

The origins and early use of radiology in South Africa

Radiography in South Africa before 1899

JC de Villiers

*Emeritus Professor of Neurosurgery,
University of Cape Town*

In South Africa as elsewhere, physicists and photographers initially showed the greatest interest in the “new rays” which Roentgen announced at a scientific meeting in January 1896. In July of that year, the Port Elizabeth Amateur Photographic Society obtained a complete apparatus for “taking photographs by means of the new process” from London and on Thursday, 13 August 1896, the Port Elizabeth Amateur Photographic Society invited a representative of the *Port Elizabeth Telegraph* to attend a demonstration of their apparatus. The journalist reported glowingly on the new wonder and the president of the Society, Mr. A. Walsh, offered to demonstrate the apparatus to doctors to acquaint them with its possible uses. This was probably the first x-ray demonstration in South Africa.¹ In October of the same year, the Cape Town Photographic Society arranged a lecture/demonstration by Professor Holm on the mode of production of Roentgen rays, and an x-ray picture of a hand was taken by way of demonstration.

An x-ray apparatus obtained from Germany by the Johannesburg branch of Siemens and Halske towards the end of 1898, was used by one of their young electrical engineers, Robert Howe Gould, who took a particular interest in the new apparatus, experimented with it, and became a competent radiographer.² A demonstration of his machine at a Red Cross gathering in Krugersdorp from 18-23 November 1899 led to the apparatus being put to use there for a few months. After the Anglo-Boer war it was sent to Jagersfontein mine which had originally bought it in 1898! The Ruehmkorff induction coil, which belonged to this apparatus, is now in the Adler Museum in Johannesburg.¹

Radiology in war surgery

X-rays first found practical application on a large scale in South Africa during the Anglo Boer War, but it was not a “first”. The first military use of x-rays was in Naples in May 1896, when wounded Italian soldiers, returning from the disastrous Ethiopian campaign, were examined by this method - four months after Roentgen's publication.³ The Graeco-Turkish War in 1897 was the first major conflict where x-rays were used and the findings published from both sides.^{4,5} The British Military Medical Service had further experience in India (1897) and the River War (1898).⁶ It was also used to a very limited extent in the Spanish-American War in 1898.⁷

Radiology in the Anglo Boer War

At the outbreak of the Anglo Boer War, the two Boer Republics were medically very poorly prepared for what was awaiting them but the

to page 13

from page 12

Zuid-Afrikaansche Republiek (ZAR), due to its greater wealth, was somewhat better supplied with equipment than the Orange Free State. The British Military authorities had also underestimated the magnitude of the campaign awaiting them and experienced great organizational difficulties, in their medical as well as in their military arrangements. Radiology was in its infancy and its exact place in military surgery was not known.

Radiological services on the Boer side

The Siemens and Halske apparatus

This apparatus used by Gould for his demonstration in Krugersdorp, was later used in the hospital in Varleys Hotel in that town. In April 1900, just before the British occupation of Johannesburg, the x-ray machine was transferred to the French Hospital in the Marist Brother's School in that city. After the war it was sold to the Jagersfontein diamond mine and its Ruehmkorf coil can be seen in the Adler museum of medical history in Johannesburg.¹

Apparatus in the Staatsmeisjesschool

The management committee of Het Transvaalsche Roode Kruis bought an x-ray apparatus for the Pretoria Volkshospitaal in 1897 and this was transferred to the Staatsmeisjesschool when it became the base hospital of the First Dutch Red Cross Ambulance in December 1899. Professor J. A. Korteweg of this unit reported in 1899 that despite the apparatus being rather old, it was still capable of rendering good service

provided it was handled with patience! The radiographers were Mr Wierbitsky, a local photographer, and Mr C.F. Delfos, who during the war had become a small arms and bomb manufacturer and later also became interested in x-ray apparatus.⁸

Apparatus at Boshoff

On 13 October 1899, a Spargo x-ray tube and screen were ordered for the base hospital at Boshoff by Dr Ramsbottom, head of the Orange Free State Red Cross Ambulance. A week later he requested the Landdrost to make the local school available as a hospital as a safe place for the x-ray apparatus was required.⁹

