was enlarged and a finger passed in, when a pouch containing pus was discovered underneath the deltoid muscle, and half of a shrapnel bullet was extracted. The humerus was found to be much splintered, but the fragments were held together by the periosteum. A counter opening was made at the posterior border of the deltoid, another on the inner aspect of the arm, and the wound was disinfected as far as possible. Six weeks later, the patient was discharged to Cape Town with the wounds healed, except one small superficial sore.

CASE IV.—Lance-Corporal M'L., No. 8836, *Lovat's Scouts*, was also wounded ten days before admission. He was advancing, when he was hit by a piece of shrapnel about two inches long and half an inch broad. The segment of shell passed through his left arm a little above the elbow joint and dropped down his sleeve. The wound was bandaged. He was taken to the field hospital, and then to the Town Hall Hospital at Heilbron, where he was dressed every day.

On admission the temperature was 104.2° . There was a wound one and a half inches in diameter situated between the external condyle and the olecranon process. It was septic and sloughing, and bits of sloughing tendon could be seen at the base of the wound. This wound communicated by a sinus with another wound in front of the extensor muscles of the arm. On probing it some fragments of loose bone were felt; there was great pain and tenderness on movement; no collection of pus could be detected, but both wounds were septic. The elbow joint was X-rayed, but no fragment of shell

could be seen. The temperature was of a swinging nature going up in the evening to 103° and 104° .

A few days after admission, as the temperature continued to swing, and the patient had considerable pain, he was put under chloroform; the sinus was slit up; the external condyle was found to be fractured, and one or two loose fragments of bone were removed. The triceps tendon was lacerated, and underneath there was a collection of pus. The wound communicated with the elbow joint. Another opening was made posteriorly to allow of free drainage, and drainage tubes were inserted; the arm was put up at right angles, and the wound dressed. The temperature improved, but still continued to swing for about a fortnight. A month after the operation the discharge had practically ceased; and the joint was being moved twice daily. Seven weeks after the operation the patient was discharged to Cape Town with the wounds clean and in the process of healing.

Shell Wounds of Lower Extremities.

CASE I.—Private Y., No. 5717, *H.L.I.*, was wounded ten days ago by a shell which burst near him. A piece of shell struck him just below the great trochanter of the left femur and caused a slight wound and severe bruising. On admission the wound was healed, and although the patient walked with a considerable limp it was evidently simply due to the bruising, and passed off in a few days, after which he was discharged to the convalescent camp.

CASE II.—Gunner P., No. 68311, *23rd Battery R.F.A.*, was admitted, having been wounded ten days previously. A shell burst near him, and a piece weighing about 2 lbs. hit

him, on the inner side of the left thigh. The wound was dressed ten minutes after the patient was wounded.

On admission the patient was suffering from a large superficial wound, 5 in. by $3\frac{1}{2}$ in., on the inner aspect of the upper third of the left thigh. The skin and subcutaneous tissues were absent, and the floor of the ulcer consisted of muscular structures. Antiseptic poultices were applied to the part for ten days, and then an attempt was made to graft the granulating surface, but this was only partially successful.

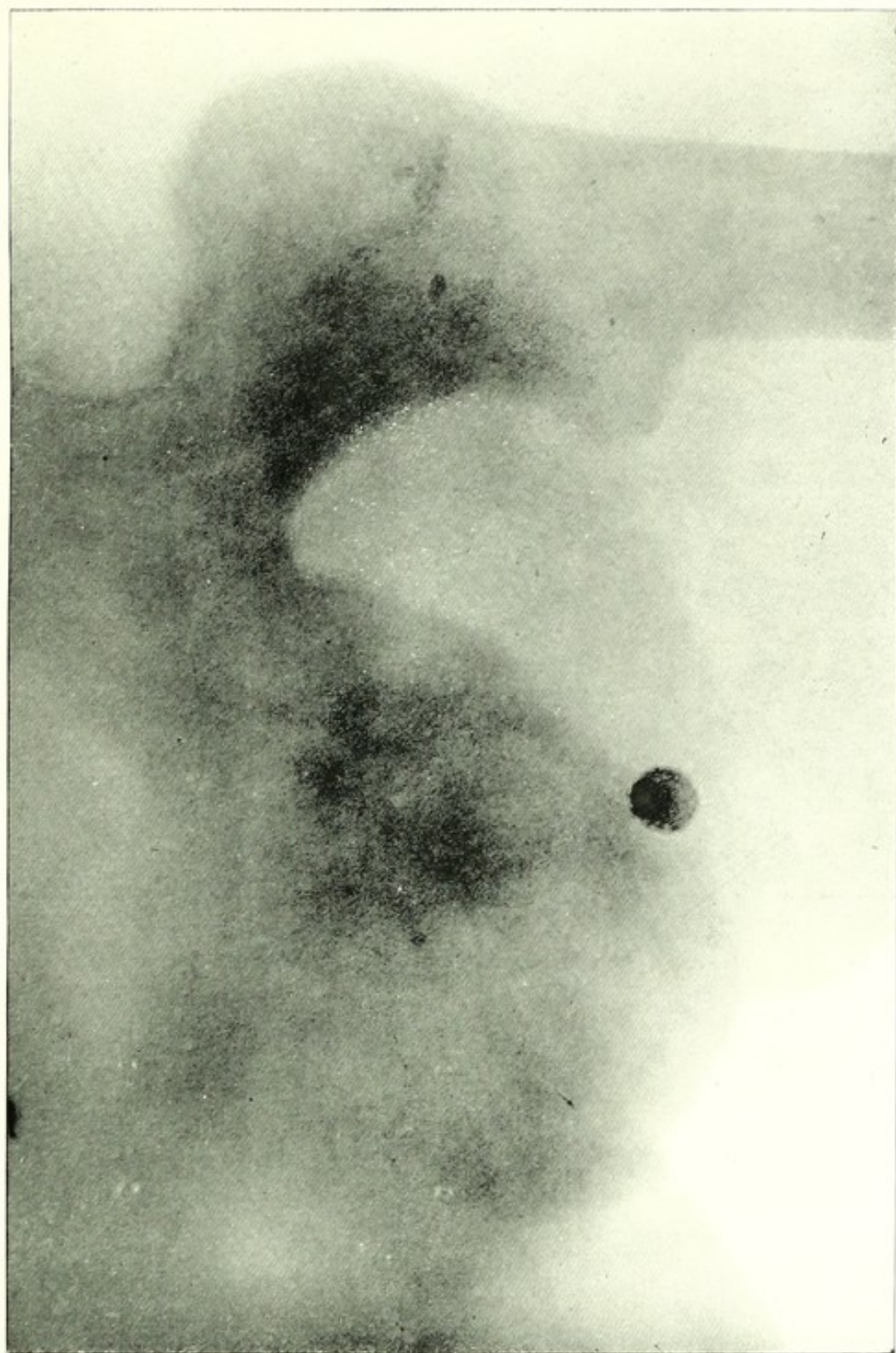
CASE III.—Trooper P., No. 1207, *Robert's Horse*—was a septic flesh wound of the buttock, the patient having been hit by a portion of a shell while engaged in scouting. Previous to his admission, an incision had been made midway between the posterior superior spine and the tuber ischii. After admission the patient was X-rayed, but no signs of any pieces of shell could be discovered. Six weeks later the patient was discharged with the wound healed, but he still walked with a slight limp.

CASE IV.—Private C., No. 4392, *Burmah Mounted Infantry*, was wounded at Spitzkop ten days previous to his admission. He was lying down when a shell burst on his left. A shrapnel bullet struck him over the left condyle of the femur. He was dressed in the field and then rode into camp. Next day he was sent to Heilbron, where he was treated for about eight days.

On admission, he complained of pain in the knee joint. There was a wound about the size of a shilling over the outer condyle of the femur towards its posterior part. The wound was septic, and there was a considerable discharge of pus. The skin around the wound was red, œdematous, and tender. There was also effusion of fluid into the knee

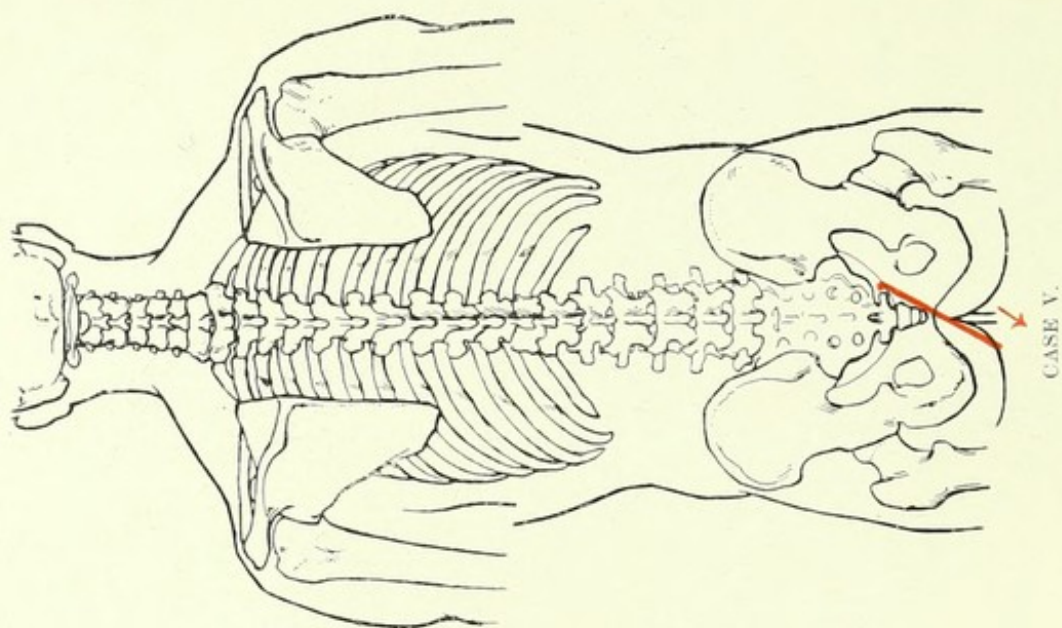
joint. On introducing a probe it went directly into the bone. An X-ray photograph was taken, and a shrapnel bullet was localised, lying rather posterior to the centre of the external condyle. Six days after admission, the patient was operated upon. An incision about four inches long was carried vertically upwards from the wound; the pus was cleared out and the wound thoroughly swabbed. The outer aspect of the external condyle was then exposed, the hole in it enlarged with a chisel, the bullet extracted, and the cavity in the bone swabbed out with pure carbolic acid. A fissured fracture of the lower end of the femur was discovered, but the wound did not communicate with the knee joint, and during the operation the joint was not opened. The cavity of the bone was lightly packed with iodoform worsted, and the wound partially closed. The cavity in the bone gradually closed, and seven weeks later the patient was discharged. He was seen later on the SS. *Dilwara*. He then complained of only a little weakness of the leg, flexion and extension at the knee joint being perfect.

CASE V.—Private J., No. 6658, 1st H.L.I., required operative interference. It was the only shell wound we saw which was not septic. Ten days previous to admission, the patient was retiring from the firing line, when he was struck by a shrapnel bullet, which entered one inch above and two inches external to the sacro-coccygeal joint on the right side. It passed downwards, inwards, and forwards, apparently passing just below the urethra. At the time the bullet struck him, he felt as if he had received a kick, and for an hour afterwards he felt severe shooting pains in the region of the perineum.

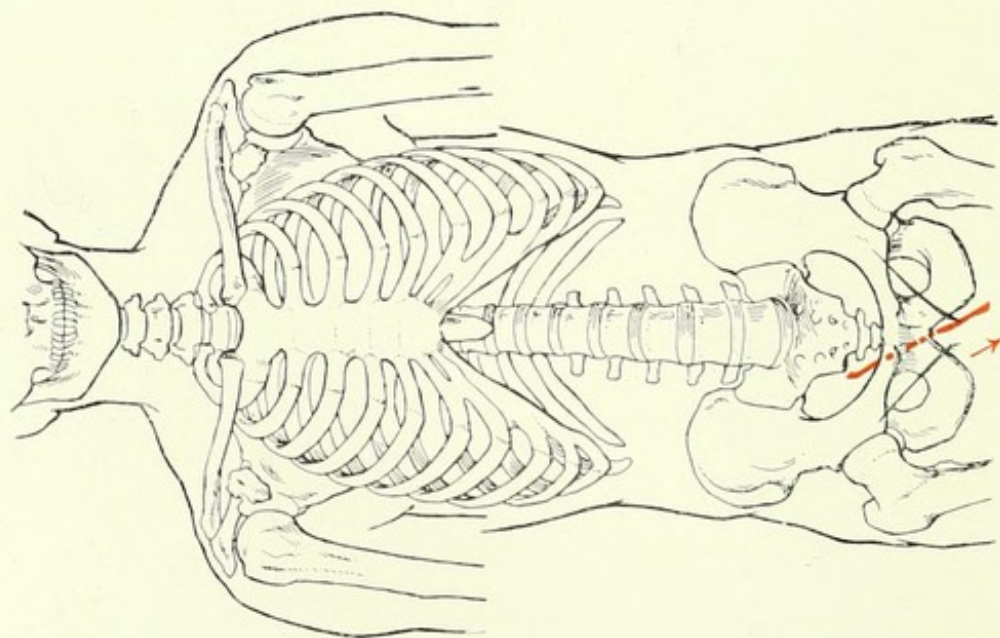


CASE V.—SHRAPNEL BULLET SITUATED IN INNER SIDE OF THIGH.

[To face page 44.



CASE V.



CASE V.

On admission the bullet could be felt lying on the inner aspect of the left thigh among the fibres of the adductor longus muscle. An incision was made over the bullet, the fibres of the muscle separated, and the bullet extracted. The muscle was drawn together with catgut stitches after the cavity had been swabbed out with carbolic, and the skin was stitched up. The wound was dressed six days later, and the stitches removed. The patient was up on the eleventh day after the operation, and returned to duty a week later.

BULLET WOUNDS.

A glance at the above cases will show that wounds due to exploded shells are of a very severe nature, and it will be seen that they compare very unfavourably with those which we are about to detail. Not only were the cases in almost every instance septic, but there was very marked laceration of the soft tissues, and in every case of bone injury there was great splintering of the bone. The fact that so much damage is done to the tissues at the time readily allows the wound to become septic; but further, there is no doubt that pieces of shell are much more liable than nickel-coated bullets, to carry infected material into the wound. These two causes are probably the explanation why so many shell wounds become septic.

The majority of wounds due to rifle bullets do not become septic if properly dressed at the time of injury, and unless they strike a bone, joint, or some vital part, the patient as a rule escapes in a wonderful manner, and is often quite fit a fortnight or three weeks after being wounded.

The cases of bullet wounds which were treated were 65 in number :—

Head and Neck,	. . . . .	6
Thorax,	. . . . .	8
Abdomen,	. . . . .	9
Extremities,	. . . . .	42

Bullet Wounds of Head and Neck.

CASE I.—Sergeant N., No. 508, *N.S.W. Mounted Rifles*, had had the tip of his nose shot off. He felt little pain, and there was little bleeding. There was no damage to the nasal chambers, and breathing was not impeded.

CASE II.—Private E., No. 1894, *H.L.I.*, was wounded ten days before admission. When first seen, there was a scalp wound, one and three-quarter inches in length, running downwards and backwards behind the right ear. The wound was in a healthy condition, but no attempt had been made to draw the surfaces together. It healed in a fortnight, and the patient was discharged perfectly well.

CASE III.—Lance-Corporal J., *H.L.I.*, suffered from a head injury, the wound involving the skull. He was wounded ten days previous to admission. The bullet had entered the frontal bone about two inches above the centre of the left eyebrow. The wound of exit was at the upper part of the right temporal region. The skull had been trephined, and on admission there was a large septic wound of the scalp and a fissured fracture at the upper angle of the wound. An angle of bone was projecting, but no portion of the brain could be seen. The case was treated with anti-septic dressings, and the wound contracted rapidly. A

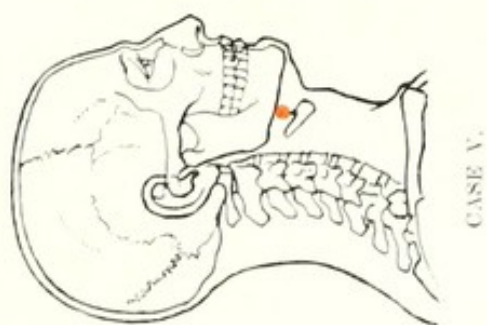
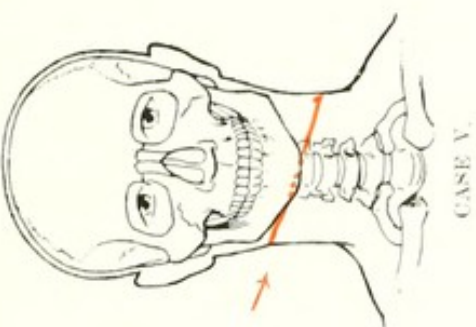
month after admission the wound was healed except at one part where the bone already mentioned was protruding from the cicatrix. This, however, was becoming gradually absorbed. The patient never had any symptoms of paralysis; vision was not affected, nor did he suffer from headache; his intelligence was unimpaired.

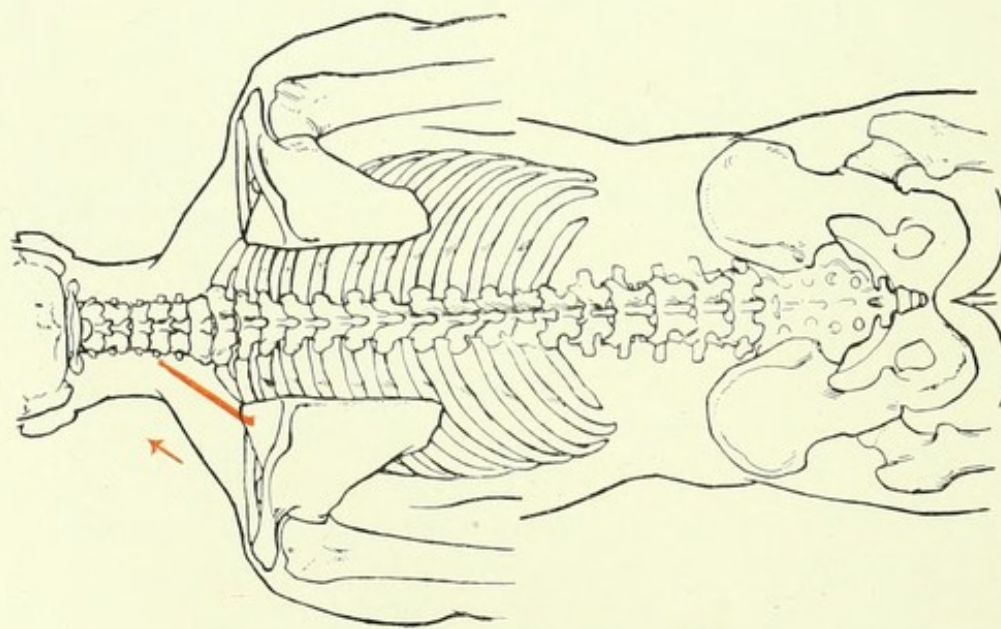
CASE IV.—Private O., No. 2417, *Royal Welsh Fusiliers*, had a wound of the neck. Seven weeks previous to admission, while retiring, the enemy being in the rear on the right flank, at a range of 600 yards, he was struck by a bullet in the back of the neck on the left side near the mastoid process. The bullet was supposed to have passed directly inwards. Previous to his admission he had been in four different hospitals and was X-rayed in one of them. On admission, a scar exactly one inch in length was found running outwards and downwards midway between the mastoid process and the middle line of the neck behind. The patient complained of pain in the region of the left parietal eminence. No signs of any head injury, however, could be discovered. The wound was probably a graze of the superficial structures, and had implicated one of the cutaneous nerves which caused the neuralgic pain over the parietal eminence. The patient was X-rayed on two occasions but nothing abnormal could be discovered. He was treated with sulphate of quinine, which relieved the pain, and three weeks after admission was discharged.

CASE V.—Drummer C., *7th Mounted Infantry*, was one in which the bullet had passed right through the neck. He was wounded ten days previous to his admission by a Mauser bullet, which entered the right side of the neck just below the ramus of the jaw, in a line with the anterior border of the

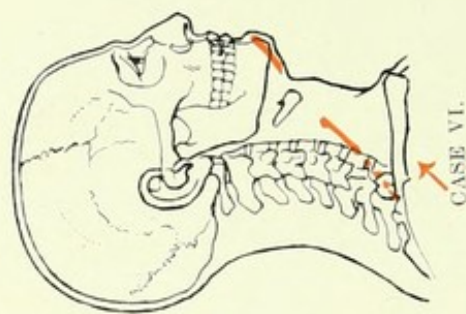
masseter muscle, and emerged at the posterior border of the left sterno-mastoid muscle, about its middle. At the time of the injury there was considerable bleeding from the wounds. The patient also vomited blood. The following day his voice became hoarse and he was troubled with an irritating cough. He continued to spit blood at intervals for two days. On admission, he complained of hoarseness and a troublesome cough. There was considerable induration around the wound of entrance, and marked tenderness about the cricoid cartilage. Laryngoscopic examination revealed nothing abnormal. The cords moved freely. The cough and hoarseness were relieved by medicinal treatment, and the induration round the wound of entrance began to disappear under inunctions of citrine ointment. The patient was discharged a fortnight after admission considerably improved, but there was still some huskiness of his voice.

CASE VI.—Private W., No. 4914, *2nd Berkshire*, was also one of injury to the neck as well as to the right shoulder and the chin. Three weeks previous to admission, the patient was scouting near the Vet River; he was approaching a kopje and was fired on; he retired; his horse was killed, and while on foot, at a range of about 500 yards, he was hit on the back of the right shoulder. He was in a crouching position at the time, with the head bent forward; the bullet passed out anteriorly between the trachea and inner border of the sterno-mastoid, and then through his chin. He crawled some yards and took cover behind an ant-heap. There was considerable bleeding at the time, both at the wound of entrance and from the mouth. All sensation was immediately lost in the right arm, but he did not notice any impairment of movement. An hour





CASE VI.



CASE VI.

later a Kaffir came up and gave him some water; this he swallowed with great difficulty, as by this time his neck had become considerably swollen. He was shortly afterwards taken to a Boer farmhouse, where he was kindly treated, and a German doctor dressed his wounds. The swelling subsided, and swallowing became easier. Eight days after the injury the patient was able to swallow without difficulty. To within a few days of admission he had no sensation in the right arm, and as a rule kept the arm slung in his coat. The condition on admission was as follows:—

The wound of entrance was a quarter of an inch external to, and one inch below, the upper end of the vertebral border of the scapula. The wound of exit was at a point an inch external to, but on a level with, the crico-thyroid membrane. The point of entrance on the under surface of the chin was midway between the symphysis menti and the hyoid bone, but half an inch to the right side, emerging again at the tip of the chin. All the wounds were then healed. The patient complained of pain two inches external to the right nipple at the end of inspiration. There was free movement at the shoulder joint. When he attempted to fully extend the right arm, pain was felt along the course of the ulnar nerve. Sensation along the front and inner side of the forearm, the palm of the hand, the ring and little fingers was impaired. There appeared to be slight wasting of the muscles supplied by the ulnar nerve. Passive movement and massage were used and there was slow but marked improvement. The patient was discharged a fortnight after admission.

Cases V. and VI. are excellent examples of what has

frequently been observed during the campaign, namely, that a Mauser bullet may pass through the region of large bloodvessels and nerves without doing serious damage.

Bullet Wounds of the Thorax.

Penetrating thoracic wounds are not necessarily attended by serious symptoms. The following are short notes of eight cases of bullet wounds of the thorax :—

CASE I.—Lance-Corporal R., No. 5728, 1st H.L.I., was wounded ten days previous to admission. The bullet struck the buckle of a belt he was wearing. The buckle of the belt inflicted a slight wound, and the bullet lodged in the subcutaneous tissue at the lower end of the sternum. The bullet was extracted, and the wound dressed on the field. On admission, ten days afterwards, it was completely healed. Beyond slight pain on taking a deep breath, there was nothing to note. The lungs were examined, and no abnormal physical signs were discovered. The patient was discharged ten days after admission.

CASE II.—Corporal F., No. 6076, 1st H.L.I., was wounded ten days before admission. While advancing, he was struck on the chest by a cross fire. He dressed the wound himself with a field-dressing at the time of the injury, but experienced difficulty in breathing, and a sharp pain ran downwards and forwards in a line with the injured rib. He walked four miles to camp where he was again dressed. The wound went septic. On admission, there were two wounds on the left side of the thorax about four inches apart, the bullet having probably grazed the ribs. There was still some discharge from the anterior wound, and on passing a probe the rib could be felt.

The wound healed a week afterwards, and the patient was discharged in a fortnight.

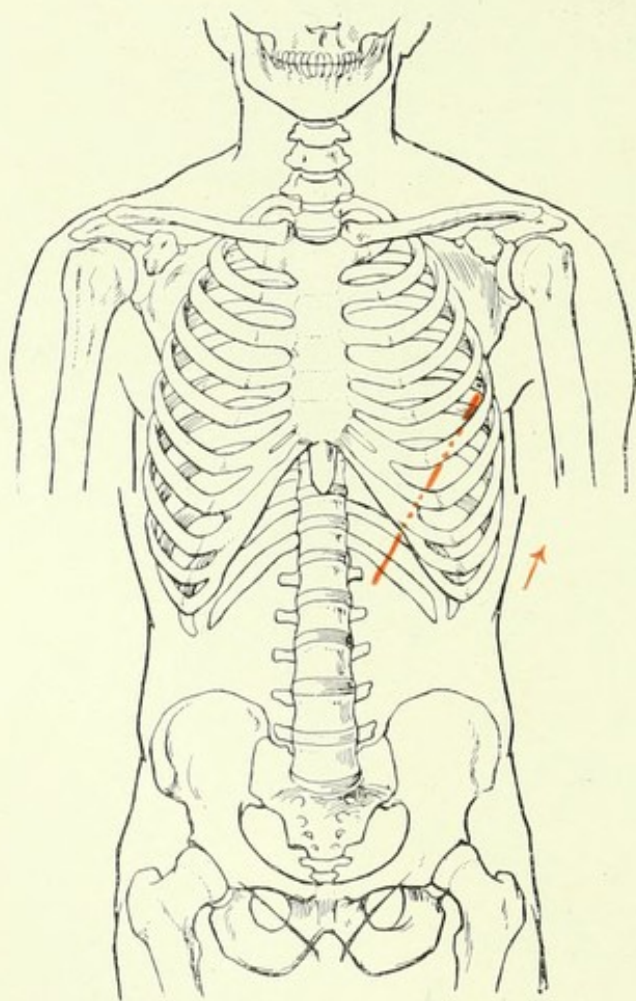
CASE III.—Private E., No. 5489, *K.O.V.L.I.*, was wounded two and a half months previous to his admission. While lying on his side firing he was struck by a cross fire, about 70 yards distant, in the region of the left scapula. He felt pain in his shoulder at the time. The left arm swelled up, and was useless for three weeks; it was massaged at Bloemfontein, and on admission all the swelling had disappeared. The patient was X-rayed at Pretoria, and he said he was told there were some fragments of the bullet seen in the region of the scapula. At that time he said he was too ill to be operated upon. On admission the wounds were completely healed. The wound of entrance was over the centre of the scapula. An inch below this there was another scar, which was supposed to have been the wound of exit. In the posterior axillary line, three inches below the axilla, there were scars of two small wounds, also said to be wounds of exit. The patient complained of great pain in the region of the scapula, and said that he was unable to sleep while lying on his left side at night. Movement of the arm appeared to be normal, but the grip of the left hand was markedly diminished. On palpation, absolutely nothing could be felt. The lungs were carefully examined and the physical signs found to be normal. He was X-rayed on two different occasions, and no signs of any fragments of bullet could be discovered. He believed that the bullet was an explosive one, but in all probability he had only been struck by some small pieces of bullet, the bullet having first struck a rock and broken into fragments, which caused superficial wounds.

CASE IV.—Lieutenant L., *R.F.A.*, was backing a horse when he received a bullet wound in the side. He did not feel much discomfort at the time, and continued his work for an hour and a quarter. He then fell down exhausted and lay for five or six hours before being carried away. He lost little blood. He was taken to hospital, where he remained in bed for about a fortnight. The only treatment previous to admission was a field dressing. No probing of the wound was attempted.

On admission, the patient complained of pain in the region of the entrance wound, also under the seventh costal cartilage three inches from the middle line. Lying on his left side caused pain posteriorly, immediately over the eleventh rib. One inch external to the scapula there was a small red cicatrix, oval in shape, and less than a threepenny piece in size. The lungs were carefully examined, and no abnormal physical signs detected. The patient was X-rayed, but no bullet could be seen. He was discharged to rejoin his regiment.

CASE V.—Private G., No. 5571, *1st R. Sussex*, was wounded three months before admission by a bullet from a cross fire from the right, the range being about 1000 yards. The bullet struck him two inches above and one inch external to the nipple, and passed horizontally and superficially across the chest till it emerged in the mid-sternal line. Patient fell down and felt very faint, the wounds bleeding considerably at the time.

The case is of interest from the fact that while being carried off the field in an ambulance the patient vomited about a pint of blood, and on three subsequent occasions on the same day he again vomited, each time bringing up dark



CASE VI.

[To face page 53]

clotted blood. On questioning him, he stated that the blood was slightly frothy, also that the vomiting of the blood eased the pain in breathing, which to begin with was considerable. After the first day he never vomited. The wounds healed, and seven weeks later he rejoined his regiment, but when on the march he was continually troubled with shortness of breath and pain in the lower part of the chest.

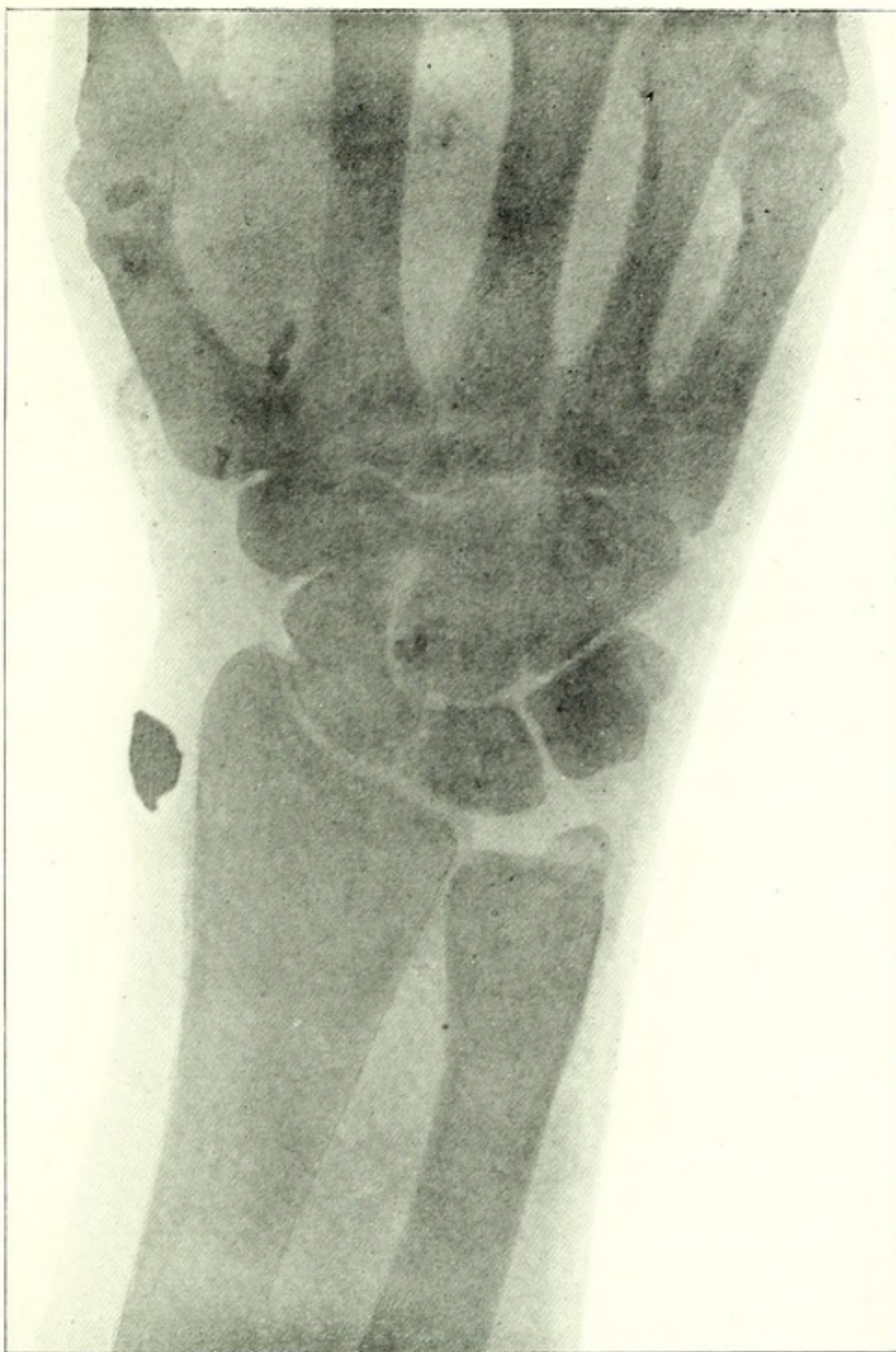
On admission the wounds were both healed and no fracture of the ribs could be detected. There was a slight tendency to keloid scarring in both wounds. Nothing abnormal could be made out in the lungs. The patient was of a neurotic temperament, and worried unnecessarily about his symptoms.

CASE VI.—Private M., No. 4176, *Royal Munster Fusiliers*, was wounded not only in the chest, but also in the arm. Twenty days before admission to hospital, he was advancing when he was struck by a bullet in the left arm. Soon afterwards, while in a semi-recumbent position, he received another wound through the left lung. Both wounds were dressed in the field, and both healed by first intention. For the first eight days after being wounded the patient spat up blood and thick mucus at intervals. There was considerable pain of a piercing character on taking a long breath. On admission to hospital the wound of the arm was found to be right through the biceps muscle. The wound of entrance in the thorax was just below the 12th left rib, two and a half inches from the middle line of the back. The wound of exit was found in the 5th left interspace anteriorly about four inches external to the nipple. The bullet must have passed through the left lung. On examining the lungs, no abnormal physical signs could be discovered. During the

patient's stay in hospital, he had a severe attack of ague; the temperature running up to 105° . The blood was examined during the attack, but no amœbæ were discovered. When the patient left hospital he was practically well.