German/Belgian Ambulances' Apparatus in Krugersdorp

In April 1900, when the Boer retreat had already commenced, Dr J. Fessler of the German/Belgian ambulance on returning from Natal, was asked to go to Krugersdorp with the x-ray apparatus, which he had brought from Muenchen. Since December 1899 this machine as well as some other equipment belonging to the German/Belgian ambulance, had been standing idle in the warehouses of the Red Cross in Pretoria. The x-ray apparatus was installed in the Boer hospital in Varley's Hotel, which was supplied with electricity by a dynamo driven by a steam engine. Fessler mentions an engineer of Siemens and Halske in Johannesburg who connected the x-ray apparatus to the mains supply, which eliminated the use of accumulators. (This engineer was probably Gould.) When Fessler's apparatus was installed in Varley's Hotel, the Siemens and Halske apparatus was removed to the French

hospital in Johannesburg. In July 1900 with the British occupation of Krugersdorp, Fessler took his instruments and x-ray apparatus to the German Consul in Johannesburg but what happened to this equipment is not known.¹⁰

The First German Red Cross Ambulance, Jacobsdal

Dr H. Kuettner, chief surgeon of this ambulance, was an experienced radiographer as he had written his doctoral thesis on the subject of radiology in war surgery, based on his experience in the Graeco-Turkish War of 1897.⁴ This German unit was sent to Jacobsdal - a seven-day journey from the nearest railway station and three times as far as the nearest source of electricity! Fortunately the ambulance had been joined in Pretoria by a trained electro-technician, Isaac Rousseau van Alphen, son of the Postmaster General of the ZAR. Van Alphen travelled to Johannesburg where he requisitioned a four horse power petrol engine at one mine and a dynamo at another, "acquired" a quantity of petroleum and a number of light bulbs which he carted back to Jacobsdal via Bloemfontein. "Presently the x-ray apparatus was installed, accumulators were loaded and the African interior saw for the first time rays of that great physicist," Kuettner said with German pride - but incorrectly.¹¹

The Second German Red Cross Ambulance, Springfontein

The x-ray apparatus supplied to this ambulance by the German Central Red Cross Committee, was probably identical to the one used by the

from page 13

First German Red Cross ambulance in Jacobsdal and was under the care of Dr Ringel, who had also seen service in the Graeco-Turkish war. That x-rays were extensively used is indicated in publications by members of this ambulance unit.¹²

The First Dutch Red Cross Ambulance

A new x-ray apparatus for this ambulance arrived in Lourenco Marques as Prof Korteweg, surgeon to this unit, returned home on 20 January 1900. It was intended for the base hospital of the First Dutch Red Cross ambulance in the Staatsmeisjesschool, whose rather antiquated machine would then be sent to their forward station at Pepworth's farm. This never materialized as all the accumulators were broken during off-loading in Lourenco Marques and as a result the ambulance unit at Pepworth's Farm was stranded without an x-ray machine.¹³

Dr F.A. Piper's x-ray machine at Colesberg

On January 15 the Hoofdkomitee of the Transvaalsche Roode Kruis received a telegram from the Ambulance Comite of the Free State offering the services of Dr Piper of Winburg with his own x-ray apparatus to the Second Dutch Red Cross ambulance. Dr Coster, head of this unit, was only too eager to take up this offer and on 17 January 1900 promised to contact the Red Cross in Bloemfontein directly. What happened after that is not clear because two days later Dr Mangold, chief of the Johannesburg Red Cross ambulance at Colesberg, informed the Hoofdkomitee that Dr Sabon and Dr Piper, with the x-ray apparatus, were

working with him at his hospital. Proof that the x-ray apparatus was in use, is provided by Dr Mangold's telegram of January 30, to the Red Cross in Pretoria, ordering chemicals for developing and fixing the x-ray plates.¹⁴

Unused x-ray apparatus on the Boer side

Prolonged negotiations between Dr W. Leyds, Minister plenipotentiary of the ZAR and the firm of Siemen's and Halske with Mr Barth Veth as intermediary, resulted in three Roentgen ray machines being shipped to Lourenco Marques for the Boers. This was during the guerilla phase of the war and there is no evidence as to who was to receive them or work them for the Boers. These machines never left Lourenco Marques and were returned to Germany after the war.¹⁵

Radiological services on the British side

This was the first war in which x-ray machines were supplied by the War Office as standard equipment for general and some stationary hospitals, i.e. hospitals where the wounded received definitive surgical treatment. Radiological apparatus was not supplied to field hospitals where the wounded were only admitted very transiently for essential life-saving care as it was thought that radiological examinations were not necessary at that stage of management. There were 22 general hospitals in South Africa but many of them took over previous stationary or private hospitals so that it is not always clear where and when an x-ray apparatus was allocated, whether it was received or if it functioned. That the War Office's intentions

to supply this service did not always materialize was pointed out by the pioneer British radiologist, Dr John Hall Edwards who was attached to the Imperial Yeomanry Hospital at Deelfontein. Of ten x-ray machines initially provided by the War Office, only four had reached South Africa by November 1899. Two of these were located so far from the battlefield that they were of little use, while the remaining six were apparently in transit or about to be dispatched from England.¹⁶

Standard x-ray equipment supplied to General Hospitals

This comprised 10-inch field service coils manufactured by Apps & Co. or Cox & Co, fitted with ordinary spring-hammer interrupters; 6-cell lithanode accumulators of 30 ampere-hours capacity, fluorescent screen; Cox's "Record Tubes"; a Mackenzie-Davidson's couch, portable cross-thread localizer and the necessary photographic materials.¹⁷ When preparations for the war were being made and hospital personnel allotted, care was taken to appoint one officer with at least an elementary knowledge of *skiagraphy* to each general or stationary hospital. The intention was that this officer should devote all his time to x-ray work but it soon became apparent that the large numbers of wounded and sick demanded the attention of all the medical officers. Despite this limitation of their radiological activities, some of these medical officers kept up a special interest in this work and became very skilled at it. Later a number of "expert radiographers" were sent out to South Africa and rendered excellent service.

to page 15

from page 14

J Hall Edwards (12.1.1901) found the late awakening of the War Office to the radiological needs inexcusable as he had long pleaded for such services to be organized timeously but he had been ignored. In his view, x-rays had not been given a fair chance because in some hospitals, despite excellent apparatus being available, there was no competent person to use it so that it posed a danger rather than a help. Some deserving hospitals were not supplied with the necessary apparatus and at a large hospital in Pretoria he found a Mackenzie-Davidson's cross-thread localizer being used by the staff as a developing table for their Kodak films!¹⁸

British hospitals with x-ray facilities

Military Hospitals

No.1 General Hospital, Wynberg

When the old military barracks were upgraded to become a hospital, an x-ray room was installed and fitted with modern equipment, including a Mackenzie-Davidson localizing apparatus. Electricity was obtained from the mains so that accumulators could be dispensed with. The experienced Mr (later Sir) Robert Fox Symons was in charge of the x-ray service.¹⁹

No.2 General Hospital, Wynberg

This tent hospital, which was erected on the parade ground below No.1 General Hospital in Wynberg, consisted of 99 double-fly marquees, with a total bed capacity of 504.²⁰ The Officer in charge was Colonel A.W. Duke and the surgeon/radiographer Lieutenant H.H. Norman.²¹ This hospital was transferred to Pretoria in July 1900.

No.3 General Hospital, Cape Town

This hospital, also under canvas, was located in Rondebosch, Cape Town, in close proximity to the Portland hospital. The Officer in Charge was Colonel O. G. Wood, the registrar/secretary was Major (later Sir) Alfred Keogh and Lieutenant N. Ensor performed the x-ray work.^{21,22} This hospital was later split into two sections, one going to Springfontein and the other to Kroonstad.

Town Hall Hospital, Ladysmith

Lieutenant and quartermaster Forbes Bruce, who had gained radiographic experience in the Tirah campaign and in Sudan, was transferred from a base hospital in Cairo to Natal in September 1899. He took one of the Abadieh kits with him and on the way to Pietermaritzburg obtained two wet batteries. In Ladysmith he worked under Surgeon Major Westcott at the Town Hall Hospital where Bruce kept up his work despite the building being struck on several occasions during the Boer shelling of the town.⁶

Intombi Camp Hospital, Ladysmith

The x-ray apparatus installed in the temporary "neutral" hospital established close to Ladysmith by mutual agreement between the combatant parties, never functioned satisfactorily due to problems with the lithanode batteries. Lieutenant Arthur Weld was the radiographer in charge of this machine.