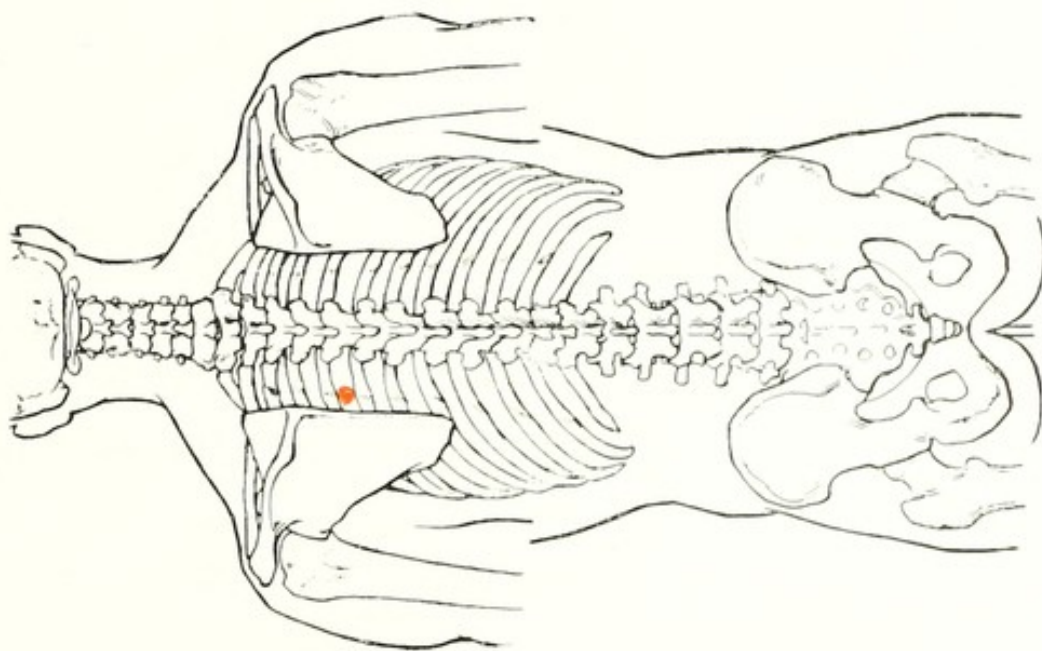
CASE VII.—Private F., No. 1825, *H.L.I.*, was shot through the chest and at the same time in the hand. Ten days previous to admission the patient was lying down in the firing line, when he was shot in the hand by what he thought to be a shrapnel bullet. This passed along the dorsum of the hand from the base of the index finger upwards towards the wrist. When retiring to get his hand dressed, he was shot in the back by a Mauser bullet: the bullet coming out in front. After being struck, he staggered for about 15 yards and then dropped. The range was about 650 yards. He was at Heilbron Hospital for a week.

On admission the patient was somewhat cyanosed. When lying in bed he was able to breathe quietly, but on assuming the erect posture dyspnœa came on. The wound of entrance was in the left side, a quarter of an inch internal to the vertebral border of the scapula about its middle. The wound of exit was represented by a short linear cicatrix, half an inch long, in the first intercostal space, one inch from the left border of the sternum. Both wounds were nearly healed. On examination of the chest posteriorly percussion showed the left side to be dull, the dulness being absolute from the spine of the scapula downwards. Breath sounds were much diminished, and vocal resonance wanting; ægophony was present at the angle of the scapula. When in hospital, the patient had several portions of shrapnel bullet removed from the back of the wrist.

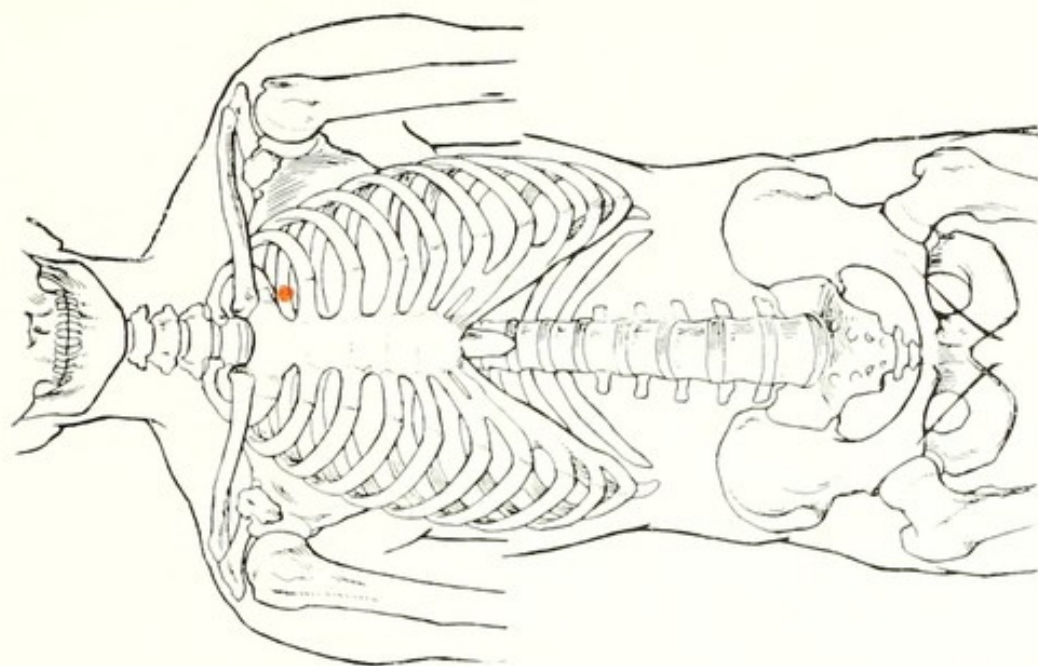


CASE VII.—PORTIONS OF SHRAPNEL BULLET IN NEIGHBOURHOOD OF WRIST.

[To face page 54.

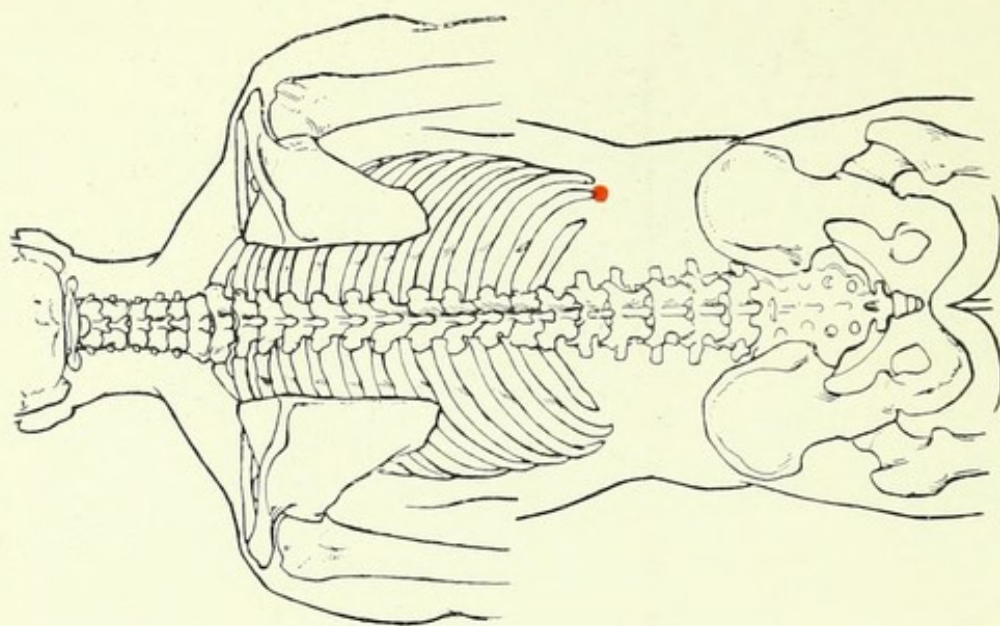


CASE VII.—WOUND OF ENTRANCE.



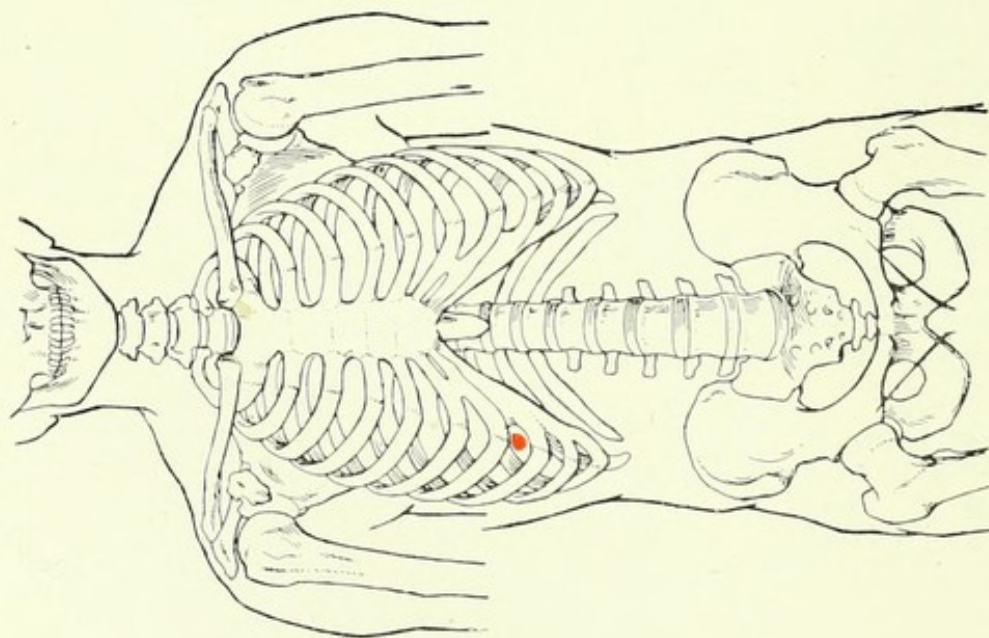
CASE VII.—WOUND OF EXIT.





CASE VIII.—WOUND OF EXIT.

(To face page 55.)



CASE VIII.—WOUND OF ENTRANCE.

He was discharged three weeks after admission, by which time all respiratory trouble had disappeared, but there was still dulness and diminution of the breath sounds and vocal resonance at the left base posteriorly.

CASE VIII.—Trooper G., No. 3052, 6th Inniskilling Dragoons, was not such a favourable one, the condition, unfortunately, being complicated with cardiac trouble. Nineteen days previous to admission, the patient was struck by a Mauser bullet at a range of about 100 yards. The anterior wound was situated on the right side in the mammary line just under the 7th rib, three and a half inches below the nipple. The posterior wound was found to be under the 11th rib, about an inch behind the posterior axillary line. On examining the chest the expansion on the right side was diminished but not entirely absent; vocal fremitus from the middle of the scapula to the base of the lung was absent on the right side.

Percussion.—There was dulness on percussion from the angle of the scapula downwards, and resistance was marked; breath sounds were greatly diminished, and also vocal resonance over this region.

Circulatory System.—The heart was found to be greatly dilated, especially the left ventricle; and organic murmurs could be heard in both the mitral and aortic regions.

Urine.—Specific gravity, 1022; reaction, acid; no albumen or other abnormal constituents.

On probing the anterior wound the probe passed backwards along the lower border of the rib for about an inch and a half. The probe was found to pass upwards and inwards for three and a half inches in the posterior wound, and could be felt to grate on bare bone in its passage, but

did not touch bare bone at the end of the sinus. Both wounds were septic. The patient suffered from breathlessness and orthopnœa. The day after admission the base of the right lung posteriorly was explored with a hypodermic needle. A syringe of clear blood-stained fluid was drawn off. The following day an attempt was made to aspirate the pleural cavity, but only a small quantity of fluid similar to the above could be drawn off. The fluid was examined microscopically and stained for organisms, but none were found. After the aspiration the effusion at the right base cleared up rapidly, and the patient was enabled to breathe more freely and to sleep more comfortably at night. Three weeks after admission, the patient suffered from a somewhat severe attack of jaundice. The jaundice was treated and in ten days the patient was much better. Two months after admission he was discharged to Cape Town. The cardiac murmurs were still present, but the pulse was much stronger and more regular. There was still, however, marked dilatation of the left ventricle. The posterior wound had completely healed. There was still a slight discharge from the anterior wound: the opening was small and just admitted a probe. The effusion at the right base had completely disappeared, but there were physical signs of adherent and thickened pleura.

Bullet Wounds of Abdomen and Pelvis.

CASE I.—Private F., No. 6479, *H.L.I.*, was about to lie down in the firing line, when he was struck by a bullet coming from the left flank at about 500 yards range. He applied the field dressing himself, and then walked about

three miles, where he obtained a horse and rode to a field hospital; from there he was sent to Heilbron Hospital, where he remained for eight days. On admission, a scar extended for about four inches across the front of the abdominal wall. It was quite superficial, and the patient suffered from no discomfort. There was, however, slight thickening round the wound. He was discharged in three weeks.

CASE II.—Corporal B., No. 5299, *6th Mounted Infantry, Bedfordshire Regiment*, was wounded five weeks previous to admission. While on horseback and wheeling round, he was hit in the front of the abdomen. He rode on, but soon after his horse was shot under him. He lay for about four hours, and then walked some distance, when he was picked up and taken into camp. There was some bleeding, but this had stopped when the patient was dressed in camp. He lay in a shed for a week, during which time he was not treated. There was considerable pain on any movement which necessitated the action of the anterior abdominal muscles. Eight days after being wounded he was taken to Heilbron, and the wound was again dressed. A large quantity of pus was evacuated through the wound of exit; the wound of entrance having by this time healed. When admitted five weeks after being injured, the entrance wound, a quarter of an inch below the umbilicus, was completely healed. The bullet had passed downwards and to the left, striking the anterior superior spine, and then passing up along the crest of the ileum, emerged about one and a half inches external to the anterior superior spine. There was marked thickening of the crest in that region. In all probability the bullet had not entered the abdominal cavity. The wound was

dressed and the sinus lightly stuffed with iodoform gauze. The wound healed in a week, and the patient was discharged a fortnight after admission.

CASE III.—Private M., No. 5896, 1st *Munster Fusiliers*, was wounded in the front of the thigh at a range of about 400 yards. While being carried off the field on a stretcher he was again shot through the abdomen, the bullet passing in at the tip of the 11th rib on the left side, the wound of exit being about one inch above the centre of Poupart's ligament. On admission both abdominal wounds were healed, but there was considerable pain along the track of the wound. The wound of the thigh had been septic, but when examined was granulating and fairly healthy in appearance. A week after admission the patient had an attack of hæmaturia. This, however, passed off, and the patient had no further urinary symptoms up to the date of his discharge three weeks later.

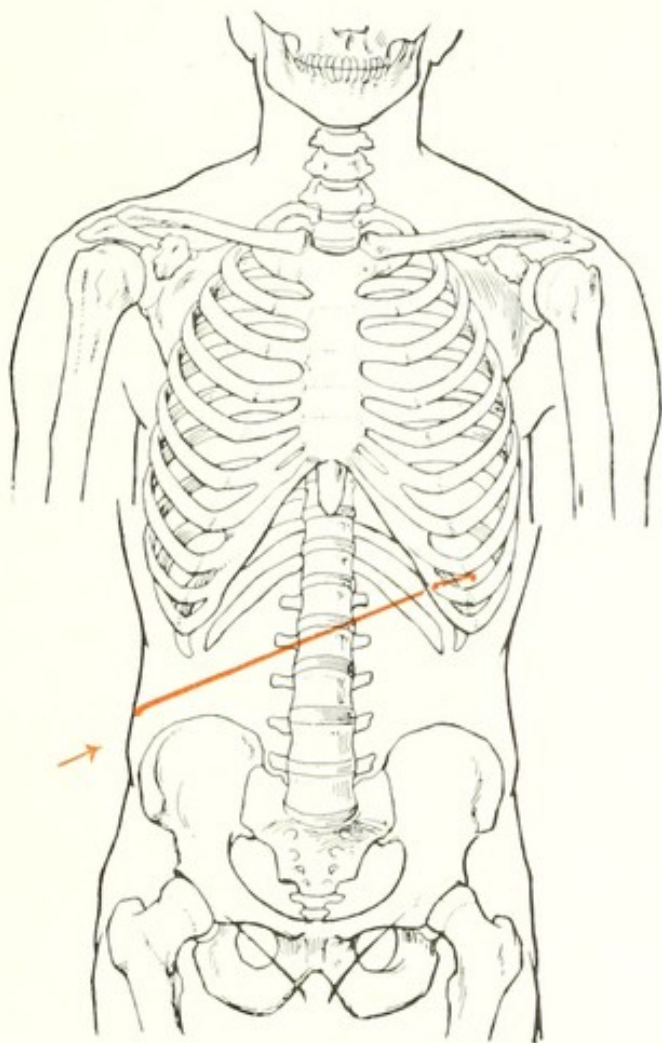
CASE IV.—Captain D., tends to show that the intestinal canal may be perforated by the modern bullet without the injury proving fatal, especially if the patient has been on a scanty diet previous to being wounded, and if, after being wounded, he refrains from eating anything for some days. This patient four months before admission was attending to a wounded man when he was shot through the abdomen by a Mauser bullet. The sensation experienced at the time was as if a hot iron had been thrust into the abdomen. He finished dressing the wounded man and then fainted. He lay on the field for about fifteen hours and was then carried in an ambulance for a distance of five miles to a hospital. There he was dressed, but refused all food that was offered to him. On the day previous to being wounded

the patient suffered from diarrhœa. He treated himself by abstaining from food, and due to this he thinks it probable that the intestinal canal was fairly empty. He continued to refuse to take food by the mouth for six days, only moistening his lips and tongue by sucking ice. Nutrient enemata were given. There was practically no bleeding from the wounds. For three days the patient's temperature ranged from 101° to 102° , and then fell to normal and remained so during the healing of the wounds, which occurred within a fortnight. There was no vomiting; no passing of blood by the rectum; no passage of flatus or fæcal matter by the wound. After lying in bed for a fortnight the patient got up for a little, and a week later, when taking a short walk, he felt a sudden pain over the seat of the entrance wound. The pain was intense; the patient went to bed; he began to retch, and continued to do so for about three hours, only a little mucus being vomited. He was treated by injections of morphia, and next morning was better. He had occasional recurrence of such attacks. When examined on admission the wound of entrance was found to be situated one inch below the costal margin and one inch to the right of the middle line. The bullet had passed from above downwards, backwards, and outwards, emerging one inch above the mid point of the right iliac crest. On the evening of 5th June, eight days after admission, the patient had an attack of abdominal pain following a slight indiscretion in diet. He lay on his back with the right knee flexed and the thigh flexed on the abdomen. Any attempt at extension caused considerable pain in the right iliac and lower part of the right lumbar region. The patient was treated with tincture of opium and castor oil, and the attack passed off.

On 15th June he was discharged to Cape Town to be invalided home.

CASE V.—Private Bell, No. 8, 1st *West Australians*, was wounded one month before admission. He was shot, first through the arm and then through the abdomen, at a range of about 40 yards. He was then carried on an ambulance to a barn where he lay for a week. From there he was sent to Heilbron; and from there on to Norval's Pont. He suffered little pain, but there were large areas of anæsthesia on the outer and anterior aspect of the thighs. When examined on admission, the wound of entrance was found to be just above the highest point of the crest of the right ileum. The wound of exit was in the 8th interspace an inch internal to the left anterior axillary line. The patient had no trouble with his bowels or urine.

Nervous System.—Pain was occasionally felt in both thighs on the anterior aspect. There was numbness on the antero-external aspect of the right thigh extending from the groin to the knee. This had been present ever since the patient was wounded. Sensation to touch was found to be markedly impaired, but not entirely absent, over an area on the anterior and outer aspect of the right thigh, commencing seven inches below the anterior superior spine and extending downwards for thirteen inches, stopping at a level with the upper border of the patella. The greatest breadth was seven and a half inches. On the left side there was a small area of hyperæsthesia on the inner aspect of the thigh, commencing at the external abdominal ring and extending down for six inches. There was impaired thermal sense, and sensation to pain was also impaired. Organic reflexes: no trouble with bowels or bladder. Superficial reflexes: epigastric and



CASE V.

[To face page 60.]

cremasteric marked, plantar absent. Deep reflexes: knee jerks present but not specially marked; no knee or ankle clonus. Voluntary motion was apparently unimpaired. While in bed during the first week the patient was in hospital sensation partially returned to the affected parts.

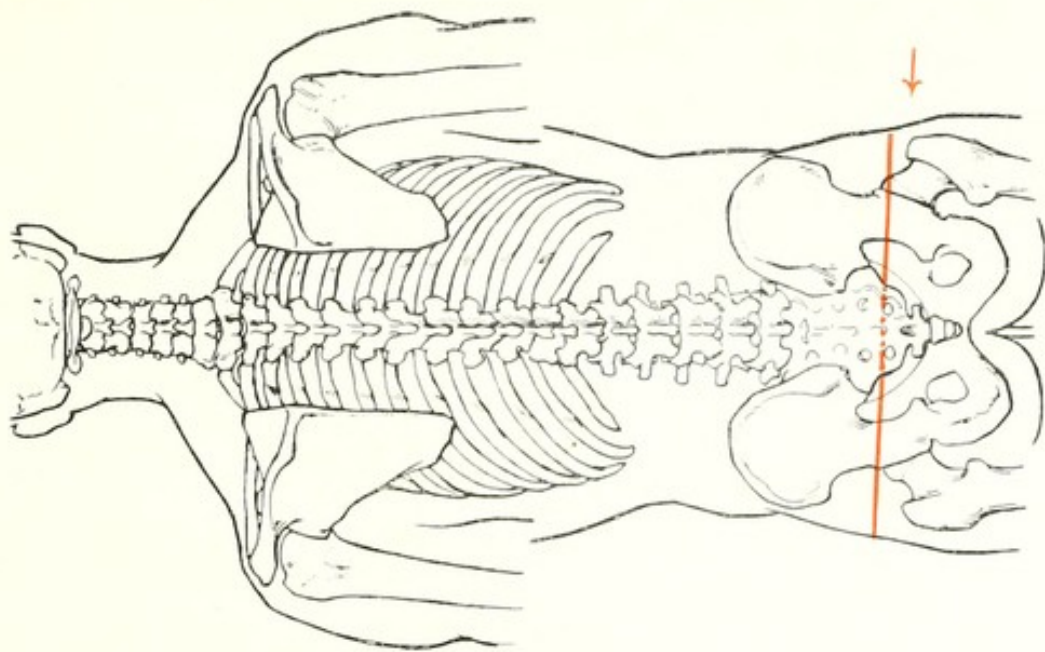
CASE VI.—Private B., *1st Munster Fusiliers*, was wounded seven weeks before admission when lying on his face. He was also wounded at the same time on the outer side of the left thigh. He continued firing for four hours and was then carried on a stretcher to a tent where the wounds were dressed. Previous to admission he was taken to Bethlehem, and then to Winburg. On admission the patient was in a very weak condition, and for three days after admission the temperature ranged from 102° to 104° . The wound of entrance was at the upper end of the left sacro-iliac joint. The margin of the wound was ulcerated and about the size of a sixpence. There was a free discharge of pus. On probing the wound, the probe passed downwards superficially to the sacrum for about two and a half inches, but no bare bone was felt. The wound of exit was two inches to the right of the sacro-coccygeal joint. It was similar to the above, but on passing a probe along the sinus bare bone could be felt. Sensation in both legs was normal and mobility good. On the outer side of the right thigh, in the region of the second wound, a veldt sore had developed. The wounds healed in a fortnight, and a week later he was discharged.

CASE VII.—Private D., No. 54, *1st West Australians*, was wounded seven weeks previous to admission. The bullet having entered the right side just over the sacro-sciatic notch, passed through the pelvis and emerged at the corresponding

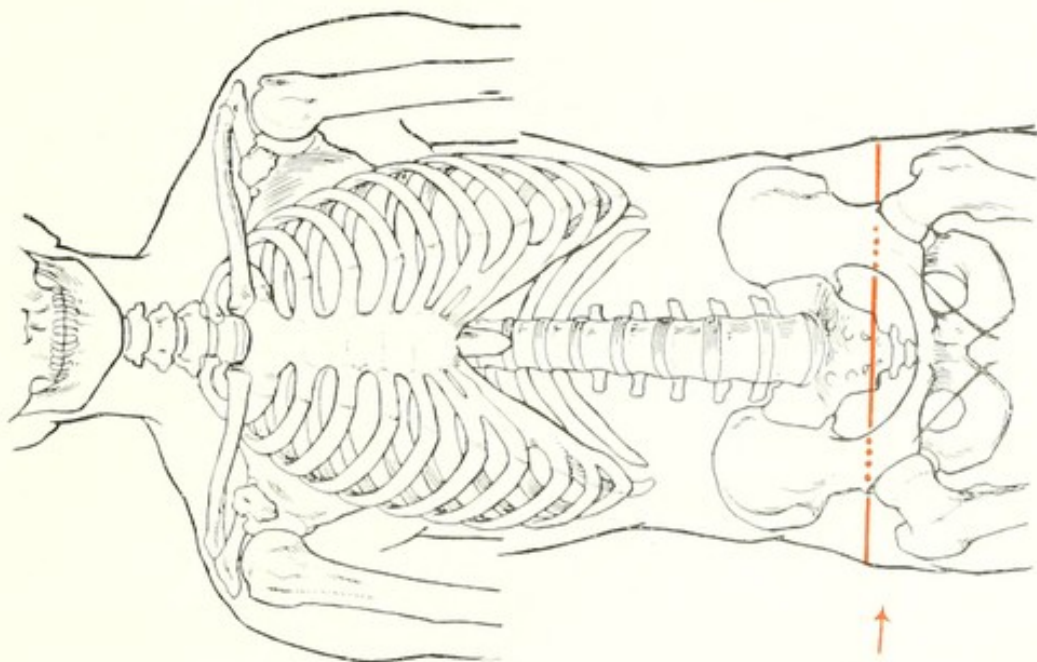
point on the opposite side. The patient was standing up at the time and was knocked over. There was loss of sensation and power of movement in the legs. The wounds both bled copiously; but the bleeding was arrested by a dressing which was applied about an hour afterwards. He was then carried to a field hospital, where his wounds were attended to. After a week he was able to move his right leg a little, although sensation was still impaired. At that time he was unable to move the left leg. Gradually the power of movement came back, more rapidly on the right side than on the left. Three weeks after being wounded both wounds were healed, and the patient was able to move about, the left leg at that time being still numb and stiff, and sensation in both legs still impaired. On admission movement and sensation had completely returned, and a fortnight later he was discharged.

CASE VIII.—Sergeant K., No. 933, *Cape Mounted Rifles*, was wounded two months previous to his admission. He was reconnoitring, mounted at the time, when he was struck on the back with a bullet from about 1200 yards range. He felt as if he had been suddenly kicked on the back and was thrown forward on to his horse's neck. A bandage having been applied, he rode on for about two miles, and then began to get faint, and for five miles he was driven in a cart into camp. The doctor who dressed the wound probed for the bullet, but could not locate it. The patient went to Fitzburg, where the wound healed six days after he was wounded. He never suffered from much pain, and from the history there was evidently no injury to the spine. Occasionally he has felt a throbbing sensation in the back, and sometimes a

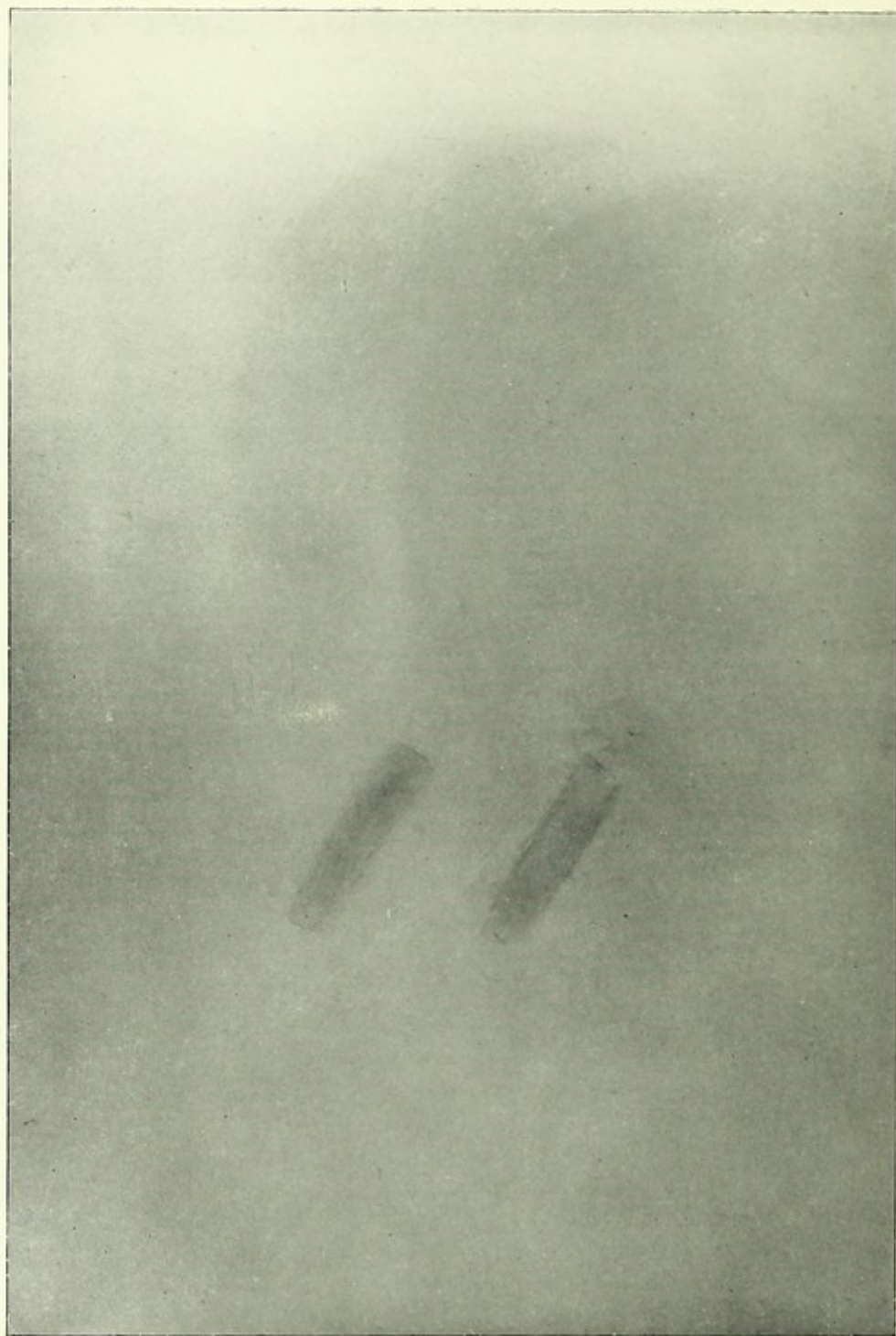
CASE VII.



CASE VII.







CASE IX.—LOCALISATION OF MAUSER BULLET BY DOUBLE PHOTOGRAPH.
Bullet situated to right of spine in lumbar region.

[To face page 68.]

sharp pain in the region of the wound when he bends forward or tries to lift a weight. Since the wound has healed he has been at four different hospitals in search of an X-ray apparatus. When examined on admission the scar of the wound of entrance was found to be a quarter of an inch to the left of the third lumbar spine; nothing could be felt, but the patient complained of pain at the level of the spine of the fifth lumbar vertebra.

The various systems were carefully examined, especially the nervous system. There was nothing to note except the fact that the knee jerks were slightly exaggerated. The patient was X-rayed; no signs of a bullet could be found, and the patient was discharged a week after admission.

CASE IX.—Corporal S., No. 291, *Canadian Mounted Rifles*, was wounded three months before admission. He was shot in the back at a range of about 1500 yards when returning to his regiment, having carried despatches to another camp. After being wounded he rode on for about four miles. When he got to his regiment he was dressed by his doctor and later sent to the Johannesburg Hospital; then to Verinigen; after that he rejoined his regiment and remained with it for about two months doing light work, as he was unable to ride. He reported sick at Middlesburg; from thence he was sent to Pretoria; from there to Springfontein; and then to the Edinburgh Hospital. When examined on admission the wound of entrance was marked by a small red cicatrix between the lower costal margin and the crest of the ileum. An X-ray photograph showed the bullet to be on the right side of the spine, and it was calculated to be four and a half inches from the surface. The patient was chloroformed; a vertical incision was

made along the margin of the left erector spinæ muscle four and a half inches in length; the transverse processes were exposed; a finger introduced, and the parts carefully explored. The bullet could not be felt. The wound healed by first intention, and the patient was discharged three weeks after the operation.

Bullet Wounds of the Upper Extremity.

CASE I.—Trooper R., No. 10466, 15th I.Y., suffered from a graze across the back of the fingers about half an inch below the knuckles. The extensor tendons were evidently not touched. The patient was discharged a week after admission.

CASE II.—Private W., No. 5187, 2nd West Kent Regiment—was due to a revolver accident. Eleven days previous to admission the patient was cleaning a revolver and accidentally pulled the trigger when the right hand was over the muzzle. The bullet entered just above the lower end of the ulna, and, passing through the carpus towards the web of the thumb and first finger, emerged through the palm of the hand an inch above that point. From the history the case had evidently gone septic, but on admission both wounds were almost healed. Passive movement was begun at once. An interesting point in connection with the case was that an X-ray photograph of the hand and wrist showed nothing abnormal. When the patient left hospital a fortnight after admission the movements and use of the hand had greatly improved.

CASE III.—Private L., No. 6699, 1st H.L.I.—was also a bullet wound in the hand, but the result, unfortunately, was not so satisfactory. He was wounded ten days previous to admission. He was treated in the field hospital and then sent



CASE V.—FRACTURE OF METACARPALS DUE TO A MAUSER BULLET.