No.4 General Hospital, Mooi River

Colonel J.A. Clery was in charge of this excellently appointed hospital and the x-ray machine was under the direction of Lieutenant W.R. Blackwell.²¹

General Hospital, Pietermaritzburg

In the early months of the war, this hospital was constituted from the existing hospitals that had found accommodation in various buildings in the town. A local chemist, M. Allerston, did the x-ray work for the military authorities.¹

No.5A General Hospital, Cape Town

This section of the No.5 General took over the old Woodstock Military Hospital, which was altered and renovated to become part of the base hospital group in Cape Town. The officer in charge of the x-ray work was Lieutenant A.F. Carlyon.²³

No.6 General Hospital, Naauwpoort

In July 1900, No.6 General Hospital, which had been waiting at Naauwpoort since 20 February, transferred to Johannesburg where it was accommodated in the grounds of the Wanderers Club. Attached to the operating theatre was the x-ray room, 20 x 12ft, fully equipped, and electricity was available through the mains supply.²⁴ The officer responsible for the x-ray work: Lieutenant H.C.R. Hime.²⁵ Later during the war the hospital was moved to Johannesburg.

No.7 General Hospital, Estcourt

This very large hospital (920 beds) was situated about half a mile from Estcourt station on the Ladysmith side. The officer in charge was Lieutenant-Colonel G. MacNeece. The operating theatre had an x-ray room attached to it and Captain W.W.C. Beveridge was in charge of this.²⁵ No.7 General became the main military hospital in Pretoria after July 1900.

to page 16

from page 15

No.3 Stationary Hospital, De Aar

This hospital was predominantly kept busy with patients with medical conditions, chiefly typhoid, and although it had a very good operating theatre, it was hardly used, probably because the Imperial Yeomanry Hospital (IYH) at Deelfontein, with its excellent facilities, functioned as a base hospital and was only 40 miles away. According to Hall Edwards, this x-ray apparatus at No.3 Stationary Hospital was never used.²⁶

Temporary Hospital, Modder River

The apparatus used here was probably the one for which a Wimshurst machine was used as power source, as indicated in the report of the Portland Hospital.²⁷

No.8 General Hospital, Bloemfontein

This was the major military hospital in Bloemfontein and was under the command of Lieut.-Colonel R.T.Beamish. The medical radiographer was Lieutenant E. McDonnell.²⁵

No.9 General Hospital, Bloemfontein

The radiography was done by the Civil Surgeons Mr J.L. Brownridge, Mr C.W. Donald and Mr E. Turton who apparently had knowledge of x-ray work according to the official notification of their appointment.²⁸

No.10 General Hospital, Bloemfontein

After the British occupation the existing hospitals in Bloemfontein became one organizational structure under the command of Major R.C. Freeman and functioned as No.10 General Hospital. Arrangements for the appointment of surgeon radiographers were made after the hospital arrived in South Africa but it is not clear who were appointed.²⁸

No.11 General Hospital, Kimberley

During the siege x-rays were taken in Kimberley and by special arrangement some of the Boer doctors could have the occasional Boer patient benefit from this service. The military hospital consisted of the existing hospitals as well as additional huts and marquees; all of which were supplied with electricity by De Beer's. It was a modern 1000 bed hospital with a railway siding within its confines to facilitate patient transport. The inter-connected x-ray room and operating theatre were located in a special building. The arrangements for the management of the x-ray machine were made in South Africa but individual doctors have not been identified.²⁹

Private Hospitals

A number of hospitals were donated by individuals or organizations through the agency of the Central British Red Cross Committee for service in South Africa. These hospitals were very well equipped and staff was selected from leading British medical institutions.