[To face page 65.]

on to Norval's Pont. On examining the hand, the wound of entrance was found to be on the ulnar side near the proximal end of the first phalanx of the little finger. It discharged pus, and bare bone could be felt on probing. The bullet had traversed the hand almost horizontally, as the wound of exit was situated at the distal end of the metacarpal bone of the middle finger. Here, also, bare bone could be felt on probing, and there was a discharge of foul pus. The hand was considerably swollen, and the patient was unable to move the middle, ring, or little fingers. An X-ray photograph showed that the proximal end of the little finger was fractured, and also the distal ends of the third and fourth metacarpals. As no improvement resulted from antiseptic poultices, the patient was chloroformed ten days after admission; the sinuses were slit up and thoroughly explored, scraped with a sharp spoon, some necrosed bone removed, and the various cavities touched with pure carbolic. The patient was kept in hospital for six weeks, and when discharged there were still three small sinuses, but he was able to slightly move all the fingers.

CASE IV.—Colour-Sergeant S., No. 4187, 2nd M.I., had a flesh wound in the back of the right forearm, the bullet having passed between the skin and the extensor tendons. The wound soon healed, and the movement of the extensor tendons was not impaired. This patient had been previously wounded by a shrapnel bullet in the hand.

CASE V.—Private M., No. 2386, 1st H.L.I., was one in which the bullet entered just below the olecrean process, and passing down the arm for about four inches, became superficial. The tendons were not involved. There was marked thickening along the track of the wound; the

patient had been wounded ten days previously. This wound healed rapidly.

CASE VI.—Private C., No. 2977, *H.L.I.*, ten days before admission, while lying down in the firing line, was struck on the forearm by a bullet which was thought to be a Martini-Henry. The bullet passed right through the forearm; the range was probably about 500 yards. When examined, the wound of entrance was found on the posterior aspect of the forearm at the junction of the upper and middle thirds. The wound of exit was on the anterior aspect of the arm in front of the middle of the radius, which was fractured. The wound was septic, and discharging a considerable quantity of pus. Antiseptic dressings having been applied, the arm was put up in splints. Some fragments of bone came away in the discharge. An X-ray photograph showed a fracture of the radius with some loss of substance. Five weeks after admission the patient was discharged. The posterior wound had healed; the anterior wound was still open, but there was little discharge; the radius had not at that time united.

CASE VII.—Gunner M'C., No. 84484, *Royal Field Artillery*, five weeks before admission, when in a kneeling position, was struck in the region of the left knee; while retiring, he was shot in the right arm, the bullet passing through the humerus and fracturing it; the range was about 400 yards. Before being admitted, he had been treated in several hospitals. On admission, the wound of entrance in the arm was found to be at the junction of the lower and middle thirds of the biceps muscle. The wound of exit was about the middle of the triceps posteriorly, the bullet having fractured the humerus in its passage. The wounds were healed; the arm could not

be fully extended; the musculo-spiral nerve was not implicated; but on an attempt being made to straighten the arm the biceps muscle became very tense; flexion, however, was perfect. The treatment consisted in massage, passive movement, and weight carrying. The patient left hospital considerably improved.

CASE VIII.—Private D., No. 6287, *Munster Fusiliers*, was one of a similar nature, and was greatly benefited by operative interference. He had been wounded some time (two months) before admission. While in the act of fixing his bayonet, the right arm being bent at an angle of 45° , he was struck by a Mauser bullet at a range of about 1200 yards. The bullet entered the biceps one inch above the bend of the elbow, and the wound of exit was one inch above the olecranon process. There was a numb pain at the wound of entrance, which lasted for about a day, and he could not straighten his arm. He walked to the field hospital about half a mile away; the wound bled considerably, and a first-aid dressing was applied. When in hospital the arm was put at a right angle in a sling. No attempt was made to straighten the arm. Six days later the wound was dressed at Heilbron; and from there the patient went to Springfontein. In ten days the wound completely healed; the arm was taken out of the sling, and the patient found that he could not straighten it; passive movements were attempted but were of little use; he was sent down to the Edinburgh Hospital in order that the elbow might be X-rayed. When admitted, both wounds were quite healed; the grip was weak; movements of the fingers and wrist were good; sensation was good; and there was very little wasting of the muscles of the forearm. As in the previous case flexion was

almost perfect, but owing to the swelling underneath the tendon of the biceps the arm could not be fully flexed. Pronation was good, but supination was not perfect; the arm and hand could not be extended beyond an angle of 45° ; the tendon of the biceps was thickened and contracted, and a hard mass could be felt underneath it, just above the bend of the elbow. An X-ray photograph showed a mass of callus just above the bend of the elbow on the anterior aspect of the humerus. Operation: an incision was made along the outer side of the biceps tendon; the outer edge of the biceps muscle, and the inner edge of the supinator longus muscle were defined; the projecting callus was then exposed by separating the fibres of the brachialis anticus muscle. The bony excrescence was freed from the surrounding parts, gouged off at the base, and removed. The arm was then forcibly and steadily extended; several fibrous adhesions in the region of the joint being in this way broken down. The joint itself was not actually implicated. The wound was stitched up; a splint was applied; and the arm put up in the fully extended position. The wound healed by first intention. Passive movement was begun ten days after the operation. The patient was encouraged to carry weights during the day, and a fortnight later was discharged.

CASE IX.—Private R., No. 5910, 1st *H.L.I.*, was wounded ten days before admission, the bullet passing through the biceps muscle of the right arm. The wound bled considerably, and the whole arm was paralysed at the time. Since then sensation and power of movement had gradually returned; but on admission there was still pain along the line of the ulnar nerve; the wounds were perfectly healed.

The treatment consisted in massage and passive movement. The patient was discharged a fortnight later.

CASE X.—Trooper R., No. 10467, *I.V.*, was a superficial wound of the upper arm, which passed externally to the humerus, midway between the shoulder and elbow joints. The range was said to be about 300 yards. The patient had been wounded thirteen days before admission, and when admitted both wounds were quite healed; there was still some stiffness and pain on moving the arm.

CASE XI.—Sergeant M'P., No. 4738, *1st H.L.I.*, was one in which a bullet had passed through the axillary border of the pectoralis major. The patient was wounded ten days before admission, and when admitted the wound was practically healed.

Comparing the above cases with the shrapnel wounds of the upper extremity, it will be noted that the laceration of the soft parts was not nearly so severe, and in those cases in which the bone was fractured there was little shattering of the fragments compared with that seen in fractures due to shell wounds.

CASE XII. is mentioned under Shell Wounds.

Bullet Wounds of the Lower Extremity.

CASE I.—Private A., No. 2970, *H.L.I.*, was wounded seventeen days before admission. The wound of entrance was on the outer aspect of the base of the fourth metatarsal bone. The wound of exit was in the centre of the sole of the foot. The wounds, unfortunately, on admission, were septic. When the patient was discharged three weeks later, both sinuses were still open, and the foot was still somewhat swollen and œdematous.

CASE II.—Private B., No. 2810, *H.L.I.*, was wounded at Spitzkop, ten days previous to admission. The patient was lying down in the firing line, when he was struck on the outer side of the ankle joint by a bullet from a cross fire, the range about 650 yards; he lay on the field till it was dark, when he was picked up. He was treated at Heilbron for a week, and then sent down to Norval's Pont. When examined, the wound of entrance was found on the posterior border of the fibula, two inches above its lower end. The wound of exit was on the inner margin of the sole of the foot, immediately below the tubercle of the scaphoid. The movements at the ankle joint were quite free, and the wounds were both healed. Apparently there was some thickening of the lower end of the fibula. An X-ray photograph was taken, but nothing abnormal was noted. The patient was discharged three weeks after admission, the movement at the ankle joint being perfect.

CASE III.—Private M'L., No. 3410, *H.L.I.*, was struck by a cross fire ten days previous to admission. When admitted, the wound of entrance was seen behind the fibula four inches above the external malleolus; the wound of exit immediately behind the internal malleolus. Both wounds were scabbed over. The muscles of the calf were massaged, and the patient discharged a fortnight after admission, the wounds having completely healed.

CASE IV.—Private S., No. 4030, *Royal Irish Fusiliers*, was injured in a peculiar manner. Two and a half months before admission he was engaged burning about 700 Boer rifles. Some of the rifles were loaded. When piling them on the fire, there was an explosion, and the patient was shot simultaneously in the right foot and the right leg. The

following morning five pieces of a lead bullet were removed from the wound in the foot. In another hospital he was X-rayed and told that there was a bullet in the leg and part of one in the foot. He was sent to a hospital in Johannesburg; then to Springfontein; and, lastly, to the Edinburgh Hospital. The wound in the right leg was on the anterior surface, and about five-eighths of an inch long and quite healed. Both the leg and the ankle were X-rayed, but no bullet was seen. The patient was discharged.

CASE V.—Trooper U., No. 4600, *Robert's Horse*, was wounded at Bethlehem ten days before admission: for five days the patient was in a bullock waggon; and for other five in a hospital or in the train. On admission the wound was found to be septic, the wound of entrance being in the middle of the calf at the lower end of the popliteal space. The track of the bullet was found to run inwards and downwards. The bullet had passed out a little below the inner head of the gastrocnemius. The patient was unable to fully extend the leg at the knee. The wound was dressed regularly, and a fortnight after admission the patient was allowed to get up, a posterior splint having been applied to the leg. In four weeks the wounds were perfectly healed. There was no contraction, and the patient was able to walk without aid.

CASE VI.—Private H., No. 2994, *1st Royal Munster Fusiliers*, was wounded three weeks before admission, the bullet passing through the left leg and the right great toe. The next day the nail of the right toe had to be removed; the toe at the time was painful and very much swollen. When admitted the toe of the right foot was swollen, and

there was a sinus on the dorsum of the last phalanx from which pus was discharging. On the left leg there was a cicatrix indicating the wound of entrance, just over the head of the left fibula. The wound of exit was also shown by a small cicatrix on the inner aspect of the upper third of the calf. There was very little contraction of the calf muscles. The patient was given chloroform, and the sinus on the big toe was enlarged and cleaned. The distal phalanx was removed subperiostially, and the wound swabbed out with pure carbolic acid and stuffed. On the day of discharge, fifteen days after the operation, the wound was looking healthy and healing rapidly.

CASE VII.—Private A., No. 81, 1st *West Australians*, was wounded five weeks before admission, when in the act of dismounting. The bullet passed from the inner side of the calf to the outer. There was considerable bleeding, but this was stopped by a dressing. When he was shot, he was knocked over and had to be carried to camp on a stretcher. He was treated for a week in a barn on the veldt, where the wound was twice dressed. He could not move his leg for a fortnight after the injury, but after that he could move about a little. In three weeks both the wounds had healed; there was still considerable stiffness and pain when the muscles of the calf were moved. There was no loss of sensation in the leg at the time of the injury, and the stiffness has gradually been passing off. The bullet had evidently passed through the *gastrocnemii* and had just grazed the back of the fibula. Some callus could be felt at that point; some fibrous thickening could also be felt along the course of the bullet; the calf muscles were stiff, and the patient complained of pain on movement. The treatment consisted in passive exercises,

and the patient was discharged with a freely movable ankle a fortnight later.

CASE VIII.—Private B., No. 2961, *2nd Lincolns, 7th M.I.*, was hit in the calf of the leg by a cross fire, the range being 600 yards. He felt a severe shock in the leg, and there was a shooting pain which passed down to the foot. The bullet entered on the inner side of the leg. Both wounds, especially the outer one, bled profusely. At first the patient felt a numbness in the whole of the leg below the wound; he crawled for 40 yards, when a first-aid dressing was applied by a comrade; this did not, however, stop the bleeding; he was helped on to his horse and rode for about half a mile, but the pain was so great that he had to dismount; he was then picked up by a doctor and stretcher party; the bleeding was stopped and the wound dressed. The wound must have been very septic, as the discharge used to make its way through the dressing, a few hours after the wound was dressed. While at Heilbron an incision was made on the outer side of the calf below the wound of exit and a drainage tube inserted. He remained in hospital there for another week, and was then sent to the Edinburgh Hospital. On dressing the leg the wounds of entrance and exit freely discharged pus; also the incision in the calf, which was about an inch long and at a lower level than the wound of exit. The tendo Achillis was markedly contracted, and the patient was unable to put his foot at right angles to the leg; the knee joint could be freely moved. The treatment consisted in syringing out the septic cavities, which burrowed underneath the superficial calf muscles, with corrosive lotion, and inserting drainage tubes. No attempt was at that time made to get the foot into good position. The

wound was flushed out and dressed regularly. Seven weeks after admission all the wounds were healed and there was no pain or tenderness: he could fully extend the leg at the knee and put the heel to the ground.

The three following cases were all complicated with bone injury, the last one being in a very critical state of health for about a fortnight after admission.

CASE IX.—Gunner L., No. 31962, *R.F.A.*, is peculiar from the fact that he was wounded on the front of the tibia by a bullet which itself caused little injury, but it struck a knife which the patient had stuck in his stocking, the handle of the knife splintered, and a large splinter ran into the front of the tibia. This splinter was removed at the time by the patient. When admitted, the wound had healed to a certain extent, but there was a discharging sinus, and on probing this bare bone could be felt. The wound was slightly enlarged, and two sequestra removed, the septic cavity swabbed out with pure carbolic and stuffed with iodoform worsted and allowed to heal from the bottom. This took some time, and when the patient was discharged five weeks later the cavity was completely filled up, but there was still a granulating surface at the seat of injury.

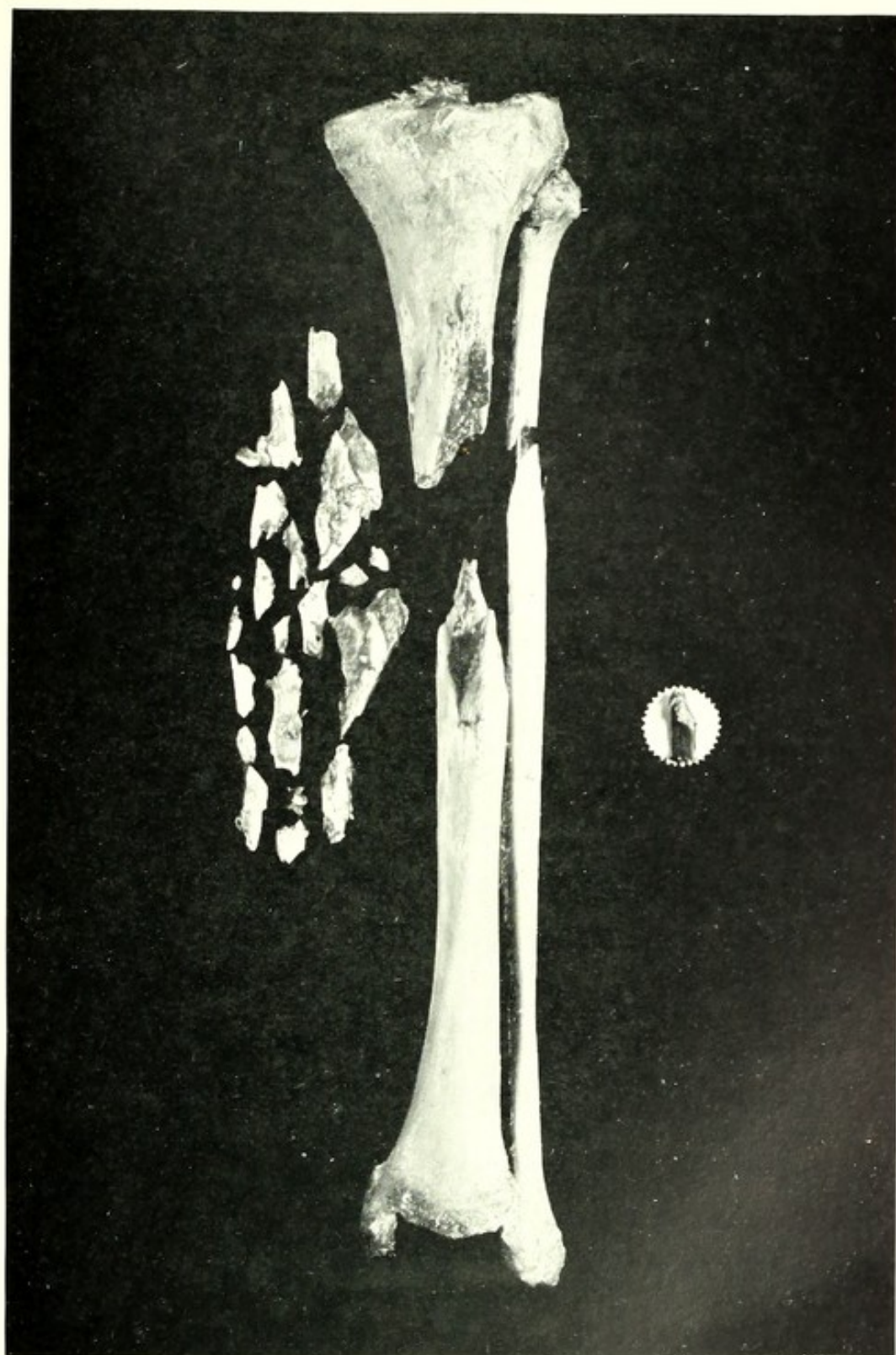
CASE X.—Private D., No. 3237, *1st H.L.I.*, was one of a compound fracture of the left tibia. Ten days previous to admission the patient was bending over a wounded man with his back towards the enemy when he was struck by a bullet which entered at the inner and posterior aspect of the left leg, and came out through the tibia. The range was about 400 yards. He was carried off the field by an ambulance, and suffered great pain. During the night he slept in a

farmhouse with no support to the leg, the pain being very severe. Next morning rough splints were obtained, and two days later proper splints were applied at Heilbron Hospital. He stayed there a week, during which time the wounds were not again dressed. On examination, both the wounds of entrance and of exit were nearly healed, and the tibia was in fairly good position. The wounds were dressed three times, and at the end of a week were completely healed. The limb was then put up in silicate of potash, and the patient discharged to Cape Town.

CASE XI.—Trooper F., No. 10220, *37th Bucks Yeomanry*, had the leg amputated through the knee joint. Ten days previous to admission, when advancing towards a farmhouse while patrolling, the patient had his horse shot under him at close range. He was then hit in the right hip, the bullet passing through the hip and the left testicle. A few minutes later he was hit on the left leg, both bones of which were fractured. After a time the Boers came out and took him into the farmhouse. There was not much bleeding from the wound in the hip, but there was considerable bleeding from the left leg. He was left lying in a shed for 38 hours, no dressing of any kind being applied. After that a doctor removed him in an ambulance. He was taken to camp, given chloroform, the wounds dressed, and splints applied to the fractured limb. The wounds in the hip and testicle rapidly healed. At intervals of two days the left leg was twice dressed under chloroform, and then the patient was sent down to the Edinburgh Hospital. On admission, the temperature was 101° , the patient was extremely weak and exhausted; the wound of entrance in the region of the hip was shown by a scar three and a half inches posterior to and two

inches below the upper edge of the great trochanter; the bullet had also passed through the right testicle, which was much swollen and very tender. There was a large gaping wound on the inner side of the gastrocnemius muscle of the left leg, from which a copious discharge of very fetid pus escaped. Another irregular gaping wound was seen on the front and outer side of the tibia; there was marked cellulitis round the wound; on passing the finger in masses of splintered bone could be felt, and a gap of several inches could be made out between the upper and lower fragments. The patient's strength was maintained as far as possible, and three days after admission the wound was very thoroughly examined and dressed under chloroform. Two days afterwards, he was put under chloroform and the leg amputated through the knee joint by antero-posterior flaps. The wound was then thoroughly douched out with strong antiseptics, a tube was inserted at each corner, the patient was put back to bed, and the stump put on a lead splint. A saline enema with brandy was given immediately the patient returned to the ward. During that night and the next day the patient was kept going with brandy, strychnine, milk, and saline rectal injections. The evening after the operation his temperature, which had been 102° the night before, went up to 104.8° . In spite of the endeavour to purify the parts sepsis persisted, but after some weeks the patient made a good recovery.

The photograph shows the great shattering of the bone. The bullet at the side was found among the tissues. The patient was satisfied that he had been struck by an explosive bullet, but in all probability the bullet, a Mauser, had first struck either a rock or a stone, and then entered the patient's leg.



CASE XI.—COMMINUTED FRACTURE OF TIBIA AND FIBULA.

The Bullet (distorted Mauser) which caused injury, to right of photograph ; fragments of Bone to left.

[To face page 76.

The five following cases were all injuries in the region of the knee joint :—

CASE XII.—Drummer G., No. 5859, *2nd Seaforths*, was one of a man who had been wounded at Magersfontein nine months previous to his admission. He was wounded in the left leg in two places; one bullet passing right through the lower end of the femur, the other grazing the outer surface of the leg about its middle. He was taken to Modder River Hospital, and then to Wynberg. He returned to Bloemfontein about five months ago, and since then has done a considerable amount of marching. During this time he suffered considerable pain in the left knee, especially at night after a march. Ten days previous to admission he reported sick and was sent down to the Edinburgh Hospital. The wounds of entrance and exit were quite visible: the wound of entrance half an inch above the upper border of the patella; the wound of exit three and a half inches above the line of the joint behind—between the hamstring muscles. The bullet must have passed very close to the popliteal vessels. The movement of the joint was found to be good; there was slight thickening of the femur immediately above the condyles, and marked effusion into the knee joint, otherwise the patient was quite healthy. The treatment consisted in the application of a fly blister and a posterior splint. The effusion was soon absorbed, but the patient still complained of pain at the upper part of the joint above the patella. He was discharged a fortnight after admission.

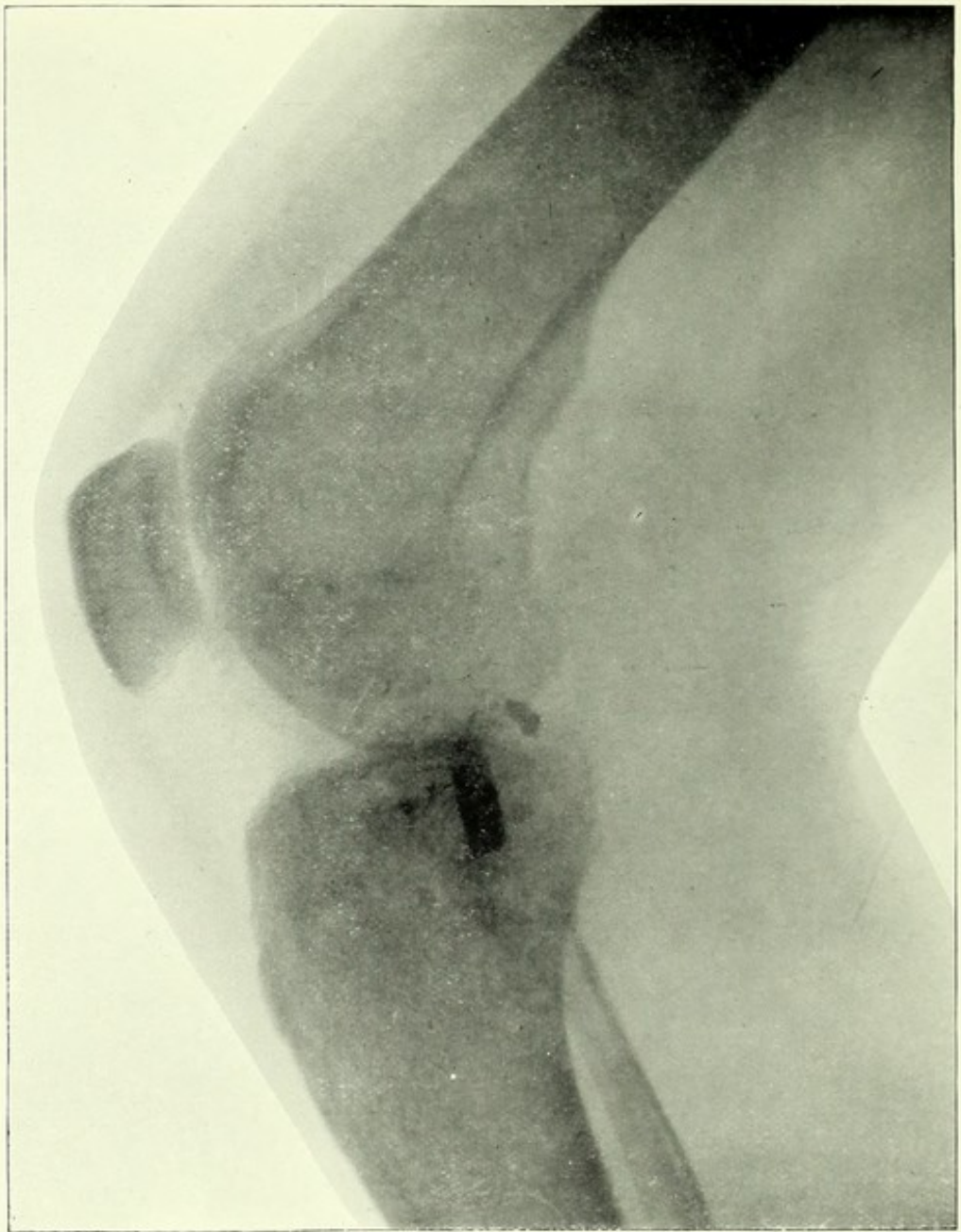
CASE XIII.—Private H., No. 2595, *Royal Irish*, was struck on the right knee by a Mauser bullet at a range of about 700 yards nearly two months before. The bullet lodged on the inner side of the knee joint, and was extracted the morning

after the patient was wounded. When examined, the knee joint was found to be stiff; the wound was superficial and granulating; the joint could only be moved through an angle of about 30° . The leg was kept at rest to allow the wound to heal.

CASE XIV.—Private K., No. 2893, *1st H.L.I.*, was wounded on the inner side of the left knee ten days previous to admission. The knee joint was in a semiflexed position at the time, and the patient experienced great pain when any attempt was made to alter this position. He was taken to Heilbron Hospital, where he was twice dressed, and the wound rapidly healed. On admission, the posterior wound was seen to be in the popliteal space; the anterior wound was over the most prominent point of the internal condyle, and was not healed. The joint was X-rayed; nothing was discovered. A posterior splint was applied, and the knee joint was gradually straightened. The wound over the internal condyle soon healed; and before the patient left the hospital, three weeks after admission, he was able to walk about although the joint was somewhat stiff.

CASE XV.—Private M., No. 22, *1st West Australian M.I.*, had been wounded five weeks previous to admission. There was nothing special to note, the bullet having passed in just above the patella and having evidently passed through the vastus internus and the internal condyle of the femur. The wounds were healed and the movement was good.

CASE XVI.—Private B., No. 5671, *1st Royal Sussex*, was wounded by a Mauser bullet six weeks previous to admission. It entered about the middle of the right thigh posteriorly, and passed out at the junction of the middle and lower thirds of the thigh. It then entered the left thigh a



CASE XVI.—LATERAL VIEW.

[To face page 79.



[CASE XVI.—ANTERO-POSTERIOR PHOTOGRAPH.
Mauser Bullet in head of Fibula.

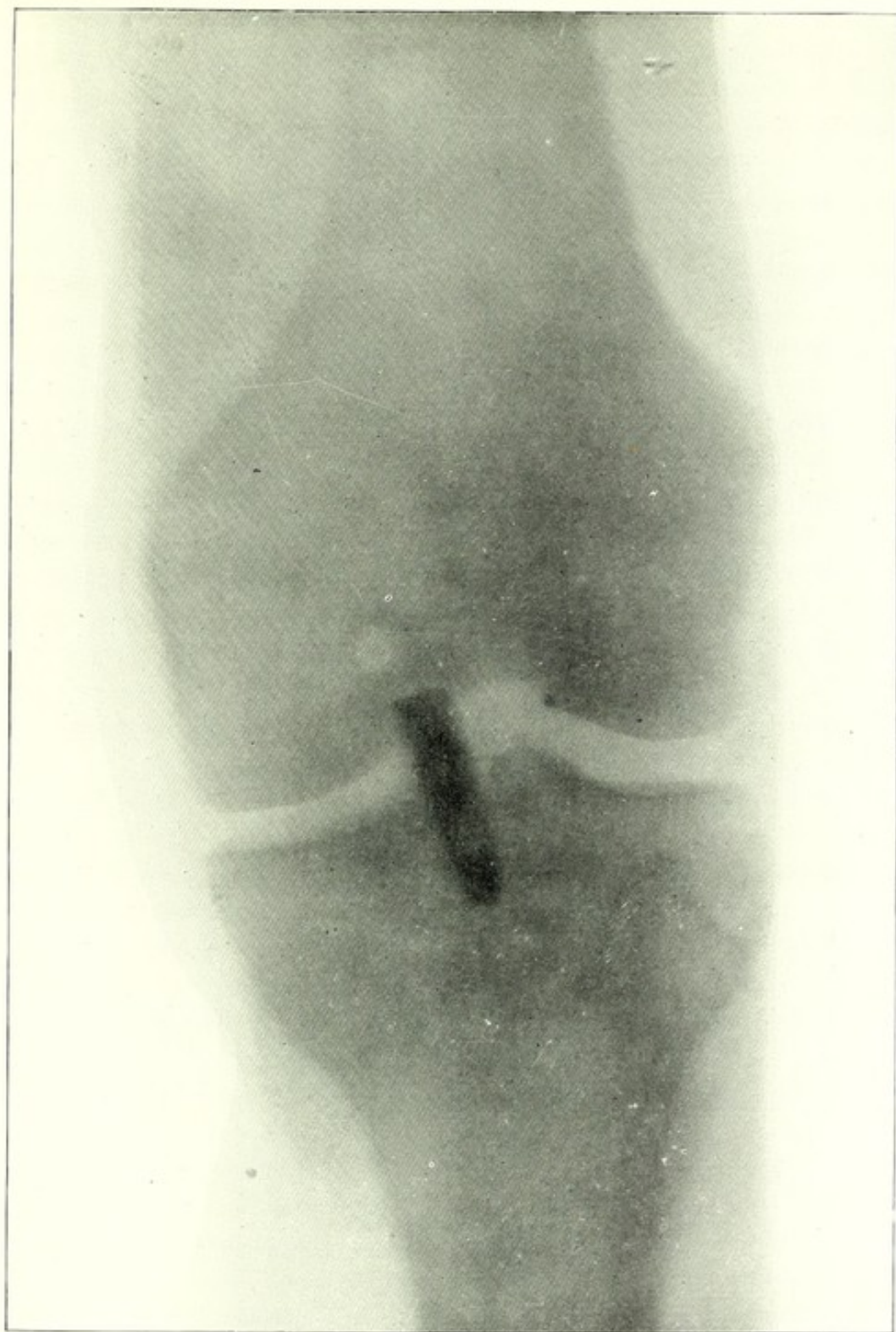
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little lower down and lodged in the head of the fibula. After being wounded, he lay for four hours before he was dressed. He was treated in various hospitals before arriving at Norval's Pont, but no attempt was made to remove the bullet. On admission the wounds were all healed; the patient complained of some pain in the region of the left popliteal space; and there was weakness of the joint; the patient walked on the toes of the left foot with the knee slightly bent. At the time the patient was wounded he was lying down and was struck by a cross fire at a range of about 300 yards. On examining the knee joint, no effusion could be made out; the only thing noted was that the popliteal pulsation was more distinct on the left side than on the right; and some thickening and pain on pressure in the region of the head of the fibula. An X-ray photograph was taken, and a Mauser bullet was found lying apparently just behind the head of the fibula. It will be noted in the photograph that there are two or three small splinters of bullet lying in the track of the bullet across the popliteal space. No attempt was made to remove those splinters at the operation.

The following day a vertical incision, four inches long, was made on the inner side of the biceps tendon, the centre of the incision being on a level with the knee joint; the external popliteal nerve was exposed and retracted outwards; the outer head of the gastrocnemius was pulled inwards; the popliteal muscle was exposed and its fibres separated. No signs of the bullet could be discovered until on gouging into the head of the fibula the bullet, a soft-nosed Mauser, was found completely imbedded in it. Two days after the operation the wound was dressed and appeared perfectly healthy.

Two days later the temperature was still up; the wound again dressed, and nothing found in the wound or near the wound to account for the temperature. Ten days afterwards, the temperature still kept up; the wound was healed, but there was marked expansile pulsation in the position of the popliteal artery, and a systolic thrill could be felt. Later, it was found necessary to ligature the femoral artery at the base of Scarpa's triangle.

CASE XVII.—Private S., No. 5003, *H.L.I.*, was wounded ten days previous to admission. He was kneeling on his right knee firing a Maxim gun when a Lee-Metford bullet struck him just about the patella. The Boers were at intervals of 200 to 2000 yards away. The patient fell backwards and sat down with the knee flexed; he was carried out of action; the leg was partially straightened and a field bandage applied. He was treated at Heilbron for a week. On admission, an attempt to straighten the leg caused the patient intense pain. Over the inner and anterior aspect of the joint there was marked tenderness on pressure. Sensation and pulsation below the seat of injury were normal. The temperature was 100.6° . The joint was X-rayed from the anterior and lateral aspects. The bullet was localised towards the inner and posterior part of the joint. On exposing the upper surface of the tibia the bullet was found imbedded in its postero-internal aspect very far back. It was necessary to fully flex the joint before the bullet could be gripped and removed. Some greenish semi-purulent fluid was found in the bony cavity; this was swabbed out with gauze, and the part flushed with one-in-forty carbolic lotion; the capsule was carefully stitched up with catgut stitches, and the skin stitched, a small drain of worsted having been inserted at either end. Unfor-



CASE XVII.—ANTERO-POSTERIOR PHOTOGRAPH OF KNEE-JOINT.

Lee-Metford Bullet *in situ*.

[To face page 80.

tunately the wound went septic, and this delayed healing. He was seen four months later in Scotland: the joint was stiff but useful, and he was recommended to have nothing further done.

The next three cases were all admitted with the idea of having bullets removed: but in none was the bullet discovered. The notes of the three cases are shortly as follows:—

CASE XVIII.—Private O., No. 8325, *2nd Scots Guards*, was wounded three months before admission. He was struck by a bullet on the middle of the outer aspect of the left thigh while under a cross fire at a range of about 800 yards. He was dressed in the field. The wound healed rapidly. He has been in several hospitals, but in none was there any attempt to remove the bullet. On admission, there was a healed scar five and a half inches below the anterior superior spine of the ileum on the left side; some fibrous thickening could be felt half an inch below the scar. The patient complained of pain in the region of the calf. For two months previous to admission the patient had been doing light duty. He was X-rayed on several occasions, but as no bullet could be discovered, operation was not recommended, and he was discharged.

CASE XIX.—Private V., No. 4654, *4th Derby*, was wounded in both legs. Three months previous to admission he was lying flat on his face, about 800 yards from the enemy, when he was struck just above the left buttock. The bullet passed down the left thigh and broke the femur. At the same time another bullet entered the right calf at the lower edge of the popliteal space, passing out about the middle of the inner edge of the tibia; it then passed through the

big toe. He lay for about four hours on the veldt, and was then picked up and his fracture set in the field hospital. The leg was X-rayed, but the patient did not know whether any bullet was discovered. On admission, the wound of entrance in the left buttock was found one inch below the posterior superior spine of the ilium. The hip joint was not implicated. There was marked thickening about the middle of the left femur; also slight shortening, which caused the patient to walk with a distinct limp. There was some synovitis of the left knee joint. All the wounds were completely healed. The limb was X-rayed on several occasions. The thickening of the femur was verified; but no bullet could be discovered.

CASE XX.—Private C., No. 3460, 1st Royal Munster Fusiliers, was wounded three weeks before admission. While in a stooping position, and advancing under fire, he was shot in the region of the left hip. The patient was in two hospitals before being admitted; and in one the wound was twice probed, but no bullet was discovered. On admission he was able to walk, but limped slightly. The wound of entrance was three and a half inches above and one inch behind the great trochanter. There was considerable discharge of pus. On probing no bullet could be felt. A sinus ran downwards, backwards, and inwards, at the bottom of which there was a large localised abscess. No wound of exit could be discovered. The patient was X-rayed, but nothing was found. In this case, operation was advised. The sinus was slit up, and the abscess thoroughly swabbed out; then the walls scraped and touched with pure carbolic; the cavity was stuffed with iodoform worsted; and the wound partially closed. It healed in less than a month,

and the patient, having been again X-rayed and nothing found, was discharged.

The following nine cases were all bullet wounds of the thigh. In one the bullet was still *in situ*, and was removed.

CASE XXI.—Private T., No. 72, 1st West Australian M.I., was wounded five weeks before admission, the bullet passing through the right thigh as the patient was dismounting. There was little bleeding. The wound healed by first intention, and a month later he was able to walk. On examining the healed wounds, it was evident from their position that the bullet had passed very close to the femoral artery. The patient was convalescent, and was discharged three days after admission.

CASE XXII.—Private P., No. 4362, H.L.I., was wounded for the second time during the campaign. Ten days previous to admission a bullet passed through the anterior surface of the upper third of the thigh. The patient was lying down at the time, and the range was about 100 yards. The bullet passed from without inwards. After being wounded he was dressed, and then marched for about ten miles. The wound of entrance was on the anterior surface at the junction of the upper and middle thirds of the thigh. The wound of exit was four inches internal to this, and at a slightly lower level. The wounds were almost healed on admission, and he was discharged a fortnight later.

CASE XXIII.—Trooper L., No. 3725, 12th Lancers, was one in which the bullet had been removed before his admission to the hospital. Ten days previously he was charging up a kopje, when he was struck by a Mauser bullet which, glancing off a half-crown piece which he had in his pocket, passed downwards into his thigh. On admission, a sinus

was found at the external border of Scarpa's triangle, three inches below Poupart's ligament. The wound healed, and the patient was discharged in a week.

CASE XXIV.—Colour-Sergeant R., No. 2664, 6th *M.I.*, was wounded ten days before admission. He was galloping to a kopje, with the enemy on the left flank, when he was ordered to retire. While wheeling to the left he was shot, the bullet passing from without inwards, and downwards through the thigh. The range was about 100 yards. He rode on for three miles, after which the wound was dressed. On admission both wounds were quite healed. The bullet had passed through the lower third of the quadriceps extensor of the thigh. The patient was discharged ten days later.

CASE XXV.—Private F., No. 6687, 1st *H.L.I.*, was wounded ten days previous to admission while advancing at a range of about 300 yards. He fell out, and the wounds were dressed, after which he walked four miles back to camp. The wound of entrance was four inches anterior to the upper border of the great trochanter, and the wound of exit one inch anterior to the same point. The wounds were superficial and healed rapidly, and the patient was discharged a fortnight after admission.

CASE XXVI.—Sergeant S., No. 5755, *H.L.I.*, was wounded ten days previous to admission. When admitted the patient walked with a distinct limp. The wound of entrance was about half way between the pubis and the anterior superior spine. The wound of exit was just above and behind the great trochanter. Both wounds were septic. After being dressed for a fortnight they completely healed, and the patient was discharged three weeks after admission.

CASE XXVII.—Private S., No. 3578, 1st *H.L.I.*, was wounded ten days previous to admission. He was struck by a cross fire when lying on the ground. The bullet entered the left buttock and, taking a superficial and almost horizontal course, came out through the right buttock. There was considerable bleeding at the time from the wound of entrance, but little from that of exit. The wounds were dressed half an hour afterwards. The wounds healed by first intention. A thickened band of fibrous tissue could be felt along the whole track of the bullet.

CASE XXVIII.—Private D., No. 4380, 1st *H.L.I.*, was also wounded ten days previous to admission. While advancing he was suddenly knocked over, the bullet passing through the fleshy part of the inner side of the left thigh. He dressed the wound himself, but lost a considerable quantity of blood. In the evening, with assistance, he walked to a farmhouse about a mile away. The following evening he was taken to Heilbron in an ambulance waggon. Eight days later he arrived at Norval's Pont. The wound of entrance was at the junction of the middle and upper thirds of the thigh at the inner border of the rectus muscle. The bullet had passed directly backwards. There was considerable redness and œdema round the edge of the anterior wound and slight discharge from it. The leg was kept at rest and antiseptic fomentations applied. Three weeks after admission both wounds were healed, and the patient was discharged.

CASE XXIX.—Private M'P., No. 1988, 1st *H.L.I.*, was admitted ten days after being wounded. While advancing the patient was struck in the middle of the left thigh.

The firing was from the direct front, and the range about 2000 yards. The wound was dressed on the field, and again two days later. It healed by first intention. The evening after being wounded the leg became very stiff, and on admission the patient could only walk with difficulty, pain being felt in the extensor muscles of the thigh. A small cicatrix was seen six inches below the middle of Poupart's ligament. There was thickening on the antero-internal aspect of the thigh on the same level as the wound. The thigh was X-rayed and a bullet localised. The bullet, from the photograph, appeared to be lying in the bone on a level with the wound of entrance. An incision four inches in length was made along the upper third of the thigh on the outer aspect. The fibres of the tensor fasciæ femoris and vastus externus were separated, the anterior surface of the femur being thus exposed. On passing in the finger the bullet was at once found lying at the bottom of the wound in a groove on the antero-internal aspect of the bone. It was completely surrounded by a capsule: this was incised and the bullet removed. The wound healed by first intention, and the patient was discharged.

CASE XXX.—Corporal C., No. 1065, *Brabant's Horse*, was wounded one month before admission, being struck in the region of the right hip. Since then he had been in at least four hospitals, and in one the bullet was probed for but not found. After admission an X-ray photograph was taken and the bullet was seen lying about half an inch above the iliac crest, and was calculated to be two and a half inches from the surface. The patient was chloroformed, and an incision was made three inches long parallel to the crest of the ileum on the right side,

but the bullet was not found. A further incision was then made upwards over the crest of the ileum along the outer side of the erector spinæ muscle. This was defined, and a further search made for the bullet. As nothing could be detected it was thought inadvisable to persist, so the wound was closed and the patient put back to bed. He was discharged shortly afterwards to Cape Town.

RÖNTGEN RAY WORK.

ROBERT BAY WOOD

CHAPTER III

RÖNTGEN RAY WORK

THE X-ray outfit was supplied by Newton & Co., London, under the direction of Dr Milne Murray. It consisted of a 10-inch spark Apps-Newton induction coil, a 6-cell "Lithanode" accumulator, a fusible cut out, one set of spare platinum points, tube holder, 12 focus tubes—6 being of the Webster pattern—spirit lamp, screen, bellows, and the wire for connecting. The plates used were Edwards' "Cathodal"; they were of three sizes, whole plate, 8 by 10 in. and 10 by 12 in. The whole of this apparatus arrived at Norval's Pont without a breakage. As soon as possible the accumulator was filled and charged from Capt. Dumaresq's dynamo, as the hospital's was not ready. The apparatus was placed temporarily in a room of block B, and the first skiagraph was taken on 25th May.

The mode of working was as follows. First as to charging the accumulator. This was done from the dynamo, which had an electro-motive force of 100 volts, through a resistance of 6, 16 c.p. lamps arranged in parallel. It was found impracticable to run the engine for 24 hours continuously, owing to heating of the dynamo, but the five hours during which the engine was worked for the purposes of lighting

were found to be sufficient when applied at frequent intervals, and did the instrument no harm. It may be noted here that the battery was exceedingly useful in re-exciting our dynamo, which was constantly losing its residual magnetism. On two occasions we recharged the accumulator of the Welsh Hospital.

After a week or two the operating theatre of block C was used as the X-ray room. In it there was ample accommodation, and arrangements were made for darkening the room to some extent during daytime.

The tubes used were the ordinary focus tubes supplied by Newton & Co. They were very satisfactory, the only breakage being the platinum wire of one accidentally twisted off. Five of these tubes were more or less used during the six months we were at work. The Webster pattern tubes were not so satisfactory, and only one was used. The tube holder was an ordinary wooden one. We had no special table, the patient being simply laid upon a mattress with the plate under him; and we had no special localising apparatus. In certain cases where there was danger of breaking the plate the patient stood or sat against the wall, and by means of a simple apparatus the plate could be moved up or down, backwards or forwards behind him. As a rule, however, the mattress was used, the patient lying on the plate. On two occasions only were plates broken by pressure. The exposure varied from half a minute up to three-quarters of an hour in spinal and hip cases.

As regards localisation, a very simple method was adopted. The bullet having been discovered and its position approximately ascertained by means of one photograph, this position was marked on the skin surface. The tube was then

moved 3 inches above that point and a photo taken ; then 3 inches below the point and another exposure given on the same plate. The distance between these two points was of course 6 inches. The other data necessary were the distance from the tube to the plate and the distance between the two images of the bullet on the negative. These were carefully measured, and by means of Dawson Turner's formula the distance of the bullet from the plate and therefore from the skin surface could be calculated. By this method the approximate depth of the bullet was ascertained in three cases. In one the bullet was successfully removed from the thigh at the depth indicated. In the other two cases the bullet was situated in the lumbar region at too great a depth to warrant removal.

The plates were developed by means of Burroughs, Welcome, & Co.'s Hydrokinone tabloids, which were found efficient and convenient.

Upwards of 50 cases of gunshot wounds and fractures were photographed by means of the X-rays. In several of these, bullets were discovered, in many their absence was proved. Numerous other cases were examined by means of the screen.

Gunshot injuries of the tarsus were repeatedly examined where bullets had passed through in all directions, and no abnormality could be detected by means of the screen, or in the skiagraph. In two cases bullets were discovered and localised in the knee joint, and were removed with perfect recovery. In one of these the tunnel through which the bullet had passed could be faintly made out in the lower end of the femur.

In several other cases the rays were useful as a means

of diagnosis, such as an aortic aneurism, which could be seen pulsating, a case simulating aneurism with absence of pulsation in the arteries of the left arm, needle in the finger, glass in the hand, a case of transposition of the viscera.

In no case did we find a soft-nosed bullet, and in no case were we certain that such a missile had been used, although in one or two we suspected it.

No ill effects were experienced by the patients even with the longest exposures to the rays.

REPORT OF MEDICAL CASES.

BY FRANCIS D. BOYD, M.D., F.R.C.P.E., Physician to the Hospital,

FROM NOTES OF CASES TAKEN BY

GEORGE L. CHIENE, M.B., C.M.; W. M'FARLANE, M.B., Ch.B.; JAMES
MILLER, M.B., Ch.B.; A. H. WATT, F.R.C.S. Ed.; E. PRATT YULE,
M.B., M.R.C.P. Ed.

REPORT OF MEDICAL CASES

BY THE REV. J. B. BROWN, M.D.

OF THE MEDICAL DEPARTMENT

OF THE UNIVERSITY OF CHICAGO

CHICAGO, ILL., 1881

CHAPTER IV

REPORT OF MEDICAL CASES

ENTERIC FEVER.—THE SPECIAL FEATURES, SYMPTOMS, AND COMPLICATIONS.

The Onset of the Disease.—The onset of the disease was in most cases identical. There was pain in the head, the pain was very severe in the back of the head and in the neck, and was usually accompanied by pains in the limbs. The headache was usually accompanied by constipation. In only a few cases was the commencement of the disease characterised by the presence of diarrhœa as a symptom. When diarrhœa was present at the commencement it was frequently succeeded by constipation.

THE ALIMENTARY SYSTEM.

A marked characteristic of all the cases was the extreme foulness of the mouth during the fever. Enormous masses of sordes collected on the lips, teeth, tongue, buccal mucous membrane, and palate. In some of the cases this could be ascribed to neglect of the mouth during the first ten days of illness. Many of the patients were first in a field hospital, then in a bullock waggon, and, lastly, in the ambulance train. Though in the train everything possible was done, it is manifest sufficient care of the mouth was quite out of the

question. The same foulness was, however, noticed in cases where the disease developed amongst the staff of the hospital who were under careful supervision from the first day of illness, and in whom antiseptic douchings and medication were carefully carried out. It is possible that the dryness of the climate and the all pervading dust had a causal influence.

Implication of the fauces in the septic inflammation was very common, and was much complained of by a number of patients. It added to the difficulties of feeding.

Ulceration of the Soft Palate.—The so-called pharyngotyphoid was seen in one case only. The ulcers were small, superficial, and cleanly cut.

The Condition of the Bowels.—During the attack a large number of the cases exhibited obstinate constipation, which had to be overcome by aperients. In about an equal number the bowels were regular; in a small percentage of cases there was some slight diarrhœa during the acute illness, but in no case was this severe and intractable, yielding as a rule to a mild dose of astringent or opiate. The exact figures were—constipation in 37 per cent.; the bowels regular in 36 per cent.; diarrhœa of a mild character in 27 per cent. It is possible that this condition of affairs may be accounted for by the fact that all the milk used in hospital was boiled.

Melenia occurred in only two cases; in one it was slight and called for no special treatment, in a second it proved rapidly fatal. A full account of this case is given amongst the

analysis of the fatal cases. Hæmatemesis occurred on one occasion in one case. The quantity of blood lost was not large, and no ill effects followed.

Appendicitis.—What appeared to be a mild attack of appendicitis supervened on enteric in one case. The patient had been up and on ordinary diet for thirteen days, and was waiting for transport, to be sent to the base. One evening he complained of pain in the abdomen. There was a recurrence of fever. He lay with the right leg drawn up. The abdominal pain was most marked in the right inferior quadrant of the abdomen, and there was extreme tenderness at M'Burney's point. No tumour could be felt. Under rest and mild aperients the attack passed off in a week.

RESPIRATORY SYSTEM.

Considering the frequent dust storms, it is rather surprising to find how few of the cases exhibited affections of the upper respiratory tract. In one case there was marked laryngitis, with aphonia. The attack followed on a very severe dust storm. The condition lasted for ten days, after which the patient made an uninterrupted recovery.

Œdema of the glottis occurred in one case, and necessitated tracheotomy. The patient died of asthenia nineteen days after operation. *Post-mortem* the larynx appeared normal. A full account of this case is given amongst the fatal cases.

Bronchitis was not a marked feature, though present to a certain extent in a number of cases; in only one did it give rise to anxiety.

Hypostatic Hyperæmia of the Lungs was present in 15 per cent. of the cases. There were the usual signs of dulness on percussion, with broncho-vesicular breathing and copious crepitation.

True croupous pneumonia was met in two patients, but the cases are not included amongst the enteric fever series. Neither gave Widal's reaction, and in the fatal case no typhoid bacilli could be found in the spleen, and there was merely congestion of Peyer's patches, not ulceration. They were considered therefore not to be enteric fever, though they exhibited many features of the disease.

Broncho-pneumonia was present in a number of the cases. It was demonstrated by post-mortem examination in several of the fatal cases. There were the usual physical signs: impairment of percussion, bronchial breathing, with rhonchi and crepitations.

Infarction of the Lung, accompanied by some slight pleural effusion, was present in two cases in hospital and in one civilian who was attended in the neighbourhood of the hospital. Case 47 is a good example. The patient had passed through a sharp attack of enteric fever with very marked abdominal features. Save some slight evidence of bronchial catarrh, the respiratory system had not suffered. By the twenty-first day the temperature had fallen for the first time to subnormal. On the evening of the twenty-first day he complained of pain in the right side, difficulty of breathing, and cough. There was considerable tenacious bright red deeply blood-stained sputum. Dulness on percussion was present posteriorly from the angle of the scapula downwards. At the immediate base there was diminution of

the breath sounds, and vocal resonance, while at the upper part of the area of dulness there was marked bronchial breathing, with numerous crepitations and increased vocal resonance. Two days afterwards some friction was audible about the angle of the scapula. There was some slight increase in the amount of the effusion. The sputum remained tenacious and deeply blood-stained, the colour varying from a bright red to a somewhat prune-juice-like tint. The pneumo-coccus was never found. The patient made a good recovery. All evidence of fluid in the pleural cavity had disappeared by the thirty-eighth day of disease, but the impairment of percussion had not entirely disappeared at the time he was sent down to the base to be invalided home.

Pleurisy with Effusion is, according to Osler's *Report on Enteric Fever*, a rare complication in America. In Britain it is fairly common. In our series, pleurisy with a considerable amount of effusion was present in four cases. In all, absorption took place fairly rapidly; in none had aspiration to be resorted to to get rid of the fluid. Suppuration in the fluid never took place.

Hiccough is a somewhat rare complication, except as the result of diaphragmatic peritonitis. The following case is one of interest, showing how persistent and serious the condition may be even where there is no peritonitis present.

No. 51, admitted 26th May, the fifth day of disease. There was the usual history of headache, loss of appetite, gastro-intestinal disturbance. The temperature varied from 100° in the morning to 102° at night. The patient was put on intestinal antiseptics with douching and antiseptic applica-

tions for the mouth. The bowels moved twice daily—copious pea-soupy motions. For the first ten days the progress was fairly satisfactory, save for the fact that there was some delirium at night. A very copious rash developed. By the sixteenth day of disease the mouth, notwithstanding every care, had become very foul. There was considerable pharyngitis, which rendered it difficult for the patient to take nourishment. On the eighteenth day the abdomen became much distended, and several severe attacks of hiccough occurred. For the next three days hiccough was continuous day and night, accompanied by low muttering delirium. No treatment seemed to have any influence in inhibiting the regularly recurring spasms. The abdominal distension could be controlled, but not the hiccough. On the twenty-second day there was some improvement, the hiccough ceasing at intervals under sedatives. This improvement was progressive, the tongue began to clean slightly, nourishment was taken better, and there were longer intervals between the attacks of hiccough. A copious erythematous rash developed on the arms. There was gradual improvement in the general condition, and the patient made a good recovery. Hiccough was present during the attack for nine days. Its onset was coincident with the onset of tympanitis. It gave rise to grave anxiety, as during three days when it was practically continuous it entirely prevented sleep.

THE CIRCULATORY SYSTEM.

The Pulse.—The average pulse rate in the cases was : in the first week, 90 per minute ; in the second week, 94 ; in the third week, 94 ; in the fourth week, 90. The highest pulse

rate in a patient where recovery took place was 130 per minute. This occurred in three cases. In ten cases where recovery took place the pulse rate exceeded 110 per minute; in twenty-seven the pulse rate reached 100 per minute. In the fatal cases the pulse rate ranged from 92 as a minimum to 160 as a maximum, but in only *two* of the fatal cases was the pulse rate ever observed *below* 100 per minute.

The Heart.—Gradual cardiac failure with the usual prolongation of the long pause and weakening of the first sound, accompanied with failure of the general strength, was present in a number of cases. During the fever a systolic murmur sometimes developed at the apex, which was accounted for by muscle relaxation. In no case was endocarditis met as a complication. In three cases the patient on admission was found to have an enlarged heart; two as the result of old standing mitral regurgitation, one from mitral stenosis; of these three cases, two died, demonstrating very clearly what a fatal handicap any old standing cardiac lesion is in enteric fever.

Affections of Vessels.—Thrombosis was a somewhat common complication. It occurred in 6 per cent. of the cases. It came on late in the disease, in the earliest case on the twenty-sixth day of disease, as a general rule in the fourth week. In two cases there was no rise of temperature, but in most of the cases there was febrile disturbance with pain along the course of the vein followed by œdema of the leg. The œdema was marked, and persisted to some extent up to the time the patient was discharged.

Blocking of a cerebral artery was seen in one case. It

came on after the temperature had reached the normal on the fourteenth day of a very mild attack of enteric. A full account of the case is given under the Affections of the Nervous System.

It is a little difficult to account for the prevalence of thrombosis in the epidemic. The experience of different countries and different epidemics varies in this relation. In America it appears to be very uncommon. Osler records only two cases in *Johns Hopkins Hospital Reports on Enteric Fever*. Dreschfeld, on the other hand, regards it as a fairly common complication. It has certainly been so in South Africa, and many of the victims have been incapacitated by it for many months.

THE CUTANEOUS SYSTEM.

The rash was well marked in most of the cases, very pronounced in a number, and that especially where the general toxæmia appeared to predominate over the abdominal symptoms.

An erythema of the arms, legs, and trunk was met with in two cases. It appeared to be very similar in nature to the "septic rash" seen in some cases of scarlet fever.

GENITO-URINARY SYSTEM.

The complications met with in the genito-urinary system were nephritis and cystitis. Nephritis occurred in three cases, in all taking the form of a mild catarrhal attack.

Case No. 41 is a fair example. His illness began ten days before admission with headache, pain in the back, and loss of appetite. There was no diarrhœa. On admission,

patient was somewhat dull and heavy. He was thin, having lost flesh considerably. His temperature was 102° . The tongue was furred. The throat sore and congested. The bowels rather constipated. The abdomen showed a characteristic rash. The spleen was enlarged and palpable. The area of cardiac dulness was somewhat enlarged. The first sound very weak, the second aortic markedly accentuated. The pulse was 76, regular, but the arterial pressure was distinctly raised and the vessel wall thickened. There was great complaint of lumbar pain; micturition was more frequent than normal during the night. The urine gave a specific gravity of 1020. The amount averaged about 40 ounces in twenty-four hours. It contained albumen and a trace of blood. The microscope showed epithelial and hyaline casts, numerous epithelial cells, and some red blood corpuscles. There were no nervous symptoms, save some slight insomnia. The Widal's reaction gave a positive result. The patient passed through a fairly smart attack of enteric, the temperature rising to 103° at night up to the twenty-fourth day, after which it gradually fell to the normal on the thirty-first day. The blood disappeared from the urine in a few days, and by the thirty-sixth day all trace of albumen had gone, and the patient was on convalescent diet.

In two of the three cases there was a history of former nephritis; in the third, though no history could be obtained, there was evidence of former kidney mischief in the presence of an enlarged heart and thickened arteries. We may take it, then, that all three began their enteric fever with more or less damaged kidneys, and that the incidence of a catarrhal attack was not surprising. In no case was the severe hæmorrhagic type of nephritis present. Apart from these

three cases albuminuria was never noted, though the urine was carefully tested in all the enteric cases. It must be admitted that in some of the fatal cases albuminuria may have been present for some time prior to death, though, as it was impossible to obtain a specimen of the urine, its presence was not proved. We may conclude, then, that renal complications were remarkable by their absence in this epidemic; in the only three cases where they did occur there was evidence of a weakened kidney before the attack. In no case was there nephritis when the patient began his fever with normal kidneys. In all the cases where nephritis was present the patient made a good recovery.

Cystitis occurred as a complication in the course of the fever in two cases. In one the urine was acid, and a coli-like bacillus was present; in the second there was a mixed infection diplococci, staphylococci but no streptococci being present, accompanied by a bacillus which had all the appearance of the bacillus coli or typhosus.

Tubes were inoculated from the urine drawn off aseptically in a number of cases. In two of the nephritis cases the tubes proved sterile. In the third there was a mixed infection, both cocci and a coli-like bacillus being present. In no case, except where there were complications affecting the urinary tract, could any cultivation be obtained from the urine. In no case was there a pure bacteriuria with the typhoid bacillus as a causal factor.

THE OSSEOUS SYSTEM.

In only one case did any complication arise due to an implication of the osseous system. The patient developed

otitis media, with implication of the mastoid. He made a good recovery without operation. A number of other cases of middle ear and mastoid suppuration were seen, where the condition could be traced to an attack of enteric some weeks before. In no case of enteric was there any affection of the bones of the extremities.

THE NERVOUS SYSTEM.

During the initial stages of the fever, headache, pain in the neck, back, and limbs was a constant symptom, accompanied, as a rule, by insomnia.

During the progress of the fever delirium was present in a proportion, but not a large proportion, of the cases. Most of the patients were heavy and drowsy, but the typical "typhoid state" was not present in a large proportion—it was the exception rather than the rule. Tremors were frequently present, and subsultus was marked in the severer cases. Cerebral thrombosis was present in one case. No. 81 was admitted suffering from a mild attack of enteric fever. The attack might almost be called abortive, as the temperature reached the normal on the twelfth day, but as regards the diagnosis there could be no doubt. On 2nd June, the fourteenth day of disease, patient, at the time of the morning visit, seemed well, but by dinner time he had become dull, and took little or no notice of his food when it was offered; by evening the lethargic condition was more marked. When asked to do anything he made an effort, and then relapsed into apathy. There was paresis of the right side of the face, and complete paralysis of the right arm and leg. The tongue, when protruded, appeared to point slightly to the right side. The palate was unaffected. The superficial reflexes were

present, the deep exaggerated on the right side. There was no ocular paralysis. Hearing was normal. There was complete aphasia. When asked a question, he made an indistinct grunting sound in response, though he evidently understood and made an effort to answer. He seemed, moreover, unable to interpret written language. There was some loss of sensibility in the right arm and leg.

During the next few days he improved gradually, and became less dull and apathetic. After two weeks it was possible to investigate his nervous phenomena more completely, and in the third week a satisfactory examination could be made. The sensory functions showed tingling in the right hand and arm up to the middle of the right forearm. At first there had been severe pain in this region, so much so that he could not bear to be touched; but this had entirely disappeared. Sensibility to touch was absent in the right hand from the wrist downwards; normal over the rest of the body. Sensibility to pain was absent in the right hand, unimpaired elsewhere. The temperature sense was perverted in the right hand, and all over the right arm, every foreign body in contact over these areas being felt as very hot. Elsewhere the thermal sense was normal. The muscular sense was impaired in the right leg; it could not be tested in the right arm.

Sight was apparently perfect. The pupils were equal and reacted to light and accommodation. The hearing and sense of smell were normal.

The organic reflexes which had been lost had become normal. The superficial reflexes were normal. The knee jerks were present on both sides, the right was exaggerated. There was no knee clonus, but marked ankle clonus on both sides.

The paralysis of the right side had become less complete, the movement in the arm being now partial, and the movement in the leg fairly good. The speech had improved. At first he had only been able to grunt inarticulately, though he evidently understood. After a day or two he could articulate yes and no, though indistinctly. At the beginning of his attack there was sensory visual aphasia; he could not read written characters, but this quickly passed off. At first he refused to write, but he rapidly began to make successful attempts with the left hand.

The trophic and vaso-motor functions were affected. The right hand was distinctly colder than the left, but there was no palor or flushing.

From this time onward improvement took place. The motor power gradually returned. The abnormal sensations in the right arm disappeared. Sensibility to heat and cold entirely returned in the right forearm and hand. The right knee jerk continued exaggerated, but the left became normal. Ankle clonus was present on the right side. Supinator and extensor jerks were present in the right arm. The mental condition improved markedly. His vocabulary increased, though the speech remained of a slurring character. The patient was transferred to the base to be invalided home.

Hemiplegia is an uncommon complication of enteric fever. It may be due to thrombosis, embolism, or hæmorrhage. Thrombosis is the most common cause, and taking into consideration the frequency of thrombosis in enteric fever, it is perhaps surprising that central thrombosis is not more common. In all, there seems to be some twenty-four cases recorded in the literature of the subject. Four of

those are recorded by Osler in the *Johns Hopkins Hospital Reports*, Vol. VIII., No. 3-9.

In our case the lesion seems to have been in peripheral branches of the middle cerebral artery connected with the supply of the fibres of the ascending parietal and ascending frontal convolutions, above the internal capsule. The improvement which took place in the patient's condition rather points to a cortical implication of the cerebral circulation. Had the lesion been a blocking of the blood supply to the internal capsule itself, one could not have expected the marked improvement which took place.

THE FEVER.

The temperature in the cases in hospital during the acute stage was taken every four hours in the axilla. In the cases seen in hospital during the first week the temperature averaged from an average maximum of 102.9° to an average minimum of 101.4° . During the second week, from an average maximum of 103.1° to an average minimum of 101° . During the third week, from an average maximum of 102.9° to an average minimum of 99.3° . Fever was present in the fourth week in 48 per cent. of the cases; during the fifth week, 25 per cent.

During the first week the highest temperature attained was 105.6° , and that in only one case. In a second case, where the disease began with a rigor and high fever, the temperature reached 105° on the second day, a very unusual onset for an attack of enteric fever. The patient was seen in consultation on the second day of the disease. He was admitted to the General Hospital, Naauwpoort, where he died about the tenth day of the disease. In the second week, the

temperature reached 106° in two cases ; 105° in six cases ; and 104° in twenty-one cases. During the third week, the temperature reached 106° in two cases, both of which were fatal ; 105° in one case, and 104° in eighteen cases. During the fourth week, 106° was reached in one case ; 104° in four cases. During the fifth week, 105° was reached in one case. The temperature in the cases taken as a whole was thus not remarkably high, and in only two of the fatal cases did the temperature reach 106° . When high fever did occur, it was remarkable in some of the cases how little it seemed to affect the patient ; for example :—

PRIVATE No. 4992, *Shropshire Regiment*, admitted 29th May, the eighth day of the disease.—When admitted, he was in a dull, heavy state, with no clear recollection of the previous four days, two of which he had spent in a bullock waggon, and two in a hospital train. On admission, his temperature was 102° . It remained at this level for four days, but on the fifth day, the fifteenth day of the disease, it rose to 106° . For six days it fluctuated between 105.8° and 102° , and for the next five days, between 105° and 99° . During this time the patient did not seem to be much affected by the fever. He perspired a good deal, and expressed himself at times as feeling quite comfortable, at other times he felt a "little hot." There was some hypostatic congestion and evidence of catarrh at the bases of the lungs, but the pulse kept good, and he took his nourishment well throughout.

Post-Typhoidal Pyrexia.—Post-typhoidal pyrexia occurred in a number of cases : to be strictly accurate in 13.3 per cent. of the total cases. In most of the cases the elevation of the temperature was accompanied by constipation, and

all symptoms disappeared on the administration of a purge. In some of the cases it was very difficult to arrive at any cause for the fever. The patient had nothing to complain of beyond a little headache and the fever, which at times reached 105° . For example: No. 41 passed through a sharp attack of enteric with all the usual signs and symptoms. During convalescence, after he had been up for three days, the temperature suddenly rose to 105° with a rigor. It continued elevated for two days. During this time there were no physical signs to account for the fever. On the morning of the third day the temperature fell to 97° , and the patient expressed himself as feeling better than he had done before the attack. During the rest of the convalescence the temperature remained normal.

Such attacks of fever are well recognised, and it is very difficult to find any definite cause. It is probable that some slight exciting cause produces the reaction in an organism weakened by the previous fever.

The Type of the Fever.—Enteric fever, as seen in the epidemic in South Africa, presented, as in most epidemics, various types. They might be divided into:—

- (1) The mild, or abortive type.
- (2) The grave type; (a) abdominal; (b) toxæmic.
- (3) The apyrexial type.

The mild or abortive type was met with fair frequency. The patient had headache, malaise and gastro-intestinal disturbance, with a febrile state lasting six to eight or ten days, the temperature reaching 101° - 102° or 103° at night. As a rule, he never felt very ill, and it was only by the presence of a positive Widal's reaction in the uninocu-

lated that the positive diagnosis of enteric fever could be established.

Of the grave type, there were two distinct classes. The class in which the abdominal symptoms predominated, and the class in which the toxæmic symptoms predominated. In the first, the gastro-intestinal symptoms were predominant. There was a very foul tongue; the abdomen was markedly distended, tympanitis being a prominent symptom. Nourishment was poorly taken and badly assimilated. If the nourishment was pushed, the stools showed the presence of undigested milk. If the case proved fatal, very extensive ulceration of the small intestine was found.

In the toxæmic variety, there was a marked rash. The temperature was high and there were pronounced nervous symptoms, as delirium, tremors, subsultus, and carphologia. The abdominal symptoms were not pronounced.

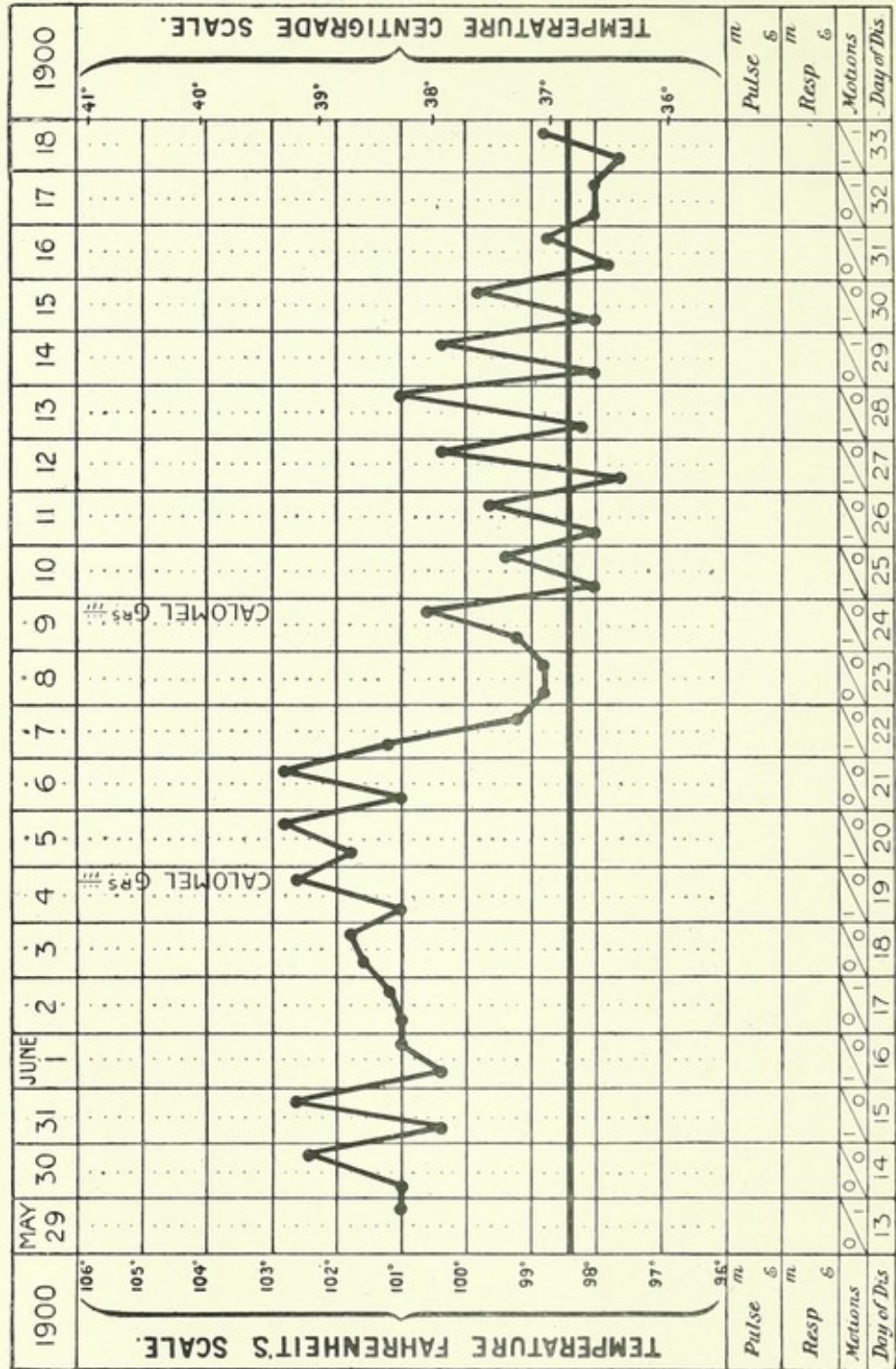
Only one case of the apyrexial type of the disease was noted in one of the staff who had been inoculated once. The patient suffered from headache, colicky pains, loss of appetite, and some slight diarrhœa. The stools were of a typical pea-soupy appearance. There was no fever. The patient attempted to go about and to do work, but found himself quite unable. He was admitted to hospital. He complained of headache, weakness and colic with diarrhœa. The abdomen showed no marked distention, but a number of spots were visible, some of which appeared to be typical. The motions were characteristic. The blood gave a positive Widal's reaction. During the whole of the time (five weeks) the patient was in hospital, the temperature only rose above the normal on one occasion, when in the evening it reached 99.4°.

The case appears to have been a mild attack of enteric in which inoculation had a marked effect in altering the course of the disease.

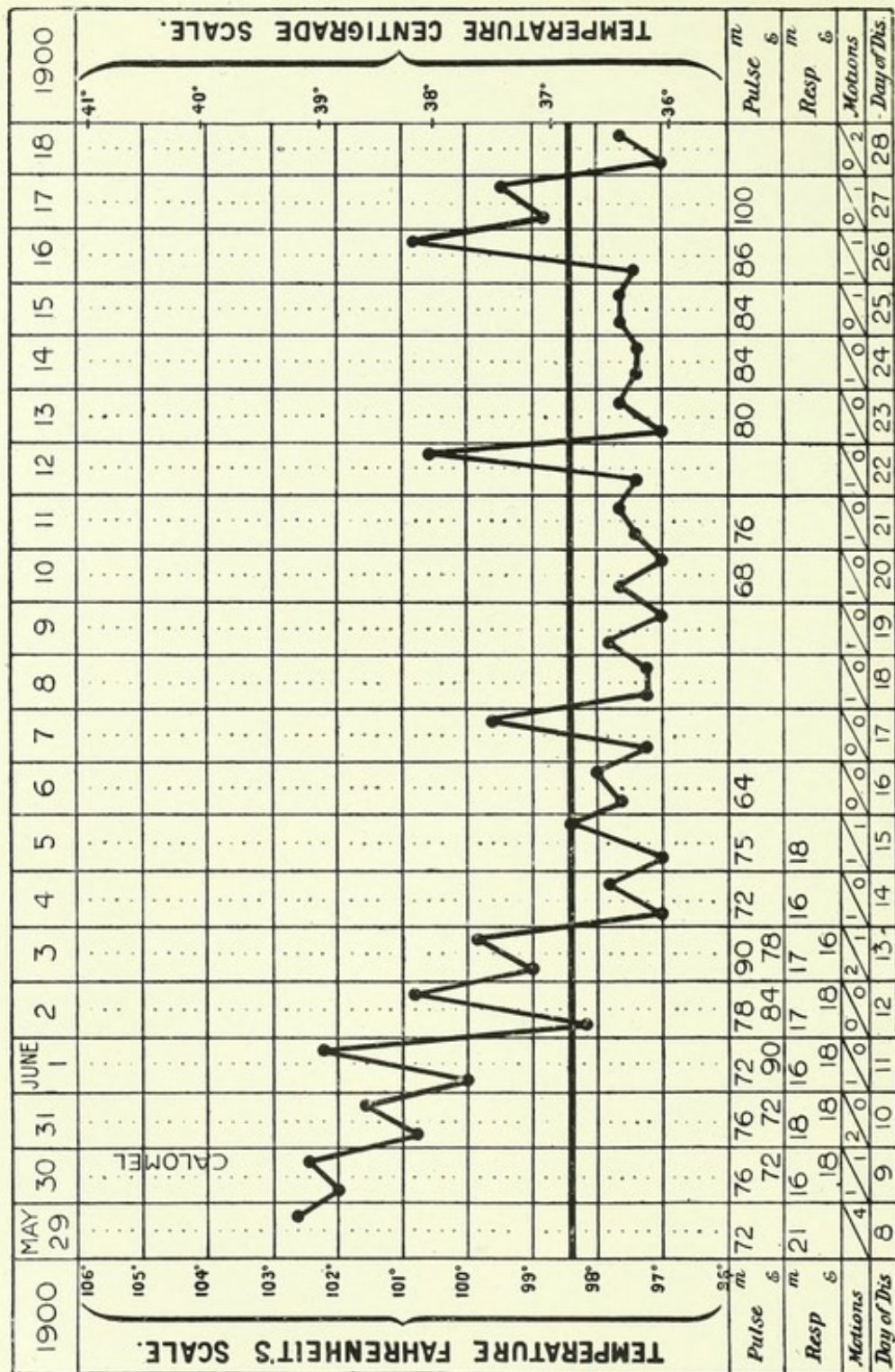
Widal's Reaction.—After the erection of the laboratory Widal's reaction was carried out in every case where the diagnosis seemed to be at all doubtful. A twenty-four hours' culture of the typhoid bacillus was always used. Normal saline solution was used as a diluting medium, a dilution of 1 in 30 being used. Several observations were performed coincidentally, so that a check was established. The reaction was negative in 6 per cent. We are faced with the question: Were those actually cases of enteric fever or no? If not enteric fever, what was the condition?

The following is an abstract of notes of the cases:—

CASE I.—Trooper No. 51, age 20, admitted 29th May.—Before admission the patient complained of great weakness, pains in the head and abdomen, and diarrhœa. He had moved about from place to place in a bullock waggon, and was exposed to cold in all weathers. On examination, the patient, a fair man, had rather a dull, heavy expression and a very flushed face. The temperature was 102° ; the tongue furred and fissured transversely; the abdomen was not distended, and there was no pain or tenderness; a few rose-pink spots were visible; splenic enlargement was doubtful; examination of the lungs showed some bronchial catarrh; the heart sounds were pure but weak; the pulse very soft. For ten days the temperature fluctuated between 104° at night and 101° in the morning. On the sixteenth day of the disease Widal's reaction was still negative. There was some slight diarrhœa,



CASE II.—ENTERIC FEVER. NOT INOCULATED.



CASE III.—ENTERIC FEVER. NOT INOCULATED.

but the motions were not characteristic. About the seventeenth day, the temperature in the morning became normal, but to the twenty-fifth day continued to rise to 102° at night. After that the patient convalesced, and was sent down to the base three weeks afterwards. It is possible that at a later date the examination of the blood might have been positive. Owing to a break-down in the laboratory arrangements it was impossible, however, to carry out the Widal subsequently.

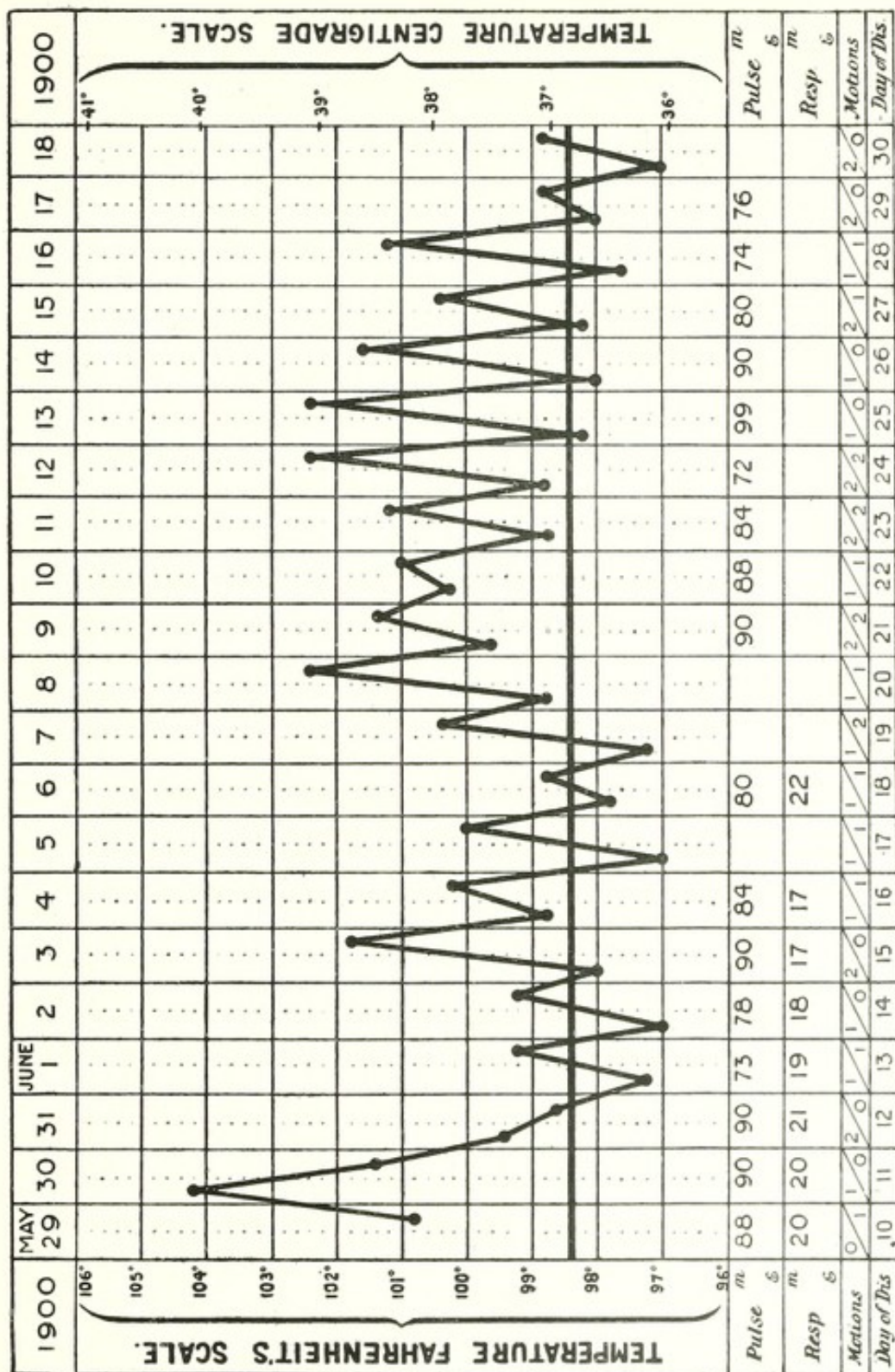
CASE II.—Private No. 34, admitted 29th May.—There was nothing important in his history save the fact that he had had malarial fever five years previously. His present illness began with headache, pain all over the body, weakness, and loss of appetite. On admission, apparently on the thirteenth day of disease, the patient was somewhat emaciated, the tongue was furred, the bowels were loose, the abdomen was not distended, but showed characteristic spots, gurgling was present, the spleen was enlarged but not palpable. The temperature remained between 101° and 103° up to the twenty-first day, then fell somewhat, ranging between 101° and normal up to the thirty-third day, when it became normal at night. On the thirty-fourth day of the disease, the Widal's reaction gave a negative result.

CASE III.—Private No. 35.—Seven days before admission patient was taken ill with giddiness, sore throat, and diarrhoea. On admission the tongue was furred, the fauces congested and swollen, the bowels loose, and the motions of a somewhat yellow colour, the abdomen full, a papular rose rash, disappearing on pressure, was visible on the chest and abdomen; the spleen was enlarged. The temperature remained between 102.6° and 100° up to the twelfth day, when it became normal in the morning, but rose at night to 100° . By the fifteenth day it

steadied down, and the patient convalesced, convalescence being occasionally interrupted by slight attacks of pyrexia. Had it not been for the negative result of the Widal's reaction, one would have said unhesitatingly that the patient had had a mild attack of enteric fever, with the characteristic splenic enlargement, gastro-intestinal disturbance, and rash.

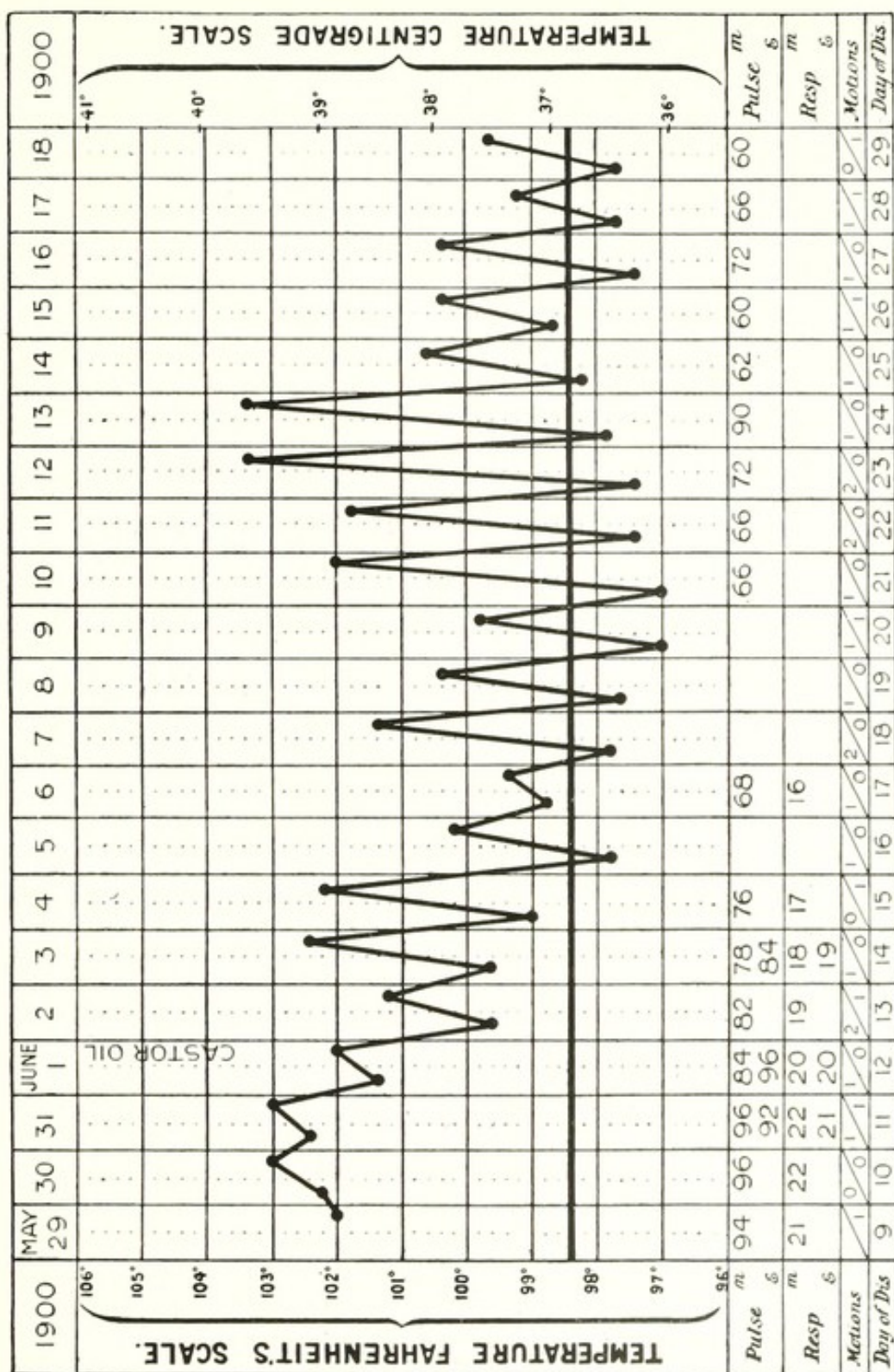
CASE IV.—Private No. 38, admitted 29th May.—Patient's illness began with severe headache; diarrhoea came on, the motions being yellowish in colour; the throat was sore. On admission the tongue was very furred and dirty; the tonsils were red and swollen, but no patches were present. The abdomen was distended, but there were no spots. On admission the temperature, 101° , rose the following day to 104° . The patient's spleen was slightly enlarged. Patient was delirious and very ill. The temperature continued to fluctuate— 99° to 101° —for nineteen days, then settled down and remained normal. Widal's reaction was negative. Had it not been for the negative Widal, the case would have been considered a characteristic one of enteric fever, the only sign awaiting being the rash.

CASE V.—Trooper No. 42, admitted 29th May, the eighth day of the disease.—His illness began with headache, loss of appetite, pains through the body and limbs, and general weakness. On admission the patient's face was flushed, the pupils dilated, the tongue very foul, the abdomen somewhat full and on the upper part some scattered characteristic spots, the spleen was enlarged. There were signs of catarrh at the bases of the lungs. The temperature on the first four days remained steadily at 103° . On the thirteenth day the temperature began to fluctuate between 100° in the morning and 102.4° in the evening. By the sixteenth day of

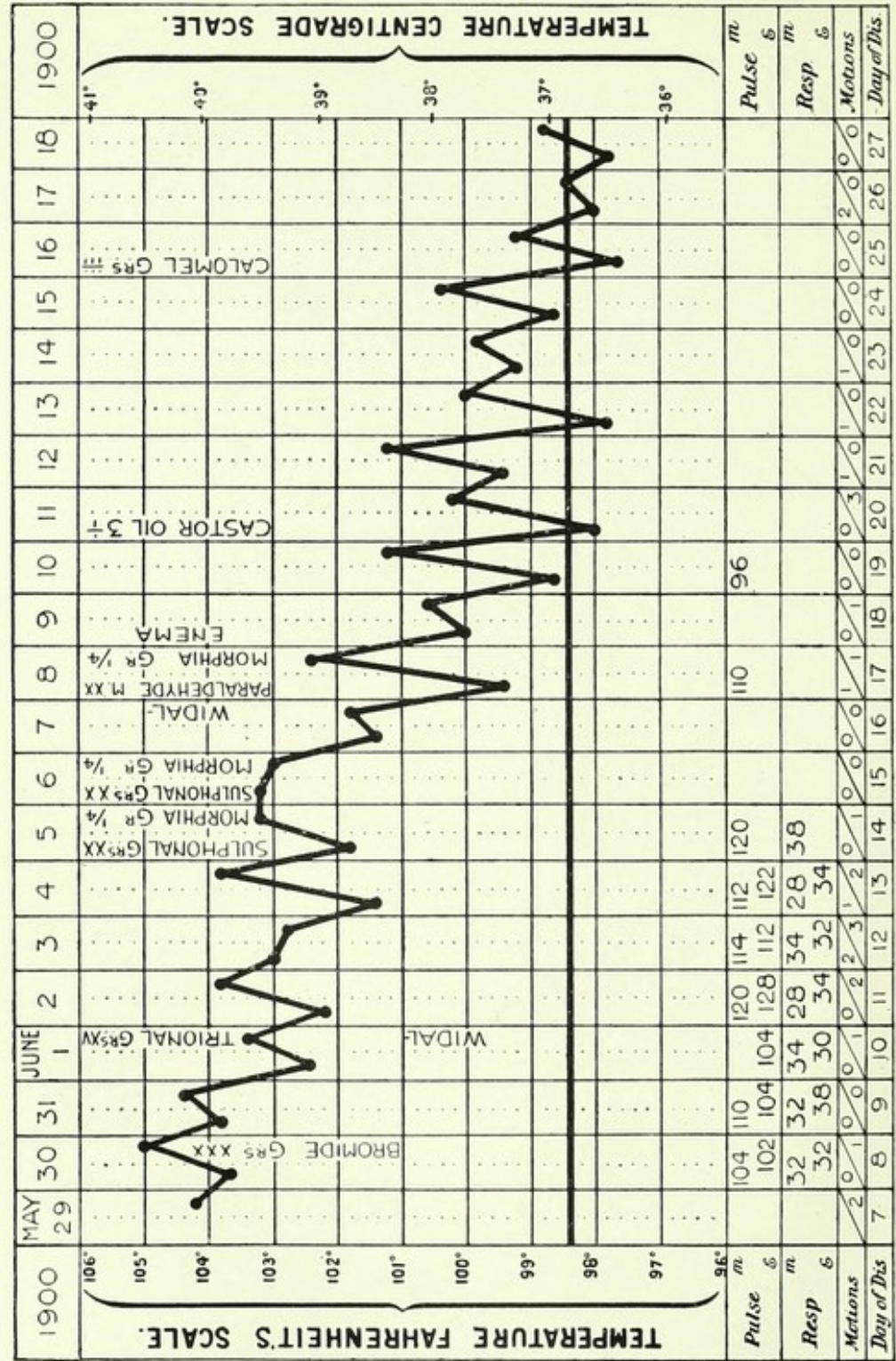


CASE IV.—ENTERIC FEVER. NOT INOCULATED.

(To face page 116.)

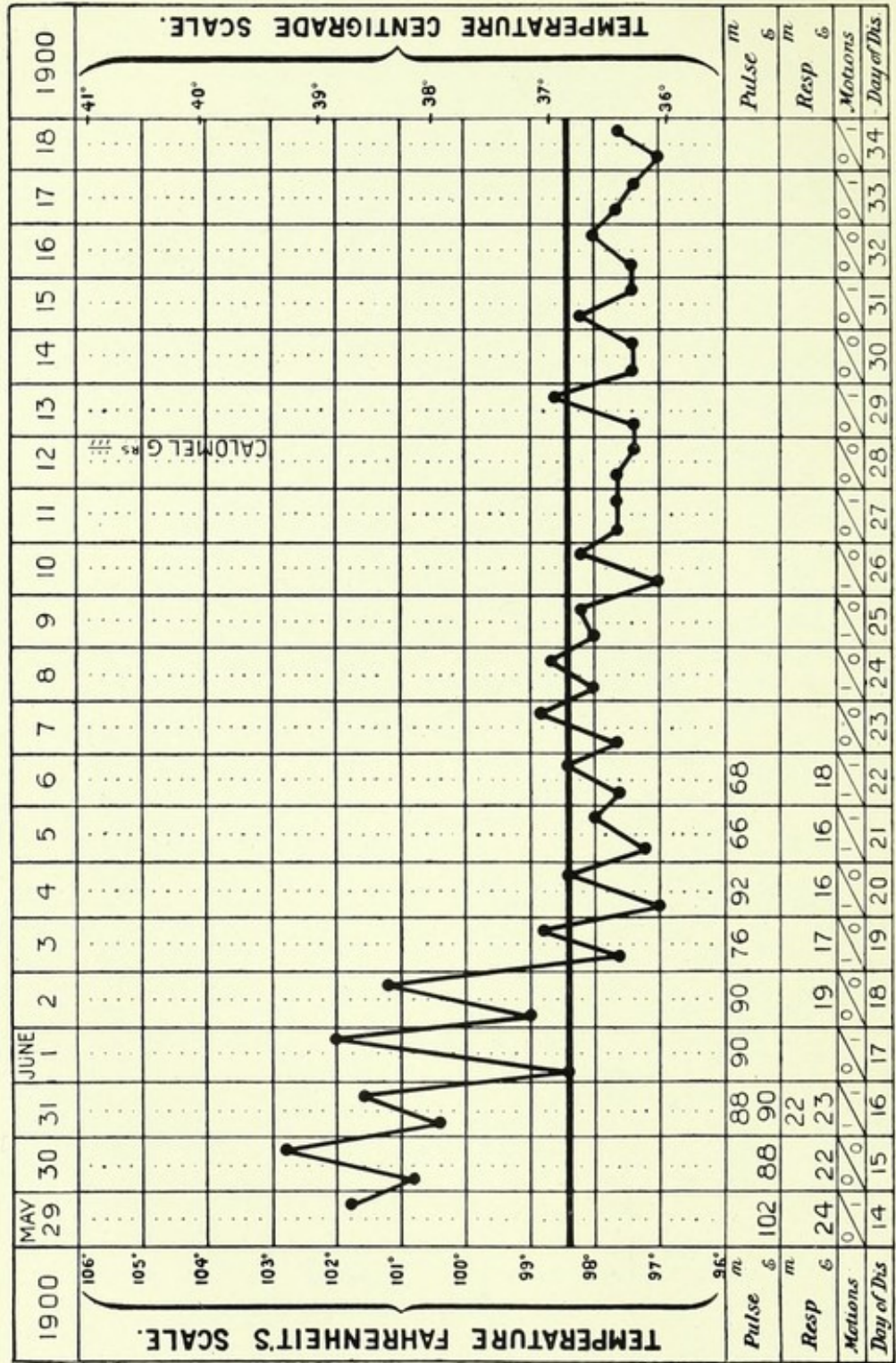


CASE V.—ENTERIC FEVER. NOT INOCULATED.



CASE VI.—ENTERIC FEVER. NOT INOCULATED.

(To face page 117.



the disease it had reached 98° in the morning, but up till the thirty-first day it rose to 103° at night.

CASE VI.—Private No. 44, *Royal Suffolks Regiment*, admitted 29th May 1900.—His illness had begun seven days before, with headache, malaise, giddiness, and faint attacks. On admission the patient had a dull, heavy look. The face was flushed; the temperature 104° ; the tongue very dry and covered with a brownish yellow fur; the abdomen was distended and tympanitic all over; the spleen not palpable, the dulness being obscured by tympanites. There were a few rose spots on the abdomen; diarrhoea was present, the motions being of a pea-soupy character. With the exception of feebleness of the cardiac sounds, the circulatory system seemed normal. At the base of both lungs there was impairment of the percussion sound, and medium crepitations were audible. He was very restless and delirious at night. On the disappearance of the abdominal distention it was possible to make out that there was some splenic enlargement. Widal's reaction was carried out on the tenth and sixteenth days—the result negative. The temperature remained between 105° and 102° for the first week of his being in hospital, and then gradually took a downward course, reaching the normal in the evening of the twenty-sixth day of the disease. The patient made a good recovery.

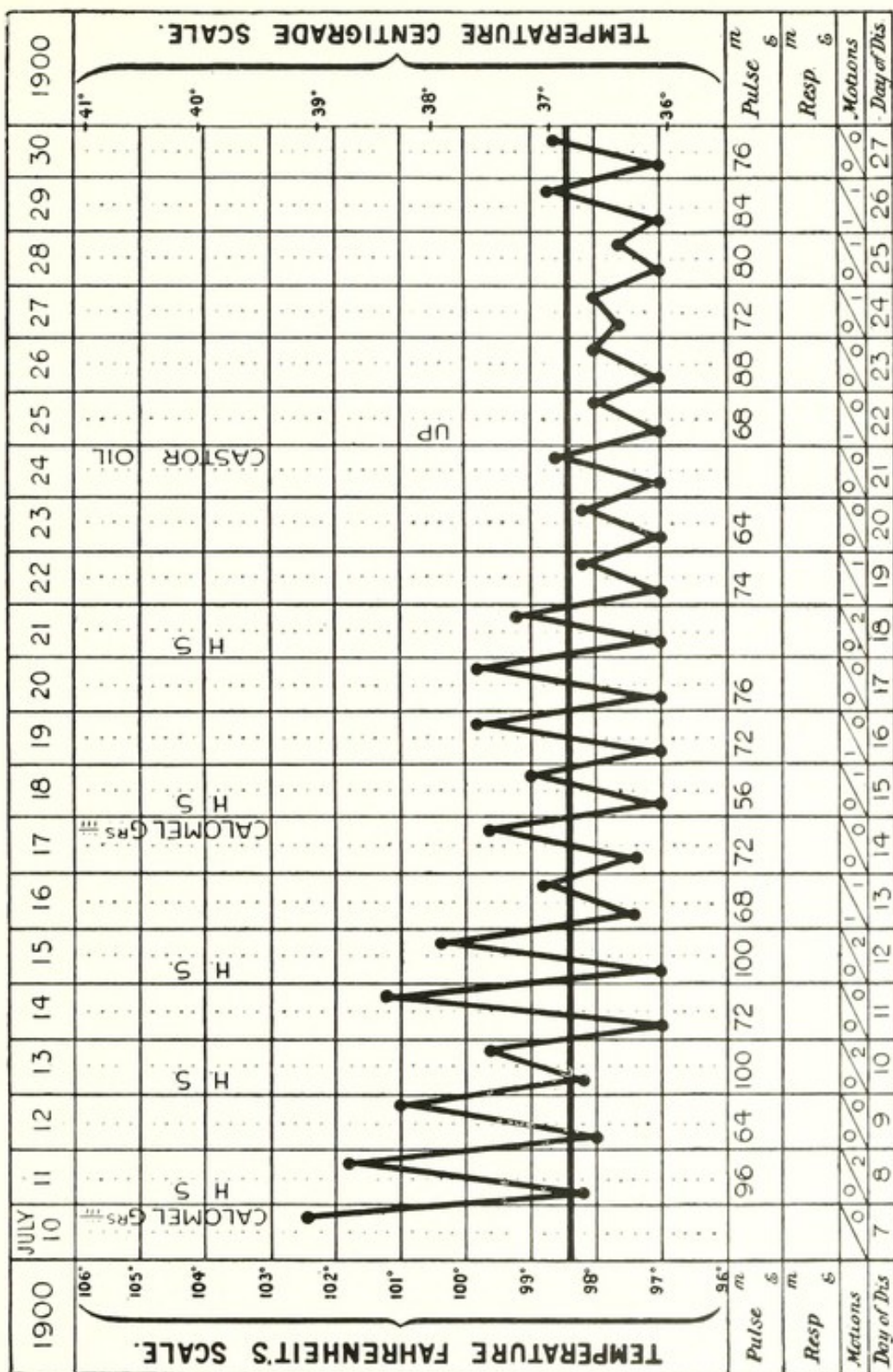
CASE VII.—Private No. 53, *Lovat's Scouts*.—Fifteen days before admission patient began to feel disinclined for food, and had headache. Diarrhoea came on and lasted for two or three days. On admission he complained of headache and occasional pains in the abdomen. He was a fairly well-nourished man. The face was somewhat flushed; the tongue was moist and furred; the throat was slightly congested;

the abdominal wall showed half a dozen characteristic spots ; the spleen was slightly enlarged. The respiratory system showed some bronchitis, otherwise it was normal. The temperature ranged between 103° and 99° till the twentieth day of disease, when it became normal and remained normal. He made a good recovery. The examination of the blood was negative.

CASE VIII.—Private No. 54, *K.O.S.B.*, admitted 29th May.—A week before admission the patient had an attack of diarrhoea at Kroonstad. This was followed in two days by a very severe headache and pains all over the body. He was a fairly well-nourished man. The tongue was covered with a thick white fur. After admission the diarrhoea disappeared and was followed by constipation. The abdomen was not distended, but there were several large rose-coloured papulæ scattered over the surface. The spleen was enlarged. The respiratory system showed merely a little bronchial catarrh. Widal's reaction on the twenty-fifth day of the disease was negative.

CASE IX.—Trooper No. 70, admitted 10th July 1900.—About a week before admission, while waiting for a convoy at Karee, he began to have shiverings at night, followed by sweatings. The patient lost his appetite. He had pains in the head, and felt generally out of sorts. He went sick, and was admitted to a field hospital till he was sent down by No. 3 hospital train.

On admission the teeth were good ; the tongue large, flabby, and furred. The motions were rather fluid. The abdomen was not distended, two suspicious-looking spots were visible on the surface. The spleen was somewhat enlarged. The temperature on admission was 103° , it fluctu-



ated between 103° and 99° during the first week in hospital, then fell somewhat, fluctuating between 100° and 97° to the twentieth day of the disease, when it was normal at night. Widal's reaction was negative.

CASE X.—No. 50, 17th *Lancers*.—The patient was admitted as convalescent after dysentery. He had had an acute attack of dysentery, with all the usual symptoms, before admission. After admission it was found that the temperature was irregular, swinging from 100° in the evening to 98° in the morning. He was much troubled with headache and gastro-intestinal disturbance, and a typical rose rash appeared on the abdomen. The spleen was enlarged. He passed through what appeared to be a mild attack of enteric fever modified by inoculation. Convalescence was interrupted by a slight attack of perisplenitis. Widal's reaction was carried out on two occasions with negative results. (See Table, page 120.)

Of these ten cases, the spleen was enlarged in nine, in one the enlargement was doubtful. A rash was present in nine, absent in one. Gastro-intestinal disturbance was present in all. Diarrhoea was present in six, constipation in two, and the bowels regular in two. In five cases there was definite bronchial catarrh. The longest period of the fever was in the second case, where it lasted thirty-three days; the shortest in the third case, where fever was present for fifteen days. The average duration of fever was twenty-three days. It is possible that in the first of these cases the agglutination reaction might have been found had the blood been examined at a later period, but a break-down in the laboratory prevented this being done. In the other cases the blood was examined either on several occasions or when

TABLE SHOWING THE SIGNS IN THE TEN CASES WHERE WIDAL'S
REACTION WAS NEGATIVE.

	SPLENIC ENLARGEMENT.	RASH.	GASTRO- INTESTINAL DISTURBANCE.	MOTIONS.	BRONCHIAL CATARRH.	FEVER.
1	Doubtful.	A few spots.	Yes.	Not typical.	Present.	25 days.
2	Yes.	Yes.	Yes.	Diarrhœic.	No.	33 days.
3	Yes.	Yes.	Yes.	Loose, yellow colour.	No.	15 days.
4	Yes.	No.	Yes.	Diarrhœic.	No.	19 days.
5	Yes.	Yes.	Yes.	Regular.	Present.	31 days.
6	Yes.	Yes.	Yes.	Diarrhœic.	Present.	26 days.
7	Yes.	Yes.	Yes.	Diarrhœic.	Present.	20 days.
8	Yes.	Yes.	Yes.	Constipated.	Present.	25 days.
9	Yes.	Yes.	Yes.	Diarrhœic.	No.	20 days.
10	Yes.	Yes.	Yes.	Constipated.	No.	16 days.

once, late in the attack. It is possible the reaction might have been found at a date when no examination was made, but it was not present on the occasions when the examination was carried out.

In discussing the diagnosis of those cases the question arises: Is there any other known condition except enteric fever under which they could be classified? In some of their features they closely resemble Malta fever. They agree with Malta fever in the mode of onset with severe headache, with gastro-intestinal disturbance and splenic enlargement but they differ from Malta fever in that none of the cases showed the characteristic relapse; in all the cases except one there was a characteristic rash; in six there was diarrhoea, which is very uncommon in Malta fever; in none were there the fleeting rheumatic-like implications of the joints so characteristic of Malta fever. It is a matter of great regret that in these cases we were unable to carry out the agglutination test with the "*micrococcus melitensis*." Several efforts were made to obtain a culture, but without success. Splenic puncture was not undertaken. It is a matter of regret now that it was not. It is an operation which one has fairly frequently performed without any harmful results, but is not one that one cares to undertake when not absolutely necessary, as one never knows when an accident may happen, and in those cases it was felt at the time that it would be better left undone.

Taking all the facts into consideration we must conclude that though Malta fever may be present in South Africa the cases quoted were not examples of the disease; and taking into consideration the fact that they occurred during an epidemic of enteric fever, along with the signs and symptoms

which they presented, we are driven to the conclusion that the condition was enteric fever—enteric fever possibly in a modified form, but still enteric fever.

Six per cent. of error is much higher than the generally accepted margin of error in the bacteriological diagnosis of enteric fever. One is not prepared to say that in all these cases the reaction was absent during the whole course of the attack, but it was absent on more than one occasion late in the attack. Had the blood been examined more than two or three times it might have been found present on certain occasions. Time, however, did not permit of the blood being examined more frequently. The results tend to show that the absence of agglutination even late in the attack is of less diagnostic value than is usually supposed unless proved from a very large number of observations in an individual case. It is possible that in those cases the amount of regeneration of antitoxine which, according to Ehrlich, takes place in the body, was just sufficient to neutralise the amount of toxine present at the time of the observation, and there was thus no over-regeneration and no uncombined molecules of antitoxine present in the blood. There was thus no antitoxine free in the blood to produce that direct action on the micro-organism which results in agglutination.

The Relapse.—Out of 150 cases relapse occurred in 5.3 per cent., a somewhat lower figure than is generally found in hospital cases. Only those cases were considered to have relapsed where, after a period of apyrexia, the fever returned with fresh characteristic symptoms, such as the development of fresh spots, gastro-intestinal symptoms, and splenic enlargement.

The following is an abstract of the notes of cases where relapse occurred :—

CASE I.—A. B., *orderly*, inoculated, admitted 17th May, complaining of headache and general malaise. The temperature during the first week ranged between 101° and 103° . The tongue was very dry and coated, the motions characteristic, the abdomen somewhat distended, and a few rose spots were visible. The spleen was enlarged. The Widal's reaction was positive. The patient passed through a mild attack of enteric fever, possibly modified by inoculation. The temperature was normal by the twenty-fifth day of the disease, and remained subnormal for ten days. On the thirty-fifth day the temperature began to rise, and continued to oscillate up to 102° till the forty-seventh day. During the relapse there was a fresh and copious development of spots, with some slight gastro-intestinal disturbance. No cause could be found for the relapse. It is possible that the patient was allowed up too soon, but it is very doubtful that this had any causal influence. He was up for one hour on 12th June, and for increasing periods up to the 18th, and on the 19th the temperature began to rise, not suddenly as one might have expected had over-exertion brought on the fever, but by ascending stages, as in the recognised onset of enteric fever.

CASE II.—Private No. 59 was admitted 29th May. He passed through a severe attack of enteric fever. During the attack the temperature repeatedly reached 106° . There was a copious rash, splenic enlargement, tympanitic distention, with some slight diarrhoea and hypostatic congestion of the lungs. The pyrexia lasted up to the forty-first day of the disease, when for five days there was a period of complete

apyrexia. On 4th July he was allowed mince meat, contrary to the general rule that a patient should be seven days without fever before any extra food was given. That evening the temperature rose to 102° . In two days there was a fresh copious development of spots, the fauces became swollen, and two small ulcers developed upon the soft palate. There was considerable abdominal discomfort. The temperature remained between 104° and 102° for thirteen days, but it gradually descended by easy stages, and the patient made an uninterrupted recovery. It may be noted that during the period of apyrexia after the initial attack there was marked constipation, aperients being given three times in five days.

CASE III.—*Conductor of native labour*, passed through a very mild attack, the temperature reaching the normal on the seventeenth day of the disease. For nine days there was complete absence of fever. On the tenth day, which in the record of the case is noted as very windy and dusty, there was recurrence of the fever. Patient complained of abdominal uneasiness, and a fresh crop of spots developed. On 8th July the patient had been put on convalescent diet. On 9th July the temperature rose. During the relapse the pyrexia lasted ten days. The patient made a good recovery.

CASE IV.—Private No. 69, *Suffolks*, passed through a mild attack of enteric. This was succeeded by ten days of apyrexia, when the patient appeared to convalesce rapidly. On the night of the eleventh day the temperature rose to 100° ; next night to 101.4° ; the night after to 103° . He passed through a typical mild relapse, with headache, gastro-intestinal disturbance, a rash, and some tonsillitis. The Widal's reaction was positive. At the time the recurrence of the fever came on the patient had been on ordinary diet for seven days.

CASE V.—Private No. 80, *K.O.R.L.*, passed through a fairly severe attack of enteric. He was admitted to hospital on the tenth day. The fever lasted to the twenty-second day of the disease. After five days, when there was entire absence of fever, the temperature suddenly rose to 103° . From that time the temperature kept oscillating between 104° and 99° for seven weeks. Then for three weeks more it rose at night to 100° , and was normal in the morning. During the relapse the usual rash, gastro-intestinal disturbance, and splenic enlargement were present. The patient became extremely emaciated. During the seventh week the patient had several rigors, with attacks closely simulating malarial attacks. The blood was frequently examined for the malarial parasite, but it was never discovered. It is difficult to ascribe any cause for the relapse. There was to our knowledge no injudicious increase in the diet. For three days before the relapse came on marked constipation was present, and several aperients had been given with no effect till the morning of the day on which the temperature rose.

CASE VI.—Drummer C., No. 85, admitted to the hospital on the seventh day of the disease. He passed through a severe attack of enteric fever. The temperature only reached the normal on the fortieth day of the disease. There was thrombosis in the veins of the left leg. After two days of complete absence of fever the temperature rose to 105° , and the patient passed through a relapse which lasted fifteen days. No cause could be found for the return of the fever. There was no alteration on the diet, and the bowels remained regular during the whole attack.

CASE VII.—Private P., No. 88, *3rd Royal Lancasters*,

admitted on the fifteenth day of the disease. Patient had a mild attack of enteric fever. The temperature reached the normal on the twentieth day of the disease. There was no diarrhoea during the attack, but the spleen was palpable, and spots were present. After six days of complete absence of fever the temperature began to rise again. No cause could be ascribed for the recurrence, which lasted twelve days, after which the patient made an uninterrupted recovery.

CASE VIII.—*Native Conductor*, No. 89, was admitted convalescent from enteric fever. He convalesced very favourably, gaining flesh and apparently doing well for the first ten days in hospital. On the eleventh day the temperature began to rise, reaching 103° on the second evening, and 105° on the fourth evening. There was abdominal distention, spots were present, and the spleen was enlarged. The bowels were regular. He passed through a typical relapse, the fever lasting seventeen days. It may be noted that on the day when the fever recurred, the patient, feeling very hungry, had obtained some ration bread from one of the other patients. The patient made a good recovery.

The intervals during which the temperature was normal between the original fever and the recurrence are: ten days, five days, nine days, ten days, five days, two days, six days. Relapse occurred in 5.3 per cent. of the cases, a not very high percentage when it is remembered that all our patients were men; for it is recognised that relapse is more common in the male than in the female. No cause can be ascribed for the relapse. In one patient, No. 2, increase in the diet was certainly allowed too soon, and the temperature rose five

hours afterwards. In two cases constipation was present before the relapse, but this cannot be held to have had any causal relationship. In the other cases, absolutely no cause could be ascribed for the recurrence of the fever. In one case the temperature rose suddenly to 105° ; but in the others the rise took place gradually, by ascending stages, as if it were the onset of a second distinct attack of enteric fever. The patient had evidently got a fresh dose of poison, which had been lying dormant in some part of the body, and being set free, induced a second, but, in all except one case, a modified attack of the fever. There was no mortality amongst the relapsed cases; they all did well, and made a good recovery. The length of the fever during the relapse was not prolonged unduly in any of the cases, with the exception of No. 5, the prolonged period of pyrexia being then possibly due to post-typhoidal anæmia, which was fairly well marked. It is not easy to give any explanation of the relapse in these cases. A fresh poisoning of the system had evidently taken place. Chiari has suggested that the bacilli persist in the bile passages, and that an indiscretion in diet produces their discharge into the alimentary canal and a re-infection. In only two of our cases could any indiscretion in diet be traced. Three patients were on full diet, and one on convalescent diet, when the relapse took place. Dr James Miller cut sections of the liver and bile ducts in the fatal cases of the fever, and in none could bacilli be found. In the fatal cases marked reactionary changes are found in the mesenteric glands, with numerous clumps of bacilli. It seems possible that re-infection starts from the mesenteric glands on the subsidence of the reactionary changes and the re-establishment of the lymph stream. An insufficient degree of

immunity having been produced during the original attack, a fresh attack was precipitated.

ANALYSIS OF FATAL CASES.

I. *Death due to the Severity of the General Condition— Asthenia.*

(1) No. 78, age 25, not inoculated. On admission the patient was too ill to give much of his history. He was a fairly muscular man, with a dull, listless expression, and a flushed face. The pupils were dilated. The lips were dry and cracked; the teeth were good; the tongue was dry and cracked, copious brown sordes present, and the throat painful, swollen, and much congested. He took his nourishment fairly well. There was no sickness or vomiting. There was some diarrhoea but the motions were not very fluid. The abdomen was slightly distended. There were no distinct spots. The spleen was distinctly enlarged. The circulatory system showed no subjective phenomenon. The apex beat was neither visible nor palpable. The left border of the heart was in the mammary line. On auscultation, the first sound of the heart was very weak, the second sound relatively accentuated. There was an intermission every sixth beat or so. The pulse rate was 100 to 114; it was irregular in time and force, with an occasional intermission; the tension and pressure low; marked decroticism was present. The vessel wall was healthy. The respirations were 20 to 28 per minute, regular. There was no cough. The breath sounds were harsh, expiration somewhat prolonged, especially at the bases, where a few crepitations were audible. The skin was

hot, flushed, and dry. There was no distinct eruption. No headache was present. The patient was listless and apathetic, quiet, and slept fairly well. On admission the temperature was 103° . It remained between 102° and 103° up to the day of death, on 7th June.

The patient was kept absolutely at rest in bed on a purely milk diet. Salol, grains five, was given three times a day. Tincture of digitalis and tincture of nux vomica every four hours to alternate with $\frac{1}{2}$ oz. of whisky.

The patient remained much in the same condition for the first seven days. After that the pulse began to fail. The intermissions and irregularities became more marked. The pulse became more rapid and feeble. Cyanosis was noticed. Congestion at the bases of the lungs developed. The patient never seemed to react to stimulation, and he sank and died on the tenth day after his admission to hospital.

Post-Mortem.—The heart was found to be soft and flabby and somewhat dilated. The blood was very fluid. The lungs were healthy at the upper part; there was marked congestion and œdema of the lower lobes. Some patches of broncho-pneumonia were present in the lower lobes. The intestine showed several small ulcers scattered over the lower end of the ileum towards the valve. The ulcers were superficial. The spleen was enlarged, but firm in consistence. The kidneys were congested. The liver showed cloudy swelling. The mesenteric glands were enlarged and acutely congested.

Microscopic sections were prepared by Dr James Miller. (1) The intestine: a small portion showed swelling of the solitary glands due to increase of lymphocytes, no bacilli were present. (2) The mesenteric glands were congested, but fairly

healthy. No necrotic areas and no bacilli could be found. (3) The spleen was congested, and showed occasional small necrotic areas. (4) The liver showed well-marked cloudy swelling, and some fatty change, but no necrotic areas. (5) The kidneys showed some cloudy swelling. (6) The lungs showed well-marked broncho-pneumonia, with some emphysema. Diplococci were numerous.

(2) No. 71, 10th I.Y., age 23, not inoculated; admitted 24th August 1900.—The patient when admitted was too ill to give his previous history. He first felt ill about fourteen days before admission, complaining of coryza and general fatigue. There was no diarrhoea or sickness. On admission the patient was slightly delirious at times, and very weak. Tremors were very marked. Slight subsultus was present. The lips were very dry. The tongue was very dry, tremulous, and thickly coated. The abdomen was fairly normal in size, soft, and there was no pain or tenderness on palpation. The spleen was not palpable. The liver was not enlarged; the lower liver area was somewhat resonant anteriorly. The skin was dry and desquamating. The lungs gave evidence of general bronchitis. The heart sounds were feeble, otherwise normal; no murmur was present. The pulse was feeble, 100 per minute. On the day after admission numerous rose spots were noted. The motions were loose and of a characteristic appearance. By 29th August the spleen had become palpable. On 30th August, at 12 P.M., the patient was delirious. Subsultus very marked. Carphologia present. The abdomen was fairly soft, no pain on palpation; the liver dullness normal. Pulse 126. A loud blowing systolic murmur had developed at the apex. There was evidence of congestion of the bases of the lungs.

On 31st August, at 11 P.M., the patient was found very delirious. The abdomen was tense and board-like. The liver dulness was gone. It was doubtful if perforation had taken place, but in any case the patient was too ill for operation. The following morning he had improved somewhat. After passing a rectal tube the abdominal distention had somewhat diminished in the early morning, and the liver dulness had reappeared to some extent. The blood was examined, and no leucocystosis found. It was decided that with the absence of leucocystosis, coupled with the slightly improved abdominal condition, perforation had certainly not taken place. The patient continued much in this condition till 3rd September, when the temperature rose to 106° . A wet pack reduced it very rapidly to 101° , but it promptly rose again to 106° . A wet pack being then applied, it remained at 101° and 102° for six hours, when it rose again to 106° . During this time the heart became very much enfeebled. On 4th September the temperature remained about 103° , falling somewhat in the evening, but the patient's condition did not improve. The pulse became weaker, the limbs cold, the lips and ears cyanosed. The patient gradually sank, dying of heart failure on 5th September, the twenty-sixth day of the disease. Throughout, the treatment consisted of cold packs, stimulants in the shape of champagne and whisky, and strychnine and digitalis for the cardiac condition.

Post-Mortem.—The left lung showed pleuritic adhesions at the base; both lungs showed broncho-pneumonia, and marked congestion and œdema of the bases. Heart: the left ventricle firmly contracted; the right ventricle flaccid and dilated. The aortic valves were normal; the mitral valves

showed considerable thickening along the edges of the cusps, but no recent vegetations. The pulmonary and tricuspid valves were normal. The abdomen: in the right iliac region a little recent peritonitis was present, binding the small intestine to the brim of the pelvis at a point three inches above the ilio-cæcal valve. The mesenteric glands were somewhat enlarged. The intestines showed a deep ulcer on the inferior cusp of the ilio-cæcal valve. About four inches above the valve a long ulcer occupied the whole of a Peyer's patch; slight ulceration extended about a foot up the ileum, and congested Peyer's patches and solitary glands somewhat higher. The large intestine was unaffected. The liver showed cloudy swelling. The spleen was rather small, the capsule wrinkled, and on section the parenchyma deeply congested but fairly firm. The kidneys were pallid; the vessels prominent, the capsules stripped readily—in a condition of cloudy swelling.

Microscopic sections prepared by Dr James Miller. The mesenteric glands showed congestion, but no necrotic areas and no bacilli. The spleen was congested, and there were occasional small necrotic areas. The liver showed well-marked cloudy swelling and some fatty change, but no necrotic areas. The kidneys were in a condition of cloudy swelling. The sections of the lung showed well-marked broncho-pneumonia, numerous diplococci being present.

(3) No. 72, *Kitchener's Horse*, not inoculated; admitted 29th May 1900.—When admitted to hospital patient was in a comatose condition, and very seriously ill. He was unable to comprehend anything said to him, and could not be roused. He was not expected to survive the night. The pulse was very rapid and feeble. The following day he

looked somewhat brighter, and made an attempt to show his tongue when asked. The mouth was very foul. A mass of membrane, forming almost a cast of the buccal mucous membrane and soft palate, was removed, after which he swallowed more easily. The following day he was slightly improved. He could be roused, and was able to write his name, but the organic reflexes were still abolished. The patient was very emaciated; the abdomen distended but very easily palpated. No pink spots were visible. There was no abdominal tenderness. The spleen did not seem to be enlarged. The pulse was very soft. On 1st June he seemed somewhat better, but had passed a very restless night, constantly trying to get out of bed. During the day he became very restless and violent, and had to be closely watched. He did not sleep much that night, and on the following day seemed a little worse. Restlessness still continued, and the temperature began to rise, and by the afternoon it reached 106°. Sponging appeared to have no effect on the temperature. He became comatose, and died quietly in the afternoon.

Post-Mortem.—The peritoneal cavity contained no fluid. No peritonitis. The intestine showed extensive ulceration of Peyer's patches and solitary glands. The glands of the mesentery were enlarged. The spleen was enlarged and pulpy. The lungs showed congestion and œdema at the base, otherwise normal. The left side of the heart was firmly contracted. The right side distended and dilated. The heart muscle was apparently normal.

Microscopic sections prepared by Dr James Miller showed the spleen acutely inflamed. Large and small necrotic areas present, but no clumps of bacilli. The mesenteric glands

showed numerous necrotic areas, but no clumps of bacilli. The kidneys were in an early stage of cloudy swelling.

(4) No. 92, *Mounted Infantry*, not inoculated; admitted 29th May.—About nineteen days before admission he went sick and was admitted to a field hospital. Becoming worse, he was sent down to the Edinburgh Hospital. The illness began with diarrhœa, which had since continued. When admitted the patient was very ill, too ill to be examined thoroughly. The lips were very dry and cracked. The tongue was cracked and swollen. There was difficulty in taking food by the mouth. The abdomen showed no special distention. The spleen extended two inches below the costal margin. No spots were visible. The liver was not enlarged. The motions were typical. The pulse feeble and irregular. The heart sounds faint, but clear. The following day the patient appeared to be a little better, but the pulse was still weak and irregular. The patient remained much in this condition till the evening of the 11th, when he was not so well. He was freely stimulated and for a time reacted, but the breathing became laboured. Cyanosis developed. He gradually sank, and died on the afternoon of the following day.

Post-Mortem.—There was found marked ulceration of the lower three feet of the small intestine, the ulceration extending at parts almost to the peritoneal coat. The mesenteric glands were enlarged and congested. The large intestine was not affected. The liver and kidneys showed cloudy swelling and congestion. The spleen was enlarged and markedly congested. The heart muscle was pale and flabby; the heart otherwise normal. The lungs showed marked hypostatic congestion.

Microscopic sections prepared by Dr James Miller showed acute congestion of the mesenteric glands, with numerous large cells filling the sinuses. Towards the centre of the sinus these cells lost their staining reaction. Numerous bacilli were present in clumps. The liver tissue showed advanced cloudy swelling, and slight fatty change. No bacilli found. The spleen was acutely congested, with large areas of necrosis and numerous clumps of bacilli. The kidneys showed acute parenchymatous inflammation. The glomeruli congested, and the nuclei of the tubule cells ceased to stain. No bacilli were present.

In those four cases death could be traced in three to the severity of the general condition, in one to exhaustion, with marked local lesion. In No. 1 the local changes in the bowel were slight; there was little ulceration, but the toxæmia was marked. Case No. 2 showed a similar condition. He died on the twenty-sixth day of disease. During his illness the temperature was constantly high and the nervous symptoms well marked. The local changes in the bowel found post-mortem were not extensive. Case No. 3 was comatose when admitted. He had been in a bullock waggon for two days, and in an ambulance train for other two days. When admitted he was not expected to live through the night. He died apparently from toxæmia, coupled with the impossibility of obtaining proper treatment during the earlier part of the illness. There was little ulceration of the bowel. The ulcers were small and superficial, and appeared to be about the second week of the disease. Case No. 4 was somewhat of a contrast. He died on the thirty-third day of disease. The post-mortem characteristic was the very extensive and deep ulceration of the bowel.

II. *Death due to Cardiac Failure.*

(1) No. 89, *Orderly*, age 22, inoculated twice; admitted 30th August 1900, complaining of headache, pains through the body, and a general tired feeling. The patient had history of good health up to the present attack. There was no history of rheumatism. His illness had begun on the 22nd of the month, with a headache in the mornings, pain in the back of the neck, and pain in the eyes. On admission he was a healthy-looking man, the face was somewhat flushed, the pupils dilated, the temperature 102° . The tongue was slightly coated with white fur, clean at the edges, and dry. The teeth were good. The appetite entirely absent. The abdomen was not distended; no rash present. The bowels were constipated. Pulse 100; of fair strength. The cardiac pulsation was somewhat diffused and heaving in character. The apex beat was visible and palpable in the mammary line. Percussion showed the left border of the heart three-quarters of an inch outside the mammary line. The right border two inches to the right of mid-sternal line. On auscultation in the mitral area a somewhat pronounced systolic murmur was audible. The second sound was accentuated. What appeared to be the same murmur was heard in the tricuspid area. The sounds at the base were pure, the second sound being markedly accentuated in the pulmonary area. The urine contained a considerable deposit of urates; otherwise normal. The respiratory system was normal. Widal's reaction was positive on the fifteenth day. The patient progressed favourably. The temperature averaged between 102° and 104° . Some difficulty was experienced owing to obstinate constipation, but during the attack the patient

took his nourishment well. On the fourteenth day some dulness developed at the base of the lungs, with bronchial breathing; a few spots were noticed. Digitalis and carbonate of ammonia were prescribed. The patient seemed to improve. On the twenty-third day the temperature was lower, ranging from 100° to 101° , and the only symptoms which caused any anxiety were some difficulty in respiration, and feebleness of the pulse. On the twenty-fifth day the patient was more cheery and talkative, and not so somnolent. He complained of some pain and stiffness in the right thigh, but nothing could be made out on palpation. At 8 P.M., when the pulse and respiration were taken, the pulse was 100 and the respiration 34, and the patient talked of getting up, being so much better that he wished to get up the following day to return to work. Shortly after this the respirations increased very much, and he complained of great difficulty in breathing. A profuse cold sweat broke out, and the pulse became almost imperceptible. He was stimulated, hypodermic injections given, hot applications applied over the heart, but no reaction took place, and the patient died in twenty minutes. There was no post-mortem examination.

(2) No. 76, 3rd Royal Lancasters, admitted 10th July 1900.—When admitted patient was in a typical typhoid state. No history could be obtained from him. A comrade stated that he had been taken ill on 1st July. He went to see the doctor several times, and then he was put into a tent for eight or nine days. After that he was brought down to the hospital in the ambulance train. He was in a typical typhoid condition: the teeth covered with sordes, the tongue thickly coated, and cracked and fissured. The abdomen was not distended, and there was no tenderness. The spleen was

enlarged, extending below the costal margin. Percussion of the heart showed an increase in the percussion area on the right side the left border was in the mammary line. The pulse was fair in force, but irregular in time. There were very numerous coarse crepitations all over the chest and especially at the bases. There was no dulness on percussion; the breathing was much embarrassed, noisy, and rattling in character. The urine, which had to be drawn off, was normal, save for the presence of a copious deposit of urates. The following day the patient seemed not so well; he was more cyanosed, and the breathing was very laboured. The temperature kept ranging from 104° in the morning to 105° in the evening. The pulse was fair, somewhat better than the appearance of the patient would have led one to expect. The heart sounds were difficult to make out, owing to the presence of numerous coarse accompaniments. He remained in this condition up to the 15th, when in the evening he became more cyanosed. The breathing was more laboured and noisy from secretion in the air passages. He was freely stimulated, and the bases of the lungs cupped, but no improvement took place. He died at seven in the evening.

Post-Mortem was performed sixteen hours after death. It showed the right side of the heart markedly engorged and dilated, a white clot extending from the appendix of the auricle through the tricuspid valve into the ventricle; some white clot in the left auricle. There was evidence of old endocarditis of the mitral valve, and stenosis was present. The right lung showed the absence of a third lobe. Both lungs showed marked hypostatic congestion and œdema. The bronchi contained a great deal of frothy secretion. There were pleuric adhesions on the diaphragmatic surface

of the right lung. The intestines showed extensive ulceration in the lower part of the ileum. The ulcers were very extensive and deep, and evidently about the beginning of the third week. There was no peritonitis or perforation.

Microscopic examination showed: (1) Mesentric glands acutely inflamed, large numbers of cells filling the sinuses; numerous necrotic areas present, and several large clumps of bacilli. (2) Spleen: numerous necrotic areas, but no clumps of bacilli. (3) Liver: early cloudy swelling, distinct fatty change, cellular infiltration of the portal areas, and some necrotic areas. No bacilli found. (4) Kidneys: some cloudy swelling and no necrotic areas. (5) Lungs: acute broncho-pneumonia, bronchi filled with leucocytes and occasional diplococci.

In case No. 1 it is possible that there was some early thrombosis of the right femoral vein, but of this there was no evidence beyond some pain in Scalpa's triangle on the day of death. There was no œdema of the leg, and no evidence of thrombosis of the saphina vein. Had thrombosis been present death might well have been ascribed to extensive infarction of the lung. It is more probable, however, that it was due more directly to cardiac failure. Throughout the attack the heart gave rise to anxiety. When admitted, mitral regurgitation with hypertrophy and dilatation was recognised, and he early developed hypostatic congestion of the lungs. This, however, improved under treatment, and death supervened in a sudden attack of syncope. Case No. 2 died of broncho-pneumonia and œdema of the lungs. His attack of enteric was more severe than in No. 1. The heart being handicapped by mitral stenosis and was quite unable to meet the demand, œdema of the lungs

supervened, and he died early in the disease, probably about the sixteenth day. The two cases exemplify well what a serious handicap an organic cardiac lesion is to a patient suffering from enteric fever.

III. *Death from Perforation.*

No. 90, age 26.—*Enteric Fever, Perforation, Operation, Death.*—Admitted 18th May 1900. Shortly after coming to South Africa patient suffered slightly from dysentery. About eighteen days before admission patient was working in the Edinburgh Hospital, and being very thirsty, he drank a large quantity of water from the cook-house barrel. In the evening he returned to camp, feeling very cold and shivery. During the night he was attacked by severe diarrhœa. The following morning he got a dose of castor oil and laudanum, which greatly relieved him. The diarrhœa ceased in about a week's time, but the patient was still far from well, suffering from sore throat, giddiness, deafness at night, and general weakness. He was attended at his camp, as the hospital was not then open. The patient became worse, and was admitted on 18th May. He was a well-developed man; the face was flushed, the lips dry and parched, the temperature 103° . He complained of great thirst. The tongue was fairly clean; the mouth and throat dry. He was much troubled with eructation. The motions were pea-soupy in character. The abdominal wall was well nourished; there were no rose-pink spots. There was some localised pain and tenderness in the right iliac region. The spleen was much enlarged, and easily palpable. The circulatory system was normal. On 21st May a rash appeared; on 22nd May it was noted that the throat was considerably inflamed and a large amount of

muco-purulent secretion present. On the 23rd he complained of pain in the left shoulder. There was some cough, but no physical signs in the chest. The temperature kept steadily between 103° and 104° . On 29th May, the twenty-second day of disease, patient was found not so well. He was very dull and heavy. The tongue very dry; the respiration laboured. The pulse rapid, weak, and irregular. The temperature 104° . After sponging it fell to 102° . There was considerable abdominal distention. The right side of the heart could be made out by percussion three inches to the right of the midsternal line. The heart sounds were feeble, the first being almost inaudible. The following day the patient was not so well, he was only semi-conscious, but was capable of being roused. The breathing was rapid and the pulse very feeble. The right side of the heart was markedly engorged and dilated. At 6.30 P.M. the patient complained of pain in the iliac fossa. It was noticed that he was lying with the right leg partially drawn up, and the abdomen in the lower right quadrant did not move with the respiration. On palpation, there was some rigidity of the lower half of the abdomen, especially at the right side, and considerable tenderness in the right iliac fossa. The patient was very collapsed. There was fall of two degrees in the temperature. As perforation had evidently taken place, it was decided to operate. On opening the abdomen some turbid fluid escaped, but there was no faecal odour and no gas. The small intestine about the lower end of the ileum showed some recent flakes of lymph on the peritoneal surface. There were one or two hæmorrhagic spots, and in places the wall of the intestine was very dark and thin. The abdominal cavity was washed out with weak sterilized boracic lotion.

Upon introducing a drainage-tube into the pelvis, a quantity of turbid fluid containing flakes of lymph with a strongly faecal odour escaped. The patient was so collapsed that no further search for the perforation could be attempted. The pelvis was washed out with weak boracic lotion, and the patient put back to bed. The temperature shortly after operation was 102° , the pulse fair. An enema of brandy and chicken jelly was given, but was not retained. As the pulse became very feeble, strychnine and stimulants were given hypodermically, but the pulse failed to react. The patient became very restless. He gradually sank, and died at 12.30 the following day.

Post-Mortem.—Two very minute perforations were found within three inches of the lower end of the ileum. Very extensive ulceration was present in the small intestine, the floor of the ulcers being formed at parts by the peritoneal coat. Peritonitis was present. The spleen was much enlarged, soft, and friable. The right side of the heart was markedly dilated and engorged with blood. The heart muscle was pale and flabby. The lungs showed hypostatic congestion and œdema. A scraping from the spleen was stained, and showed numerous typhoid bacilli, and the cellular elements more or less degenerated. Sections of the spleen showed areas of acute congestion with small areas of necrosis. At some parts the splenic structure had entirely disappeared, nothing remaining save particles of broken-down cells.

No. 90, *Royal Canadian Rifles*, age 33.—*Enteric Fever, Perforation, Death.*—Admitted 26th June 1900. The history given by the civil surgeon attached to the stationary hospital was that the patient, who was suffering from enteric fever,

had been doing very well up to within a few hours of the time of admission to the Edinburgh Hospital. Then he was seized with abdominal pain and symptoms of perforation, and was sent to the Edinburgh Hospital with a view to operation.

On admission, patient was found to be semi-conscious. The face pale and haggard. His eyes were shut, but he could be roused to answer questions. The pulse was very weak and rapid. The extremities were cold. There was great complaint of pain in the abdomen. The abdomen was distended, rigid, and difficult to palpate. The liver dulness was gone. There was a distinct dulness in the flanks. The temperature on admission was 99°. It was evident from the patient's condition that perforation had taken place some considerable time before. General peritonitis was present. There was a considerable amount of free fluid in the abdomen. The patient was manifestly in a dying condition. It seemed hardly a suitable case for operation. He was given some morphia, two and a half pints of saline solution transfused into the cellular tissue. After this he rallied for a few hours, but died in the course of the night.

Post-Mortem.—On opening the abdomen a large amount of fluid escaped. The intestines at the lower part of the abdomen were matted and adherent. Perforation had taken place at the base of the ulcer a little above the ilio-cæcal valve. The spleen was enlarged and pulpy. From the appearance of the abdomen it was evident that the peritonitis was of some duration, probably twenty-four to thirty-six hours.

Microscopic examination showed: (1) The mesenteric glands congested, large cells filling the sinuses, no necrotic areas present, and no clumps of bacilli. (2) The spleen:

necrotic areas small, no clumps of bacilli. (3) The liver: some cloudy swelling and slight fatty change. (4) The kidneys: slight cloudy swelling.

No. 73, age 26.—*Enteric Fever, Perforation, Death.*—Admitted 10th July 1900. No history was obtainable. Patient was very anæmic. The tongue dry and cracked; covered with sordes; the voice hoarse; the fauces congested. The abdomen was distended, but there was no special tenderness. It was impossible to make out the splenic dulness owing to tympanites. Some diarrhœa was present, the motions being pea-soupy in character. The circulatory system, with the exception of feebleness of the cardiac sounds, was normal. There were signs of bronchitis in the chest, especially on the right side. The patient remained much in this state for the first week, when it was noticed that the anæmia seemed more profound. There was complaint of pain in the abdomen, which was relieved on giving a turpentine enema. The following day he seemed somewhat better, though the abdomen was still very distended. In the evening the temperature reached 106° , but after sponging fell to 103° . He complained of pain and tenderness in the abdomen, which again disappeared after a turpentine enema. The pulse was rather feeble. The following morning a sudden attack of breathlessness came on. There was considerable cyanosis. The pulse was exceedingly weak. Stimulants, etc., were administered hypodermically, but the patient never rallied, and died at 8.15 A.M., the temperature then having fallen to 99° .

Post-Mortem.—Perforation was found with recent peritonitis. The spleen was enlarged and pulpy. It is probable that perforation took place on the afternoon of the 17th,

about twelve hours before the patient's death. It was reported afterwards that the patient had suddenly jumped out of bed and run to the door when the orderly was absent for a moment.

Microscopic examination: the intestinal ulcers were characteristic. There was marked involvement of the muscular coat. Numerous bacilli could be seen and traced as far as the circular muscular coat. The mesenteric glands were congested. Numerous large cells filled the sinuses. Areas of necrosis were present, but bacilli were not numerous. The spleen showed congestion and large necrotic areas, but no clumps of bacilli. The kidneys were in a state of early cloudy swelling. The liver showed cloudy swelling of the parenchyma, small necrotic areas, and increase of leucocytes in the portal tracts.

These three cases of perforation leave room for regret. In the first the patient was so ill that any extensive effort to find the perforation, which was very minute, was quite impossible. We had to be contented with washing out the abdomen and draining, if we wished to get the patient off the table alive. The second case had perforated a considerable time before admission, and it seemed quite hopeless to operate. The third case was very misleading, and demonstrates well what a misleading symptom pain is. He had had repeated attacks of abdominal pain, which passed off under treatment. When perforation actually did take place, it was not diagnosed in time to permit of operative measures.

IV. *Cedema of the Glottis—Tracheotomy.*

No. 77, 3rd Royal Lancasters, age 20.—*Enteric Fever, Bronchitis, Cedema of Glottis, Tracheotomy, Death.*—Admitted

to the Edinburgh Hospital on 10th July 1900. Patient had been taken ill at Zand River on 1st July. He was in a tent for about ten days, and subsequently brought down to the hospital in an ambulance train. The patient was a tall, very thin lad. He was in a typical typhoid state. He lay with his mouth open; the face flushed. The teeth were covered with sordes; the tongue thickly coated. Some muttering delirium was present. The abdomen was flat and soft, and easily palpated. No pain. There was some tenderness in the region of the spleen. The spleen was not palpable, but the dulness could be made out extending to the costal margin at the ninth rib. No diarrhoea was present. The heart sounds were pure, though weak; the pulse of medium strength; the vessel wall seemed slightly thickened. Numerous bronchial sibilations were audible on both sides of the chest. Under treatment, the patient improved considerably. The delirium diminished. The temperature fluctuated between 102° in the morning and 104° at night for the first week. After that the morning fall was more marked. The evening temperature kept about 103° . On 21st July, eleven days after admission, the patient's general condition seemed good; morning temperature 98.8° . There was a good deal of cough, especially after taking food. He complained also of pain in the throat on swallowing, and complete aphonia was present. There were a number of rhonchi all over the chest, and some crepitations at the right base, but the percussion sound was quite clear at the bases. About 8 P.M. the following day patient's breathing became very distressed; he had been very restless all afternoon. When seen at 9 o'clock the breathing was very dyspnoeic, the lips were livid, the *allæ nasi* in action, the extraordinary muscles of respiration

acting violently. The intercostal spaces, the lower part of the chest, and the epigastrium were being drawn in markedly with each inspiration. He was very restless, and throwing his arms about. He was given forty-five grains of ammonium bromide. The steam kettle was employed, and counter irritation kept up over the trachea. This did not relieve the dyspnœa. Tracheotomy was performed at 1 A.M. on 22nd July, and the breathing was at once relieved. The pulse improved rapidly, and he could take his nourishment, though swallowing was apt to bring on a spasmodic cough. The patient slowly improved. The pulse kept very rapid, but the respiration was easy. The tongue began to clean. The temperature fell by lysis, the ninth day after operation it was normal in the evening. Some sloughing occurred in the cellular tissue round the tracheotomy wound, but under careful dressing the wound cleaned, and the tube was removed on 30th July and the patient was able to breathe through the mouth. He remained well till 8th August, when he got a severe exacerbation of the bronchitis. The breathing was difficult, but there was no evidence of obstruction in the upper air passages. The temperature rose again to 105°. By 10th August the patient had become very weak. He was very restless, had great difficulty with his breathing, and was unable to cough up the expectoration. At 12 P.M. he was apparently being drowned with secretion from the bronchial tubes. He was turned over on his side, and the mucous membrane of the trachea stimulated with a feather through the old tracheotomy wound, and he was able to cough up a fair amount of thin yellow purulent secretion. For some time the breathing was better, but the dyspnœa returned on the following day very severely. The pulse became very

feeble and rapid, and the patient sank and died nineteen days after operation.

Post-Mortem.—The tracheotomy wound appeared healthy. There was nothing abnormal to be made out in the larynx. On opening the chest there was a little clear fluid in the right pleural cavity with lymph on the pleura. The lung showed on section an enormous amount of muco-purulent secretion in the bronchial tubes, and, in the right lung especially, patches of broncho-pneumonia. The heart: the left ventricle was firmly contracted; the right ventricle somewhat dilated; the right auricle and ventricle contained a mass of white clot, which extended into the pulmonary vein. There was no pericarditis. The heart muscle was pale and flabby. In the small intestine old typhoid ulcers were present. There were some enlarged glands in the mesentery. The spleen was not enlarged. The liver was fatty and congested. The kidneys congested.

The case was a very disappointing one. The patient was exceedingly ill at the time tracheotomy was performed. He improved after the operation, and seemed to be doing well, when the attack of bronchitis and broncho-pneumonia supervening carried him off very rapidly.

V. *Death from Hæmorrhage.*

Enteric Fever, Hæmorrhage, Death.—No. 74, 1st K.O.S.B., age 30.—Not inoculated; was admitted 29th May 1900, complaining of pains all over, and diarrhœa. Three weeks before admission his illness began with pain in the head, back, and throat. The bowels were regular. This went on for about a week, when he became so ill that he had to be admitted to hospital. About this time diarrhœa commenced.

The patient was a strong-looking muscular man, with a heavy dazed expression. His face was flushed. He lay dozing in bed, breathing heavily. The lips and tongue were covered with a white fur; the mouth dry; the fauces congested. He took his nourishment well. Some diarrhœa was present. The abdomen was full, but not specially distended. There were about a dozen characteristic spots. There was no pain, tenderness, or gurgling. The spleen was enlarged, but not palpable. The pulse 89, regular, and of fair strength. The arterial wall healthy. With the exception of weakness of the first sound, examination of the heart showed no abnormality. The next two days patient appeared to progress favourably. The temperature tended to fall. The bowels kept regular. On the 31st, some partially digested blood was noted in the motions. In the middle of the night an enormous hæmorrhage came on. The patient became practically pulseless. He recovered slightly under gentle stimulation. In the morning the patient was quite unconscious, breathing stertorously, the face and lips blanched, and of a dusky brown hue. His temperature had fallen to 97.7° , a fall of 7° in twelve hours. His pulse was barely perceptible. Preparations were made for transfusion, but before those were completed the patient died.

Post-Mortem.—On opening the abdomen there was no general peritonitis. The sigmoid flexure stood out distended with dark blood. The peritoneal surface of the intestinal coils showed some inflammation over the area, where ulcers could be seen, but there was no perforation. In the intestine there were numerous small ulcers, from about one quarter to half an inch in diameter, on the mucous membrane of the ileum. Just above the valve there was a large irregular area of

ulceration, with large blood-stained sloughs adhering, obviously the point from which the hæmorrhage had occurred. The spleen was markedly enlarged, but fairly firm. The mesenteric glands were enlarged.

Microscopic Examination: intestinal ulcers examined in different stages showed marked involvement of the muscular coats and numerous bacilli. The spleen showed congestion and numerous small areas of necrosis. The bacilli were few both in film and section. The liver showed cloudy swelling of the parenchyma, numerous small necrotic areas, and leucocytic infiltration of the portal areas. The kidneys showed slight cloudy swelling; no necrotic areas present.

The case is a good example of death from hæmorrhage in enteric fever. The patient, apparently doing well; without any warning hæmorrhage supervening, which proved fatal in a few hours.

Mortality.—The mortality in the cases *under treatment during the whole of the attack* was 10.7 per cent., a very low mortality when it is considered that we were, for the most part, dealing with young adults between twenty and twenty-five years of age.

This would rather tend to show that the type of fever was rather milder than is the rule in Great Britain, for it must be remembered that most of our cases came to us by train, and after having had in addition two days' journey in a bullock cart, a form of treatment possibly inevitable in war, but calculated to raise the mortality of the mildest form of enteric fever.

Treatment.—The treatment carried out was, for the most part, diatetic or expectant. During the fever, and for seven

days after the temperature had fallen, the patient was kept on fluid nourishment. Fresh milk could be obtained in fair quantity, and, when necessary, this was supplemented with condensed and sterilised tinned milk. Eggs were obtainable and were used in the form of custards, egg-flip, and albumin water. Chicken and meat jellies and beef peptone were found useful.

The care of the mouth was an important element, and had to be carefully watched. Chlorine water gave most satisfaction as an antiseptic mouth wash, and seemed to have a better influence on the septic condition than any other preparation, though a variety were tried.

The fever was treated by sponging and cold packs. Sponging was carried through every two to four hours where the temperature rose above 103° . Cold packs were given where necessary. It was, of course, impossible to carry out the cold bath treatment, the water supply being an insuperable difficulty.

Of drugs, most of the patients got intestinal antiseptics: salol, mercury, chlorine, etc. These drugs, if they had no influence upon the disease, at least rendered the stools less offensive. In a number of the cases cardiac stimulants were necessary: digitalis, strophanthus, and strychnine were used.

Diffusible stimulants in the shape of whisky, brandy, and champagne were used fairly freely.

ANTI-TYPHOID INOCULATION.

Since the occurrence of the disastrous epidemic of enteric fever in South Africa medical men, and one might, with justice, say the public in general, have looked forward with great interest to an account of the effects of inoculation in

the disease. Has inoculation proved as valuable as was hoped not only in preventing but in modifying the disease? It is impossible from the experience of a single hospital to give a satisfactory answer to such a question. We must wait till the statistics of the whole campaign are published before we can draw any definite conclusion, and even then these statistics will require very careful consideration.

Inoculation is based upon the fact that when animals are inoculated with dead cultures of typhoid bacilli an increased power of resistance against the invasion of the living typhoid bacillus is established. In man it has been proved that the injection of an emulsion of dead typhoid bacilli produces the same blood changes that a similar injection produces in animals. It has further been shown that the same blood changes are produced in man by the injection of an emulsion of dead typhoid bacilli as are produced by an attack of enteric fever.

Of the staff of the Edinburgh Hospital, fifty-eight were inoculated, twenty-seven being done once, and thirty-one twice. In seven, the inoculation appeared to produce no appreciable effect. In a smaller number there was merely a slight local reaction, as indicated by some tenderness at the point of inoculation perceptible on the following day. In the very large majority there was marked local and general reaction. The effects of the inoculation were manifest in from two to five hours. There was a feeling of malaise and faintness, with, as a rule, a rise of temperature of 2° to 4° . In some cases there was an actual rigor. At the point of inoculation there was marked pain and swelling. The feverish condition lasted, as a rule, for twenty-four to thirty-six hours, after which the local swelling diminished. In

some cases there was marked enlargement of the lymphatic glands nearest to the point of inoculation, which persisted in one case for weeks. In the cases where inoculation was performed twice the second reaction was not so severe as the first.

Amongst the staff of the hospital, of the fifty-eight inoculated nine developed enteric fever. Of those nine cases one proved fatal, death supervening on the twenty-fifth day from a sudden attack of cardiac failure. It must in fairness, however, be noted that the patient started his attack with an impaired heart from an old standing mitral lesion. Of the remaining eight cases, three may be described as very severe attacks with persistent high fever and marked abdominal or nervous symptoms. In four cases the attack was pronounced, in one it was of an apyrexile type.

Relapse occurred in one case, there were complications in two cases, in both pleurisy with effusion, in one thrombosis of the veins of the leg. Inoculation was carried out twice in the fatal case and in four of the milder attacks; once in the three very severe cases and in the apyrexial case.

Of the soldiers admitted into hospital who had been inoculated, inoculation had been performed once in every case. Eighteen cases of enteric were observed, two were very severe, five severe, and ten were apparently modified attacks. Though the signs and symptoms of enteric fever were present they were very mild, the fever not being high and often of short duration (seven to ten days). In two, complications occurred, five cases were admitted with a history of a slight fever with gastro-intestinal disturbance. It is impossible to be certain if these were cases of enteric fever. They may have been modified attacks, but some of

the signs and symptoms were absent, and as they had been inoculated the presence of a positive Widal's reaction was valueless from a diagnostic point of view.

Our experience thus has been that while inoculation *appears* to modify the disease, as completely modified attacks are met with in the uninoculated. Again, very severe attacks with complications and relapse occur in those who have been inoculated. We cannot from this conclude that inoculation has been valueless, for had not the patient been inoculated the attack might have been still more severe.

It is interesting in this relation to consider the significance as regards immunity indicated by the presence of an agglutinative reaction in the blood. On this point there is much difference of opinion. Some observers hold that agglutination and immunity are distinct, others that agglutination is the essence of immunity. Experimentally it is found that a high degree of agglutinative power is never present without a certain degree of immunity. It is probable that the presence of agglutination indicates that reactive processes have occurred in the body, which lead to increased resistance. Our experience of the presence of agglutination after anti-typhoid inoculation was very varied. In some individuals the agglutinative power of the serum disappeared very rapidly, even in those who had been inoculated twice. In others who had been inoculated twice, under similar conditions, there was marked agglutinative power after six months. The agglutinative power was so high that the reaction took place almost instantaneously. Were these persons immune against enteric infection? It is not possible to say that they possessed complete immunity against natural conditions of infection, but it seems probable that a reaction

had taken place which led to an increased power of resistance.

It is exceedingly important to note that in the case of three of the staff who had been inoculated, and who developed enteric fever, agglutinative power was *absent* during the early days of the fever. Therefore, we can with justice conclude that it was not present at the time of infection.

The effect of inoculation on the mortality of the disease can only be arrived at, one would consider, after years of careful observation, and from statistics carried over a long period, and dealing with very large numbers. The outlook for inoculation is hopeful. Immunity is a relative term. While we cannot consider an inoculated person immune, it is to be hoped that we can consider that he has got an increased power of resistance.

An important question in relation to inoculation is, Can inoculation be considered entirely free from harmful results? With regret this question must be answered in the negative. In the case of at least one of the members of the staff, inoculation was followed by a marked lowering of the health standard, a malaise and indefinite feeling of lassitude and weariness. The sufferer ultimately developed enteric fever some two months after inoculation.

"SIMPLE CONTINUED FEVER."

In the army classification of disease "simple continued fever" is to be found as a distinct entity. It is probable that it owes its presence to the fact that the authorities desire a definite diagnosis for weekly returns, and it may at the time be impossible to say what febrile condition the patient

is developing. After a few days the condition declares itself to be possibly enteric fever. The diagnosis is not changed in the returns; it cannot be. The patient must be nominally discharged as "simple continued fever," and re-admitted as enteric fever. But is there such a disease as "simple continued fever"? Most army medical men who have had large experience in tropical and sub-tropical climates assure one that there is a definite febricula which occurs in white people in hot climates, who have undergone fatigue and been exposed to the influence of a tropical sun. The civil surgeons, on the other hand, were for the most part inclined to regard all cases of "simple continued fever" as undiagnosed enteric fever.

It is interesting to consider the cases which were admitted to the Edinburgh Hospital, for we had the means by examination of the blood of more or less certainly excluding enteric fever.

In all, we admitted 38 cases. Of those 38, in ten no definite diagnosis could be arrived at. The patient was seedy and run down. There was no fever while in hospital. He had a history of headache, and possibly a day or two of doubtful fever. When under our care there were no definite physical signs of disease; the Widal's reaction was negative. It is possible, indeed probable, that those patients were, for the most part, convalescents after influenza. There was a considerable amount of influenza in South Africa at the time, and one is inclined to think that influenza will account for most, if not all, of the ten cases. Of the remaining 28, seven were undoubtedly cases of enteric fever of a mild or abortive character. There was the usual history of headache, malaise, constipation, and some fever lasting a few days

Examination of the blood gave a positive Widal's reaction. Four cases may have been abortive enteric fever. There was a similar history of malaise, fever for a few days, etc., and the examination of the blood was positive, but then the patient had been inoculated against enteric, so no diagnostic evidence could be drawn from the Widal's reaction. In six cases there was a history of former repeated attacks of malaria fever. The patient, when he came to us, had, as a rule, been dosed with quinine, thus in none of the cases were we able to prove the presence of the malaria parasite, but the fever must be considered to have been of malarial origin. Take a soldier who has had repeated attacks of malaria, expose him to the influence of a hot sun by day, cold by night, couple this with fatigue and possibly damp. Such a man being predisposed through his malaria to febrile reaction, there is no reason to doubt that under the circumstances a febrile attack will be precipitated. The same applies to Mediterranean fever. Two of the patients admitted had had repeated attacks of Mediterranean fever. When under our care they passed through a mild febricula which was certainly not enteric fever, but no more was it a definite attack of Mediterranean fever. Of the other cases of "simple continued fever," two were catarrhal dysentery; one, debility from over-marching, with some slight weakness of the right side of the heart; convalescent pneumonia accounted for one; rheumatism for one; gastro-intestinal catarrh for one; one was a surgical case; one the results of salivation with mercury; and one an early pulmonary tuberculosis. From these facts one may conclude that "simple continued fever," while it is a useful term for a preliminary diagnosis, can scarcely be elevated into the position of a

distinct disease. As a rule, if the case is watched with care, a definite diagnosis can be arrived at. The figures are of interest from another point of view; if 18 per cent. of the cases of "simple continued fever" are enteric fever, it is very desirable to have a more definite diagnosis, or else sanitary precautions should be taken in all febrile conditions where enteric cannot be definitely excluded.

DYSENTERY.

While epidemic dysentery in the present campaign has not proved so serious or so disastrous as enteric fever, but few of those who visited South Africa escaped mild dysentery. This may be ascribed to the contamination of food by unwholesome dust and flies, and to the difficulties of obtaining pure water. Such an attack is of the nature of a catarrhal enteritis. At first there is simple diarrhœa, which may not be severe. The motions, at first copious, become smaller and change in character, mucus and a little blood appearing. With the change in character of the motions, a certain amount of tenesmus sets in. Such an attack can usually be checked in a few days by judicious diet and a dose or two of castor oil and chlorodyne, without the necessity for rest, which is so imperative in the well-marked dysenteric attack. Thirty-seven cases of dysentery so severe as to necessitate hospital treatment were admitted. These cases varied in severity. In the milder cases there was at first diarrhœa, malaise, and frequent calls to stool; the motions consisted principally of blood-tinged mucus. There was marked tenesmus. The abdomen was not distended, in most cases, indeed, it was flaccid and easily palpated. There was some pain and tenderness in the region of

the sigmoid and colon. The temperature was not as a rule elevated, except when the condition was complicated with malaria. In several patients who had previously suffered from malaria, the early stage of the dysenteric attack was accompanied by fever.

The treatment of these cases consisted in rest in bed, and careful diet of scalded milk, chicken and beef jelly, and albumin water, with stimulants where necessary. It has been stated by some observers that stimulants were harmful in the treatment of dysentery, but our experience was otherwise, and the patients certainly appeared to do well and to appreciate whisky, brandy, and champagne when used medicinally.

Of medicinal treatment, the most successful drugs appeared to be sulphate of magnesia or castor oil with morphia. The sulphate of magnesia was given in small doses at short intervals till an aperient effect was produced. This was repeated daily or twice daily. Castor oil was most successfully given in $\frac{1}{2}$ -ounce doses with 30 minims of the *tinctura chloroformi et morphinae co.* of the B.P. By this treatment the frequent call to stool and tenesmus was diminished, the bowel obtained rest, and the enteritis diminished. The average duration of such an attack was from ten days to three weeks.

In the more severe form of dysentery all the signs and symptoms were much more severe and much more intractable. Tenesmus was a prominent and very painful symptom. The calls to stool were almost constant during the severity of the attack, and the pain was severe. The tongue was thickly coated and dry, and there was complete anorexia with, at times, vomiting. The abdomen was

frequently hard and retracted, and there was marked tenderness over the colon.

The stools, at first consisting of mucus and blood, after a time became offensive and contained sloughy shreds and muco-purulent material.

The temperature in a few of the cases was elevated a degree or two degrees at night. In most, during the greater part of the attack, it ranged from 97° to 99° . In some it was persistently subnormal.

In none of the cases did gangrene occur, and in none were there complications such as severe hæmorrhage, intussusception, or perforation of the bowel, such as may be seen in some forms of dysentery. In no case did a fatal result occur. The stools in both the severe and in the milder type of the disease were frequently examined for the *amœba coli*, but in no case could we be absolutely certain that the parasite was present. In two cases a few *amœba* were found in stained specimens, but as they had not been recognised in the fresh specimen, some doubt may be thrown upon their existence. The form of dysentery occurring in South Africa, differs thus from the *amœboid* form. It appears to be an epidemic form similar in type to the form described by Flexner as occurring in the Philippines, and by Shega in Japan. In no case in hospital was there a fatal result; we are thus unable to make any statements in regard to the morbid anatomy. The *amœba coli* was not, as a rule, present in the stool. A complete bacteriological examination of the stools was impossible under the circumstances.

The treatment of the severer cases was attended with varying success. Rest and careful dieting were of course

essentials. The diet consisted of scalded milk in small quantities, egg albumin diluted with water and flavoured with lime or lemon juice, meat peptone, chicken, and beef jelly. The effects of medicinal treatment were uncertain, and at times unsatisfactory. In some cases ipecacuanha cum ematin given in 30-grain doses every eight hours, preceded by morphia and followed by absolute rest appeared to have a very satisfactory influence on the disease. Sulphate of magnesia did not seem to suit the graver cases. Washing out the colon with warm antiseptic lotion followed by the injection of a sedative opium enema seemed to give transitory relief. In some cases where there was much gastric disturbance, all drugs were rejected by the mouth, and the greatest relief was obtained by hypodermic injections of morphia. Though no fatal result calls to be recorded in our hospital series, the condition of many of the patients gave rise to grave anxiety. There was very grave prostration during the attack, and a protracted convalescence.

DISEASES OF THE ALIMENTARY SYSTEM.

Tonsillitis.—Apart from the implication of the tonsils seen in the course of enteric fever, six cases of follicular tonsillitis were treated in hospital, and a large number were prescribed for in out-patient work and amongst the civil population. There were the usual symptoms. In several, swabs from the throat were examined and gave a pure culture of the staphylococcus albus.

Four cases of gastro-intestinal catarrh, one case of gastro-enteroptosis, one case of hæmorrhoids not requiring operation,

one case of chronic hepatitis after malaria, and five cases of catarrhal jaundice, were treated.

An interesting case of error in diagnosis should be recorded. The patient was admitted from the convalescent camp for operation, as suffering from enteric fever with perforation. The history given by the civil surgeon in charge was that the patient had been on active service for six months, during which time he had never been well. On two occasions he had been in No. 6 General Hospital, Naauwpoort, having only returned to his regiment ten days previous to admission to the convalescent camp. When admitted to the camp, patient was very weak and exhausted, temperature 102° , pulse 120. The tongue was furred and dry. The abdomen was tympanitic and distended; the spleen enlarged and palpable. The heart and lungs healthy. The diagnosis of enteric fever was made, and the patient marked to be sent down to No. 6 General Hospital. In the evening the temperature rose to 104° . The patient was restless, and partly delirious. During the night he began to groan as if in pain. Vomiting occurred. The temperature fell to 100.6° ; the pulse became very rapid and wiry. The patient lay on his back with the legs drawn up, and at intervals was seized with paroxysms of pain. The abdomen was very tender, especially to the right of the umbilicus. Perforation was diagnosed, and the patient removed at 1 A.M. to the Edinburgh Hospital with a view to operation. When seen, the patient was lying on a stretcher. The extremities were cold, the expression pinched and anxious, the temperature subnormal, the pulse small and very rapid. The abdomen was not distended. The muscles were rigid. There was intense tenderness in the

lower right quadrant ; the liver dulness was not obliterated. The spleen was enlarged. There was no rash. Granted that the diagnosis of enteric fever were correct, and we had at that time no reason to suppose that it was not, the case seemed undoubtedly one where an exploratory incision should be undertaken with a view of treating perforation if present. The patient was chloroformed, and the abdomen opened in the middle line. No evidence of peritonitis was found. The lower end of the ileum felt thicker than normal, but on careful inspection no perforation could be found. The gall-bladder was enlarged and full of fluid, but no calculus could be felt. Some warm saline was introduced into the abdomen, as the patient was very collapsed and the abdomen was closed. After getting the patient back to bed strychnia was administered and injections of normal saline solution introduced into the intercellular tissues. The patient revived somewhat, but died of exhaustion the following day.

A post-mortem examination of the abdomen was performed three hours after death. No peritonitis was present. The mesenteric glands were enlarged, and those close to the ileo-cæcal junction were softened in the centre. The intestines in the region of the head of the pancreas were firmly matted together, adhesions occluding the cystic duct. The gall-bladder was distended to about the size of a large pear and contained bile. On the fundus of the gall-bladder there were two gangrenous patches. All over the abdomen there was evidence of not very recent peritonitis, of tubercular origin. On opening the bowel, a tubercular ulcer was found at the ileo-cæcal junction.

The case is an excellent example of the manner in

which the physician may be misled during an epidemic of enteric fever. When admitted, we had no reason to doubt that the patient was suffering from enteric fever. The history, signs, and symptoms recounted by the civil surgeon seemed clear, and operation seemed the only hope. The pain and collapse was in reality probably due to colic, the peristaltic movements dragging on the adhesions caused by the tubercular peritonitis. The day after the operation one of the assistant surgeons drew attention to the fact that we had seen the patient a week before in our detention tent while we were doing the out-patient work of the camp. After careful examination we had come to the conclusion that he was then suffering from tuberculosis. When the out-patient work passed out of our hands he came under the care of the civil surgeon in the convalescent camp.

An interesting case of abdominal tuberculosis—tubercular peritonitis with a happier ending—was that of a lieutenant in the Imperial Light Horse. He was admitted, complaining of dyspepsia and inguinal hernia, for which a radical cure was desired. The patient had been subjected to considerable hardships. He had been through the siege of Ladysmith, where he was wounded, and with the relief column which went up to Mafeking. Just before he got to Mafeking he had an attack of diarrhoea with some hæmorrhage from the bowel, for which he was in hospital. From Mafeking he came down to the Edinburgh Hospital with a view to a radical cure of hernia being performed. The only point of importance in the previous personal history was that at the age of twelve the patient had an attack of "dropsy," with a swollen abdomen which rendered him an invalid for nine months.

On admission, the patient was somewhat emaciated. The expression was anxious. The teeth were good, the tongue large and flabby and covered with a copious white fur. The appetite was good, but there was marked discomfort after food—a feeling of weight and fulness with flatulence. There was no pain. The bowels were regular. The abdomen was markedly distended, tense on palpation. Fluctuation was doubtful. On percussion, the sound was tympanitic all over, with the exception of the flanks, where the sound was dull. The area of dulness altered with position. The stomach was distended with air and mapped out, the greater curvature reached one quarter inch above the umbilicus. The liver dulness in the mammary line reached from the fourth rib to about a finger's breadth above the umbilicus. The circulatory, respiratory, and urinary systems were normal. Under careful dieting the dyspeptic symptoms diminished. In spite of diuretic treatment the effusion into the peritoneum increased, and œdema of the feet appeared. Ten days after admission the abdomen was tapped and 130 ounces of fluid evacuated. The fluid was chyleform in character, the specific gravity 1014, faintly alkaline in reaction, the formed elements consisting of a few lymphocytes.

From this point onwards the patient improved; the appetite increased, and there was but little discomfort after food. He increased in weight, and there was no marked re-accumulation of fluid in the abdomen. Five weeks after admission, Mr Watt operated on the left inguinal hernia. The sac was found very thick, and on opening it about a pint and a half of chyleform fluid escaped. The patient made an uninterrupted recovery. There was no re-accumula-

tion of fluid, and he was discharged to be invalided home, having increased in weight, and with a huge appetite and a normal digestion.

RESPIRATORY SYSTEM.

Diseases of the respiratory system were in our experience rare. One had expected to see a good deal of pneumonia, but only three cases came under observation.

Private B., of Brabant's Horse, was admitted as suffering from enteric fever. He was very ill, restless, moaning, and muttering. The expression dull, the face somewhat cyanosed. The tongue was very dry, with a foul fur and deeply fissured. The lips dry and cracked. The temperature was 102° . There was consolidation of the whole of the upper lobe of the right lung. The sputum was muco-purulent, very viscid, and on staining a film showed numerous capsuled diplococci. The abdomen was distended, tympanitic all over, the splenic dulness being masked by the tympanitis. The liver appeared to be normal in size. The stools were loose—pea-soupy in character. During the three days he was in hospital, he made no improvement. On the third day the temperature rose to 105° , the pulse became imperceptible, and he sank, never having reacted to stimulation.

Post-mortem examination twelve hours after death. On opening the chest, the right lung was adherent to the chest wall over the greater part of its area. Below the third rib the adhesions were easily broken down, but above that level active dissection was required to free



CASE OF PNEUMONIA WITH GANGRENE OF FEET.

[To face page 167.]

the lung from the chest wall, and mediastinal tissues, the lung, pleura, and anterior mediastinal tissues being firmly adherent. The right lung was almost completely solid, the upper and middle lobes showing grey hepatisation, the lower lobe red hepatisation. The left lung was oedematous and congested. The liver was in a condition of cloudy swelling: the spleen enlarged, friable, and showed recent infarctions. The kidneys were congested and gave evidence of old-standing interstitial changes. The intestine showed injection of the Peyer's patches, but no swelling and no visible ulceration. The mesenteric glands were somewhat enlarged. Films and sections made from the spleen showed diplococci but no bacilli.

A case of great interest was that of a native transport boy. He was admitted to one of the tents suffering from pneumonia which, though severe, the temperature reaching 105° , passed through a normal course. Two days after the crisis, he began to complain of pains all over his body, and especially in his feet and legs. The feet began to swell. The feet were oedematous, cold, and very tender. The swelling persisted and spread up the legs. The toes gradually became mummified, the dry gangrenous process spreading up the foot to the ankle, where in both legs a line of demarcation formed. Amputation of both feet was performed. The patient made a good recovery. The accompanying photographs show the condition of the feet.

DISEASES OF THE CIRCULATORY SYSTEM.

Organic disease of the circulatory system was comparatively rare. One typical case of aneurism of the aorta, with pressure on the trachea, was observed. The patient improved rapidly under treatment, and was invalided to the base.

A considerable number of cases of cardiac dilatation were seen, the result of over fatigue and strain. So frequent were these cases, especially affecting the right heart, that one came to regard them as the "soldier's heart." For example:—

Private No. 3097 complained of "pain in chest and feeling of weakness and breathlessness." There was no history of rheumatism. On examination the heart's action was very tumultuous and rapid; the apex beat not readily defined, but was faintly palpable in the fifth interspace in the mammary line. Percussion showed the left border of the heart to be one inch outside the mammary line: the right border one and a half inches to the right of the mid-sternal line. On auscultation at the apex the sounds were faint, and a very gentle systolic murmur was audible, which was not propagated upwards and outwards to the axilla. On passing towards the tricuspid area the murmur became louder, and accompanied a sharp, somewhat flapping, first sound. The second sound was relatively slightly accentuated at the base. The pulse was feeble and rapid.

Private No. 2901 complained of pain in the precordial region. There was no visible or palpable cardiac impulse. Percussion gave the left border of the heart three-quarters of an inch external to the mammary line; the right

border two inches to the right of the mid-sternal line. On auscultation in the mitral area, a soft blowing systolic murmur was audible, which was not propagated upwards and outwards. On passing inwards towards the sternum the murmur became louder, the point of differential maximum intensity being at the tricuspid area. There was no accentuation of the second sound in the pulmonary area. The pulse was rapid and feeble. The liver was somewhat enlarged.

These two cases are typical of a large number met with in the present campaign. In none of those cases could any rheumatic history be obtained, nor any history pointing to a former valvular lesion or to kidney disease. The young soldier, many at a developmental and adolescent period of life, is called upon to perform arduous marches, to climb kopjes, and to do fatigues. In some this results in general cardiac dilatation, but in others the greatest strain seems to fall upon the right side of the heart, and right-sided dilatation results. Dilatation as the result of over-exertion, affecting more especially the left ventricle, was seen with fair frequency, but not so frequently as the cases in which the greatest strain seemed to have affected the right ventricle, resulting in dilatation and tricuspid regurgitation.

GENITO-URINARY DISEASES.

Diseases of the genito-urinary system were not common. In all but seven cases were admitted, one case of tuberculosis of the bladder, one of hæmoglobinuria, and five of nephritis.

Genito-urinary tuberculosis; Tubercular-ulceration of bladder; involvement of epididymis, etc.—Private in the 3rd Grenadier

Guards was admitted 30th September 1900, suffering from hæmaturia. In the previous May he had first noticed that when he was making water, just at the end of the stream the urine was mixed with blood, at times appearing to be pure blood. This state of matters had gone on up to the time of admission, with intervals, however, when the urine was quite clear. Sometimes at the end of micturition there is an acute pain at the end of the penis. There was no history of tubercle in the patient's family, and his previous personal history was good.

On admission, patient, a somewhat emaciated lad with a hectic flush, and a fluctuating temperature, was passing urine which was clear at the beginning of the act, but became highly blood-stained towards the end of micturition. The urine was acid in reaction, the quantity averaged about 50 ounces, with a specific gravity of 1016. The microscope showed blood corpuscles in large quantity, and pus. On staining a film tubercle bacilli were found. There was no enlargement of the prostate or epididymis on admission, but after a time the globus major became thickened and tender. The circulatory, respiratory, and other systems were normal. The patient was treated by the open-air method, careful attention being given to the feeding. The climate at Norval's Pont was at the time ideal for the treatment, but he did not make satisfactory progress. The temperature continued to fluctuate, rising in the evening to 103°. He had intermittent attacks of diarrhœa which, added to the fever, produced rapid emaciation. He was therefore sent down to Cape Town for invaliding home.

Paroxysmal Hæmoglobinuria.—Private 1579, Yorks, was admitted complaining of blood appearing in his urine. The

patient had seen fifteen years' service. He served for three years in Egypt, where he contracted malaria. He had been in Egypt a year and a half before the attacks of hæmoglobinuria began. The attacks were heralded by dizziness, faintness, malaise, and shivering; the urine when passed was of a deep brown colour. The attacks were at that time not very severe, and not frequent. The patient was at Assouan for a year and a half after the attacks began. He then went to Cyprus, where the condition continued, but the attacks were not sufficiently severe to cause him to "go sick." In 1898, when in London, he had a very severe attack, for which he was under treatment for a month. The initial symptoms were again shivering and malaise, with the passage of urine of a deep brown colour. When warm in bed the urine became clear. Exposure to cold seemed to have a very definite relation to the onset of the attacks. Patient was in better health for some time, and was three months in South Africa without any attack. When sleeping out one night in cold weather he had a severe attack, and for the following three weeks attacks were of nightly occurrence. The attack began with dizziness, pain in the head and abdomen, shortness of breath, and weakness in the legs; shivering set in with a feeling of extreme cold, malaise, and sickness. About half an hour after the attack began, he passed urine of a deep brown colour. Before micturition there is severe pain in the testicles and legs. The urine contained no formed elements. Between the attacks the urine became clear. The patient being kept in bed, and quinine administered, the attacks disappeared. He was then allowed up. The evenings were at that time fairly cold, and it was noticed that the slightest exposure precipitated the attacks. If allowed to

go out in the morning while the temperature was still low, an attack came on very rapidly. The patient was transferred to Cape Town.

To the five cases of nephritis no great interest attaches. They were probably all precipitated by over-fatigue and exposure to cold. Two were acute diffused nephritis, one sub-acute diffused nephritis, and two an acute exacerbation occurring in the course of chronic nephritis.

GENERAL DISEASES.

Amongst the diseases usually described as general diseases rheumatism took a prominent place. In all, 26 cases of the disease were admitted, in only one did cardiac complications develop while in hospital.

Being on the high veldt, very little malaria was encountered. A number of patients were admitted with an ill-defined feverish attack, who had formerly suffered from malaria in India. Only one case of definite malarial fever was under treatment in hospital. The other cases showed merely some fever for a few days, but did not exhibit the characteristic cycle.

Debility and anæmia, the result of prolonged fatigue, was common. Rest and liberal diet, with some stimulant, such as stout or beer, worked wonders in these cases.

APPENDICES.

APPENDIX I

PERSONNEL

Military Executive Officer.

Major Sir JAMES R. A. CLARK, Bart., R.A.M.C.

Surgeon in Charge.

DAVID WALLACE (M.B., C.M., M.R.C.S. Eng., F.R.C.S.E., Assistant Surgeon, Royal Infirmary, Edinburgh ; Lecturer on Surgery, Royal Colleges School of Medicine).

Physician.

FRANCIS D. BOYD (M.D., F.R.C.P.E., Assistant Physician, Royal Infirmary, Edinburgh ; Physician to the Deaconess's Hospital).

Assistant Surgeons.

GEORGE L. CHIENE, M.B., C.M.	JAMES MILLER, M.B., Ch.B.
C. M. COOPER, M.B., M.R.C.S.	ANDREW H. WATT, F.R.C.S.E.

Matron.

Miss A. W. GILL (Assistant Superintendent of Nurses, Royal Infirmary, Edinburgh).

Sisters.

Miss M. S. BOYD.	Miss E. CUMING.
Miss A. B. CAMERON.	Miss J. GALLOWAY.
Miss J. CAMERON.	Miss E. M. HERRIOT.

Dressers.

W. M'FARLANE, M.B., Ch.B.	H. M. FLETCHER.
ST L. GRIBBEN, M.B., Ch.B.	ANGUS M'NAE.
A. C. BALFOUR.	W. H. NUTT.

GEORGE PAULIN.

Quartermaster-Sergeant.—Staff-Sergeant A. C. LLOYD (Senior N.C.O.).

Non-Commissioned Officers.

Staff-Sergeant DARLING.	Corporal BROWN.
Sergeant RUTHERFORD.	Corporal DARLING.
Sergeant HEY.	Lance-Corporal MURRAY.

First Class Orderlies.

Private DICKINSON.	Private OWEN.
Private DUFFUS.	Private SCOTT.
Private DUNCAN.	Private WEATHERBE.
Private ELLIOT.	R. D. KIDD } <i>Medical</i>
Private GEORGE.	A. C. SMART } <i>Students.</i>
Private GORDON.	

Second Class Orderlies. (St Andrew's Ambulance Association).

THOMAS BILTON.	R. LOWE.
G. BASTON.	J. M'FADYEN.
J. BURNS.	J. MENZIES.
W. DICK.	T. NEILSON.
J. GALBRAITH.	J. OGG (Bugler).

R. WOOD.

<i>Dispensers</i> . . .	{ E. J. BROWN.
	{ A. NICOLSON.
<i>Electrical Engineer</i> . . .	J. ROY.
<i>Builder</i> . . .	A. POPE.
<i>Cooks</i> . . .	{ J. MITCHELL.
	{ Corporal WILLIS, R.A.M.C.
<i>Assistant Cook</i> . . .	A. PETERSON.
<i>Servants</i> . . .	{ WILLIAM CORBER.
	{ WILLIAM HALL.
	{ JOHN HUNTER.
<i>Laundress</i> . . .	E. J. SINCLAIR.
<i>Sisters' Maid</i> . . .	JANE PEARSON.

APPENDIX II

THE SANITATION OF THE HOSPITAL

WHEN the Edinburgh Hospital was first stationed at Norval's Pont, latrine pits were in general use in the stationary camp, and it was necessary at first to work at the hospital on these lines. The arrangement has many disadvantages, disadvantages so obvious and so serious as quite to counterbalance any advantage which may arise from easy working. The system is necessary, and is the only one possible in a camp which is to be used for a very limited period; but when a camp becomes one which is to be permanent for months, if not years, it should at once be abandoned. Latrine pits require the most careful supervision if they are to be sanitary. No infectious dejecta should be discharged into the pit without being first carefully disinfected. The pit must be limed daily, and then a layer of soil filled in. Even with the greatest care the latrine is apt to become a centre for the collection of flies, the insects passing subsequently to the cook-house or mess-tent, carrying with them infection and disease. Dejecta not disinfected may become pulverised, and infection disseminated in the dust, so prevalent in the dry season in South Africa. The pit system was wisely abandoned at Norval's

Pont, and a system for the removal of dejecta, etc., by night carts substituted. The night carts proceeded some miles from the camp to discharge their contents in pits, which were regularly filled in.

The Sanitation of the Wards.—Patients who were sufficiently convalescent, and who had not suffered from enteric fever, made use of the patients' latrines. The earth closets were kept locked, the key being under the charge of the orderly. They were reserved for those convalescent patients who were unable to walk to the latrines, and for night emergencies. The earth closets were cleared thrice daily by natives. All bed-pans were covered and taken down to the round house outside the hospital bounds. A native was in attendance in the round house day and night. It was his duty to receive the bed-pan from the orderly and give out a clean bed-pan. The native washed the soiled bed-pan, and steeped it in carbolic (1 in 20). The receptacles in the round house were cleared by the night cart. Careful rules were posted in the wards for the instruction of the orderlies in the treatment of enteric stools, and for the cleansing of the hands after the treatment of the dejecta. The disinfection of enteric stools was checked from time to time by bacteriological observations. The disinfection was always found thoroughly satisfactory.

The disinfectant used was carbolic (1 in 20) and perchloride of mercury (1 in 1000).

APPENDIX III.—TABLE I.

RETURN OF OFFICERS, NON-COMMISSIONED OFFICERS, and MEN and CIVILIANS Admitted, Transferred to Convalescent Camp and other Hospitals, Returned to Duty, Died, and Remaining on handing over the Hospital to the Military Authorities, between 3rd May 1900 and 14th October 1900.

Diseases.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Influenza	2	...	1	1	...	...
Simple Continued Fever	39	9	7	23	...	...
Enteric Fever	156	16	12	109	13	6
Malta Fever	1	...	...	1	...	...
Intermittent Fever	5	...	...	5	...	...
Ague	4	1	...	3	...	...
Dysentery	33	2	7	22	...	2
Secondary Syphilis	1	1	...	...	...	...
Rheumatic Fever	4	...	...	4	...	...
Rheumatism	33	3	4	26	...	...
Debility	13	5	2	5	...	1
Epilepsy	1	...	...	1	...	...
Sciatica	2	...	...	2	...	...
Injury to Eye	2	...	...	2	...	...
Disease of Eye	1	...	...	1	...	...
Inflammation of Eye	2	...	...	2	...	...
Polypus	1	...	...	1	...	...
Aneurysm	2	1	...	1	...	...
Bronchitis	2	1	...	1	...	...
Asthma	1	...	...	1	...	...
Pneumonia	3	...	...	2	...	1
Sore Throat	4	...	3	1	...	...
Tonsillitis	4	...	2	2	...	...
Inflammation of Intestines	1	1	...	...	...	...
Hernia	4	...	1	3	...	...
Gastric Catarrh	1	...	1	...	...	...
Diarrhœa	10	1	5	4	...	...
Fistula in Ano	2	...	...	2	...	...
Hæmorrhoids	3	2	...	1	...	...
Inflammation of Gall Bladder	1	...	...	...	...	1
Congestion of Liver	1	...	...	1	...	...
Jaundice	4	3	...	1	...	...
Carried forward	343	46	45	228	13	11

TABLE I.—*Continued.*

Diseases.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Brought forward	343	46	45	228	13	11
Peritonitis	1	...	...	1	...	...
Constipation	1	...	...	1	...	...
Inflammation of Glands	1	...	...	1	...	...
Nephritis	5	...	...	5	...	...
Bright's Disease	1	...	...	1	...	...
Cystitis	4	...	1	2	...	1
Hæmaturia	1	...	...	1	...	...
Varicocele	3	...	...	2	...	1
Orchitis	3	...	...	3	...	...
Inflammation of Leg	1	1	...	...	...	...
Hydrops of Knee	1	...	...	1	...	...
Necrosis	1	...	...	1	...	...
Synovitis	3	...	...	3	...	...
Periostitis	1	1	...	...	...	...
Inflammation of Connect. Tissue	3	...	1	1	...	1
Abscess	6	2	2	1	...	1
Poisoned Finger	1	...	...	1	...	...
Poisoned Arm	1	...	...	1	...	...
Eczema	2	...	1	...	...	1
Veldt Sores	5	2	...	3	...	...
Ulcer	1	...	...	1	...	...
Boil	1	...	...	1	...	...
Burns	3	2	...	...	...	1
Sunstroke	1	...	...	1	...	...
Bruise	3	...	1	2	...	...
Contusions	3	...	...	3	...	...
Wounds	2	...	...	2	...	...
Wounds from Gunshot, etc. . .	77	2	8	60	...	7
Sprain	6	...	...	6	...	...
Tumour of Thigh	1	1	...	...	...	...
Fracture	5	...	2	2	...	1
Concussion of Brain	1	...	...	1	...	...
Bursitis	3	1	1	1	...	...
Injuries	9	2	...	6	1	...
Ingrown Toe Nail	1	...	...	1	...	...
Rupture of Ligament of Patella .	1	...	...	1	...	...
Muscular Atrophy	1	...	...	1	...	...
General Total	507	60	62	346	14	25

TABLE II.

RETURN of OFFICERS Admitted, Transferred to other Hospitals, Returned to Duty, and Remaining (included in Table I.), arranged by Regiments.

Regiments.	Admitted to Hospital.	Returned to Duty.	Transferred to other Hospitals.	Remaining on Handing over Hospital.
Generals on the Staff	1	1	...	...
10th Hussars	1	...	1	...
12th Lancers	1	1	...	...
14th Hussars	1	...	1	...
17th Lancers	1	...	1	...
Imperial Yeomanry	2	2	...	...
Royal Field Artillery	2	2	...	...
Coldstream Guards	1	1	...	...
Lincolnshire Regiment	1	...	1	...
Yorkshire Regiment	1	1	...	...
West Yorkshire Regiment	1	1	...	...
Royal Irish Regiment	1	...	1	...
South Wales Borderers	1	1	...	...
Worcestershire Regiment	1	...	1	...
West Riding Regiment	1	...	1	...
Royal Sussex Regiment	2	2	...	...
South Staffordshire Regiment	1	...	1	...
South Lancashire Regiment	1	1	...	...
Oxfordshire Regiment	1	..	1	...
Essex Regiment	1	...	1	...
Shropshire Light Infantry	1	...	1	...
Manchester Regiment	1	1	...	...
Seaforth Highlanders	1	1	...	...
Cameron Highlanders	1	...	1	...
Royal Dublin Fusiliers	2	1	1	...
Army Service Corps	1	1	...	...
Royal Army Medical Corps	3	...	2	1
Army Veterinary Department	1	1	...	...
Brabant's Horse	1	...	1	...
Imperial Light Horse	1	...	1	...
General Total	36	18	17	1

TABLE III.

RETURN, by Regiments, of Admissions, Transfers to Convalescent Camp and other Hospitals, Discharges to Duty, Deaths, and Remaining.

Regiments.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Generals on the Staff . . .	1	...	1	...	...	...
Life Guards	2	1	...	1	...	...
7th Dragoon Guards . . .	2	2	...	...	...	...
2nd Dragoons	1	...	...	1	...	...
6th Dragoons	1	...	...	1	...	...
8th Hussars	1	...	...	1	...	...
10th Hussars	6	2	1	3	...	...
12th Lancers	4	2	1	1	...	...
14th Hussars	2	...	...	2	..	...
16th Lancers	1	...	1	...	...	...
17th Lancers	2	...	...	2	...	...
Imperial Yeomanry . . .	37	...	3	32	1	1
Royal Horse Artillery . .	6	1	1	3	...	1
Royal Field Artillery . .	12	2	2	7	...	1
Royal Garrison Artillery .	3	1	...	2	...	...
Royal Engineers	10	3	...	6	1	...
Grenadier Guards	2	1	...	1	...	...
Coldstream Guards	1	...	1	...	...	...
Scots Guards	5	1	...	4	...	...
Mounted Infantry	21	2	2	17	...	...
Royal Scots Regiment . . .	2	...	...	2	...	...
East Kent Regiment	7	1	...	5	...	1
Royal Lancaster Regiment .	5	...	...	5	...	...
Northumberland Fusiliers .	1	...	...	1	...	...
Royal Warwickshire Regiment .	1	...	...	1	...	...
Royal Fusiliers	1	...	...	1	...	...
Norfolk Regiment	3	...	...	3	...	...
Lincolnshire Regiment . . .	2	...	...	1	...	...
Suffolk Regiment	2	...	...	1	...	1
Yorkshire Regiment	4	1	1	2	...	...
Carry forward	148	20	14	106	2	5

TABLE III.—*Continued.*

Regiments.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Brought forward . . .	148	20	14	106	2	5
West Yorkshire Regiment . . .	2	...	1	1	...	...
East Yorkshire Regiment . . .	3	...	...	3	...	...
Bedfordshire Regiment . . .	7	...	...	7	...	...
Royal Irish Regiment . . .	7	...	...	7	...	...
Lancashire Fusiliers . . .	1	...	...	...	...	1
Cheshire Regiment . . .	5	1	...	4	...	...
Royal Welsh Fusiliers . . .	5	...	...	5	...	...
South Wales Borderers . . .	2	1	1	...	...	...
King's Own Scottish Borderers . . .	4	...	...	3	1	...
Scottish Rifles . . .	1	...	...	1	...	...
Worcestershire Regiment . . .	6	...	...	5	...	1
East Lancashire Regiment . . .	9	...	1	7	...	1
Duke of Cornwall's Light Inf. . .	5	1	...	4	...	...
West Riding Regiment . . .	12	4	...	8	...	...
Border Regiment . . .	1	...	...	1	...	...
Royal Sussex Regiment . . .	13	1	1	10	...	1
Hampshire Regiment . . .	4	1	...	1	...	2
South Staffordshire Regiment . . .	8	...	...	6	...	2
South Lancashire Regiment . . .	21	4	3	11	3	...
Welsh Regiment . . .	1	...	1	...	...	...
Royal Highlanders . . .	7	...	1	6	...	...
Oxfordshire Light Infantry . . .	1	...	...	1	...	...
Essex Regiment . . .	4	...	...	4	...	...
Derbyshire Regiment . . .	7	3	...	4	...	...
Royal Berkshire Regiment . . .	4	1	...	2	1	...
Royal West Kent Regiment . . .	3	...	...	3	...	...
King's Own Yorkshire Lig. Inf. . .	4	1	...	2	...	1
Shropshire Light Infantry . . .	6	2	...	4	...	...
King's Royal Rifle Corps . . .	1	1	...	...	...	...
Wiltshire Regiment . . .	3	...	...	3	...	...
Manchester Regiment . . .	3	...	...	3	...	...
North Staffordshire Regiment . . .	1	1	...	...	...	...
Durham Light Infantry . . .	2	...	1	...	...	1
Highland Light Infantry . . .	45	5	3	34	...	3
Seaforth Highlanders . . .	20	5	1	13	...	1
Cameron Highlanders . . .	5	...	...	4	...	1
Carried forward . . .	381	52	28	273	7	20

TABLE III.—*Continued.*

Regiments.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Brought forward . . .	381	52	28	273	7	21
Royal Irish Rifles . . .	2	...	...	2	...	...
Argyll and Sutherland High. .	4	1	...	3	...	...
Leinster Regiment . . .	3	...	...	3	...	...
Royal Munster Fusiliers . . .	9	...	...	9	...	...
Royal Dublin Fusiliers . . .	3	...	1	2	...	...
City Imperial Volunteers . . .	9	1	...	7	...	1
Army Service Corps . . .	4	...	2	2	...	...
Royal Army Medical Corps . .	13	1	5	5	1	1
Army Ordinance Corps . . .	1	...	1	...	...	...
Army Veterinary Department .	1	...	1	...	...	...
Robert's Horse . . .	8	...	...	8	...	...
Kitchener's Horse . . .	5	...	2	2	1	...
Marshall's Horse . . .	1	1	...	...	...	...
Brabant's Horse . . .	5	1	...	3	1	...
Imperial Light Horse . . .	1	...	...	1	..	...
Lovat's Scouts . . .	4	...	...	4	...	...
Driscoll's Scouts . . .	1	1	...	...	...	...
Remington's Scouts . . .	2	...	...	1	...	1
Imperial Bushman Corps . . .	2	1	1	...	...	...
Tasmanian Mounted Infantry .	1	...	...	...	1	...
Ceylon Mounted Infantry . .	1	...	...	1	...	...
West Australian Mounted Infnt. .	5	...	2	3	...	...
South Wales Mounted Infantry .	1	...	1	...	...	...
Queensland Mounted Infantry .	1	...	...	1	...	...
Burmah Mounted Infantry . .	5	...	...	5	...	...
Cape Mounted Rifles . . .	1	1	...	...	...	...
Victoria Mounted Rifles . . .	1	...	...	1	...	...
Royal Canadian Regiment . .	4	...	1	2	1	...
Queenstown Rifle Volunteers .	2	...	1	...	...	1
Weels' Transport Corps . . .	1	...	1	...	...	...
Cape Vol. Med. Staff Corps . .	2	...	...	2	...	...
Native Drivers of C. I. Vol. .	2	...	...	2	...	...
Railway Pioneer Regiment . .	1	...	...	...	1	...
Civil Personnel Edin. Hosp. .	20	...	15	4	1	...
General Total . . .	507	60	62	346	14	25

TABLE IV.

RETURN of Admissions, Transferred to Convalescent Camp and other Hospitals, Discharged to Duty, Deaths, and Remaining, arranged by Arms of the Service.

Arms of the Service.	Admitted to Hospital.	Transferred to Convalescent Camp.	Returned to Duty.	Transferred to other Hospitals.	Died.	Remaining on Handing over Hospital.
Generals on the Staff. . . .	1	...	1	...	...	...
Life Guards	2	1	...	1	...	...
Cavalry	20	6	3	11	...	...
Imperial Yeomanry	37	...	3	32	1	1
Royal Artillery	21	4	3	12	...	2
Royal Engineers	10	3	...	6	1	...
Foot Guards	8	2	1	5	...	...
Mounted Infantry	21	2	2	17	...	...
Infantry	291	36	17	214	5	19
Staff and Departments	19	1	8	8	1	1
Colonial Troops	55	5	9	34	5	2
Natives	2	...	...	2	...	...
Civilians	20	...	15	4	1	...
General Total	507	60	62	346	14	25

TABLE V.

RETURN of Admissions, Discharged to Duty, and Transferred to other Hospitals of the Military and Civil Personnel of the Hospital.

Diseases.	Admitted to Hospital.	Returned to Duty.	Transferred to other Hospitals.	Died.
Enteric Fever	9	3	5	1
Dysentery	4	4	...	...
Rheumatism	1	1	...	...
Debility	1	1	...	...
Sore Throat	2	2	...	...
Tonsillitis	2	2	...	...
Diarrhœa	4	4	...	...
Eczema	1	1	...	...
Bursitis	1	1	...	...
General Total	25	19	5	1

NOTES

AVERAGE DAILY SICK

I. The first patient was admitted to the hospital on 3rd May 1900. From that date to date of handing over the hospital on 14th October 1900, it had been open for 165 days, and during that time 10,830 diets were issued, giving an average daily sick of 65.63.

II. The first convoy of sick was received into the hospital on 30th May. Taking that date as the day of opening to the date of handing over (14th October), the hospital was open for 138 days, and during this period 10,648 diets were issued, giving an average daily sick of 77.16.

III. From 3rd May (date of first admission) to 29th May (day before the first convoy of sick was received), 17 patients were admitted from troops stationed at Norval's Pont.

DEATHS.

ENTERIC FEVER—13 DEATHS.

1	Case was in hospital for	1	day.
1	"	"	2 days.
2	Cases were	"	3 "
1	Case was	"	6 "
2	Cases were	"	8 "
3	"	"	12 "
1	Case was	"	18 "
2	Cases were	"	32 "

INJURIES—1 DEATH. This case was in hospital for 2 days.

Ninety-eight officers and men belonging to Scottish regiments were treated in the hospital.

OUT-PATIENTS.—In addition to the 507 patients treated in hospital, upwards of 1000 out-patients were seen and treated.

APPENDIX IV

RÖNTGEN RAY WORK—NOTES OF CASES

The asterisks denote those photographs shown in text.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
1. A. L. . . .	.....	I.	Screen.	...	...	Fracture of right fibula above centre of shaft, from above downwards and inwards. Perfect apposition.
2. Drew, Pt., 2nd Buffs, 1327.	Gunshot wound of right foot.	I.	Screen and Photo.	$\frac{3}{4}$ min.	$\frac{1}{4}$	1st metatarsal splintered, small piece of bone lying between 1st and 2nd metatarsal.
3. R. F. . . .	Fall from horse, possible Potts' fracture.	I.	Screen and Photo.	$\frac{1}{2}$ min.	$\frac{1}{4}$	Effusion into joint—no fracture.
4. J. T., Driver, R.A.	Swelling of right knee, fall from horse.	I.	Screen.	...	...	Effusion into joint.
5. Crowden, Sgt., Sh. Rgt., 2214.	Gunshot wound of forearm, paralysis.	I.	Screen.	...	...	Bones intact. Nerves probably severed.
6. A. S. . . .	Fall, injury to left ankle.	I.	Screen and Photo.	3 min.	8 x 10	Fracture of fibula 3 inches from tip of ext. malleolus.
7. R. A. . . .	Injury to right knee.	I.	Screen and Photo.	7 min.	8 x 10	Outline of joint very indistinct, effusion probably hæmorrhagic or purulent.
8. Robinson, Private, Y.L.I., 1327.	Aneurism of aorta.	I.	Screen and 2 Photos.	15 min.	10 x 12	Aneurism is situated at junction of ascending and transverse portion of aorta can be seen pulsating.
9. Chamberlain, Pt., 2nd S.G., 2850.	Aneurism.	I.	Screen.	...	...	No abnormality.
10. T. B. . . .	Bullet in neck (?)	II.	Screen and Photo.	5 min.	$\frac{1}{4}$	No bullet could be found.
11. Lowther, Lieut., R.F.A.	Bullet in left side.	II.	Screen and Photo.	20 min.	10 x 12	Tried on two occasions, no bullet could be found.

NOTES OF CASES—Continued.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
12. Byrne, 1st Leinsters, 3887.	Fracture of forearm.	II.	Screen and Photo.	1½ min. 2 min.	1 1	(1) Supination oblique fract. of radius at junction of mid and lower ½. (2) Pronation fragments much more displaced. Small fragment chipped off astragalus.
13. Abbott, Pt., 7th D.G., 4512.	Gunshot wound of right ankle.	II.	Screen and Photo.	1½ min.	8 × 10	Small fragment chipped off tibia.
14. Hall, Corp., R.H.A., 74217.	Gunshot wound of left leg.	II.	Screen.	...	...	Nothing abnormal. Astragalus must have been bored.
15. Scarbora, Pt., C.I.V., 607.	Gunshot wound of right foot.	II.	Screen and Photo.	1½ min.	8 × 10	Portion of needle evident at base of prox. phalanx of little finger. Nothing abnormal could be seen. Bullet must have struck dorsal vertebrae.
16. Native Girl .	Needle in left hand.	II.	Screen and Photo.	1½ min.	1	No evidence of any fragments of glass.
17. Whatlay, Pt., 2nd Wilts., 2711.	Bullet passed transv. through chest, transient paraplegia.	II.	Screen.	...	...	Two photos were taken, but although the vertebrae, etc., were evident no bullet could be found.
18. Native Boy .	Bottle burst in hand.	II.	Screen.	1½ hour. 1¼ hour.	10 × 12	Bullet found lying obliquely halfway between ant. sup. spine and mid line. The depth was ascertained to be 2 inches by two exposures on one plate.
19. Keeys, C.M.R., 933.	Bullet in back, range 1200 yards.	II.	Screen and Photo.	1½ hour.	10 × 12	No evidence of any glass.
20. Coulson, Corp., B.H., 1065.	Bullet in right hip (?)	II.	Screen and Photo.	1½ hour.	10 × 12	Two photos were taken, but although the vertebrae, etc., were evident no bullet could be found.
21. F., Lieut.	Glass in right foot, lump felt.	II.	Screen and Photo.	3 min.	1	Bullet found lying obliquely halfway between ant. sup. spine and mid line. The depth was ascertained to be 2 inches by two exposures on one plate.

NOTES OF CASES—Continued.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
22. Cronin, Pt., R.M.F., 3460.	Struck by bullet on left hip.	II.	Screen and Photo.	$\frac{1}{2}$ hour.	10 x 12	Two photos taken, ant. and post., no evidence of any foreign body.
23. Smith, Corp., 9th L., 3633.	Crush of foot.	II.	Screen and Photo.	2 min.	$\frac{1}{4}$	Evidence of considerable thickening, but no fracture can be made out.
24. Boardman, Sgt., B.H.	Gunshot wound of left foot.	II.	Screen and Photo.	2 min.	$\frac{1}{4}$	Nothing definite. Bones of tarsus must have been bored.
25. Pilkington, Tr., R.H., 1207.	Shrapnel bullet in left hip.	II.	Photo.	$\frac{1}{2}$ hour.	10 x 12	No evidence of any foreign body.
26. Dalgleish, Private, R.C.R., 7103.	Piece of hammer struck at hand.	II.	Screen and Photo.	$\frac{3}{4}$ min.	$\frac{1}{4}$	No evidence of any foreign body.
27.*Johnson, Pt., H.L.I., 6658.	Wound of entr. in right buttock, hardness felt in left groin.	III.	Screen and Photo.	$\frac{1}{2}$ hour.	10 x 12	Shrapnel bullet clearly made out at level of hardness.
28.*Baker, Private, 1st Roy. Sussex, 5671.	Bullet in knee.	III.	Screen and Photo.	10 min.	$\frac{1}{4}$	Two photos taken show bullet lying in knee joint to outer side and posteriorly.
29. Macphail, Private, H.L.I., 1988.	Bullet in right thigh. Entr. $5\frac{1}{2}$ in. below ant. sup. spine.	III.	Photo.	$\frac{1}{2}$ hour.	10 x 12	Bullet seen lying in bone about level of wound. Localising photo showed bullet to be at a depth of just under one.
30. Smith, Pt., R.I.F., 4030.	Bullet in left leg. Another in right tarsus.	III.	Screen and Photo.	10 min. 5 min.	8 x 10 $\frac{1}{4}$	Nothing visible but a splash of lead. Very similar, merely small fragments.
31. Owen, Private, 2nd S.G., 8325.	Bullet in left thigh.	III. W.I. V.	Photo.	20 min. 20 min. $\frac{1}{2}$ hour.	10 x 12 8 x 10 8 x 10	Three different photos were taken at different levels, but no foreign body could be discovered.

NOTES OF CASES—Continued.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
32.*M'L., Trooper Lovat's Scouts, 8915.	Shell wound of arm. Wound of knee.	III.	Photo.	14 min.	8 x 10	Shrapnel bullet. Comminuted fracture of humerus.
33. Ocock, Pt., R.W.F., 2417.	Bullet in neck.	IV.	Photo.	12 min.	8 x 10	No evidence of any foreign body.
34.*Mitchell, Private, H.L.I., 1824.	Shrapnel wound of right forearm.	IV.	Photo.	15 min.	8 x 10	Comminuted fracture of radius.
35. Mitchell, Pt., Black Watch.	Tubercle of carpus.	III.	Photo.	4 min.	1	Considerable thickening of tissues, but no distinct foci of disease.
36. Vail, Private, 4th Derby, 4656.	Bullet in left hip (?) Fracture of thigh (?)	III. IV.	Photo.	1/2 hour. 20 min.	10 x 12 8 x 10	Two photos were taken at different levels, but no bullet could be seen, and there was no evidence of a former fracture of the femur.
37. Native . . .	Crushed foot.	IV.	Screen.	...	...	Large amount of callus. No distinct fracture.
38.*Stevens, Corporal, Can. M.R., 291.	Bullet in left lumbar region.	III.	Photo.	2 hour.	10 x 12	Bullet visible just above level of iliac crest, about one inch to right of mid line.
39. Ellis, Private, K.O.Y.L.I., 5489.	Bullet in left scapula (?) Fragments had been found.	IV.	Photo.	20 min.	8 x 10	Plate showed traces of a few small fragments, which might have been bone or lead.
40. Howlett, Corporal, 2nd Norf., 1239.	Fall from horse, pains in chest, hæmoptysis.	IV.	Screen and Photo.	20 min.	8 x 10	No evidence of any fracture of scapula or ribs.
41. Harris, Private, 7th M.I., 3006.	Two horses fell on the top of him.	IV.	Photo.	5 min.	1	.....

NOTES OF CASES—Continued.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
42. Chalmers, Private, H.L.I.	Bullet passed through forearm.	IV.	Photo.	5 min.	†	Small fragments of lead to be seen on radial side of wrist.
43. Dowds, Pt., H.L.I., 6745.	Pom-pom wound of lower jaw.	V.	Photo.	† hour.	†	Plate shows absence of lower jaw, except articular ends and part of ramus.
44. Simpson, Private, 2nd Beds., 6469.	Pains in left leg.	IV.	Photo.	5 min.	†	Marked thickening of periosteum of tibia.
45. Broadwood, L.-C., Buffs.	Fall from horse. Fracture of patella(?)	V.	Photo.	8 min.	†	Patella intact, but ligament torn immediately above; bulbous end, union by young fibrous tissue.
46. Brown, Corporal, R.A.M.C., 13712.	Wrist bent in carriage handle.	V.	Photo.	3 min.	†	No evidence of fracture of any bone.
47. Funnell, Sgt., 1st R. Sussex, 3955.	Bullet in face(?) Frag. previously extracted.	V.	Photo.	15 min.	†	No evidence of any foreign body.
48. Howell, Gunner, R.H.A., 81078.	Shell wound of left thigh three months ago.	II.	Photo.	20 min.	8 × 10	Exostosis seen growing from inner aspect of femur just above condyle. No foreign body.
49. Anderson, Private, H.L.I., 2970.	Gunshot wound of right foot.	IV.	Screen.	...	...	Thickening of periosteum, no fracture, bullet probably tunnelled bone.
50.* Livingstone, Pt., H.L.I., 2386	Bullet passed through left hand.	IV.	Photo.	2 min.	†	Two photos taken, one before and one after operation. Comminuted fracture of 3rd and 4th metatarsals, and of proximal phalanges of ring and little fingers.

NOTES OF CASES—Continued.

NAME.	INJURY.	TUBE.	SCREEN OR PHOTO.	EXPOSURE.	PLATE.	REMARKS.
51. Daly, Pt., Munst. Fus., 6287.	Gunshot wound of elbow.	IV.	Photo.	6 min.	8 × 10	.....
52. Williams, Sergeant, 3rd R.L., 3016.	Tenosynovitis of fingers and hand.	II.	Screen.	...	...	Necrosis of proximal phalanx of little finger.
53. Nicholson, Sergt., N.S.W.M.I., 508.	Gunshot wound of face.	IV.	Photo.	10 min.	$\frac{1}{4}$	No bullet visible.
54. *Fraser, Pt., H.L.I., 1825.	Shell wound of arm.	IV.	Screen and Photo.	4 min.	$\frac{1}{4}$	Fragment of shell seen lying between lower end of radius and the skin. Other minute fragments.
55. *Simpson, Private, H.L.I., 5003.	Bullet in knee.	III.	Screen and Photo.	10 min.	8 × 10	Two photos. (1) Ant.-post., small- bore rifle bullet lying in knee joint to inner side of mid line; (2) Lateral, bullet shown to be lying posteriorly.
56. Clarke, Pt., B.M.I., 4392.	Gunshot wound lower part of thigh.	III.	Screen and Photo.	20 min.	8 × 10	(1) Ant.-post., shrapnel bullet seen in lower end of femur to outer side of mid line; (2) Lateral, bullet lying in substance of bone rather posteriorly.
57. Pile, Private.	Transposition of viscera.	IV.	Screen and Photo.	25 min.	10 × 12	Heart can be distinctly made out on right side, while liver is seen to the left.

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