The Portland Hospital, Cape Town - Bloemfontein - Pretoria

This was the first private hospital to be donated to the central British Red Cross Committee and was one of the best-equipped units to serve in South Africa. As the campaign progressed it moved to Bloemfontein at first and later to Pretoria. It had an x-ray machine with an independent power source, which was rarely used. The person in charge of this service was Surgeon-Major C.R. Kilkelly, who later was transferred to the Pretoria branch of the Imperial Yeomanry Hospitals.²⁷

The Irish Hospital

The Irish Hospital was the first private institution to arrive in Pretoria, and was established in the newly completed building of the Palace of Justice on Church Square. Dr Percy Stewart was the radiographer of this unit. When the Irish hospital closed, the x-ray apparatus was donated to the Pretoria division of the Imperial Yeomanry Hospital by Lord Iveagh.³⁰

Imperial Yeomanry Hospital (IYH), Deelfontein

Of his apparatus at Deelfontein, the pioneer British radiologist J Hall Edwards said that his x-ray equipment was as complete and as efficient as could be purchased at the time. It was, however by no means perfect and he admitted that if he had worked in less fortunate circumstances, he could have been in serious difficulties at times. He emphasized that a great deal of research was necessary to design an apparatus which could do the job of military radiology effectively in adverse circumstances. He had two complete x-ray kits with a dynamo driven by foot-power available at Deelfontein. This institution was handed over to the British Government in April 1901 and became No.21. General Hospital.³¹

Imperial Yeomanry Hospital, Pretoria

When the Irish Hospital in the Palace of Justice in Pretoria closed in April 1900, their x-ray apparatus was presented to the Imperial Yeomanry Hospital by Lord Iveagh. It was installed in a convenient out-building, which had been used by the previous occupier of the house as a photographic studio. Colonel Kilkelly who had previous experience of x-ray work, was in charge of the radiological

to page 17

from page 16

work and also instructed the staff in radiographic technique. When the Pretoria branch of the IYH closed, the x-ray machine was transferred to their hospital at Elandsfontein. This hospital became the No.22 General in September 1901.³⁰

The Edinburgh and East of Scotland South African Hospital, Norval's Pont

Their x-ray equipment, which was supplied by Newton and Co, London, arrived at Norval's Pont without breakage and the first skiagraph was taken on 25 May, 1900.³²

The Princess Christian Hospital, Pinetown Bridge

An x-ray and dark-room formed part of this excellently equipped hospital but who the radiographer was, is not known.³³

The Claremont Sanitarium

This luxuriously equipped institution, which was established in Cape Town in 1897, also had x-ray facilities. Part of it was used as a convalescent hospital for British officers.²⁹

Hospital ships

Privately donated ships

With the financial assistance of the Princess of Wales' fund, the steam yacht *Midnight Sun* was purchased by the Central British Red Cross Committee (C.B.R.C.C.) and under their direction it was converted into the hospital ship, *Princess of Wales*. The Roentgen ray apparatus, supplied by Messrs. Harry W. Cox, Ltd. was donated by the Duke of Newcastle but for some obscure reason the equipment did not include a localization apparatus.³⁴

A cargo ship was offered to the British Government by the American Atlantic Transport Company for conversion into a hospital ship. This was done

at considerable expense by a committee of ladies under the direction of Lady Randolph Churchill. The end-result was the American ladies' hospital ship *Maine*, which was also equipped with x-ray facilities.

Ships commissioned by the War Office

Hospital ships did not merely serve as transports for the sick and wounded but also as base hospitals in Durban harbour, in the earlier phases of the war when hospital facilities in Natal were not sufficient for the great demand created by the campaign in that province. Those ships used predominantly as hospitals were provided with x-rays but those used purely as transports were not. The *Spartan* and *Trojan* were troop ships which were converted to hospital ships in England and both were fitted with x-ray facilities. The Duke of Newcastle donated the apparatus of the *Spartan*, which was supplied by Messrs. Harry W. Cox who also supplied the one for the *Trojan*, but this was fitted in Durban. The *Nubia* was one of the hospital ships fitted out in Durban by the naval transport department and its x-ray machine was used by Dr Bensusan.

Radiography during the war in South Africa

From the numerous publications by doctors who had worked with x-ray machines in South Africa during the war, one gains a view of the work done, the difficulties experienced and the lessons learnt.

Apparatus

Tubes used

The five ordinary focus tubes supplied by Newton & Co to the Edinburgh and East of Scotland Hospital

proved so satisfactory, that no other tubes were used during the six months of the hospital's existence. The Portland Hospital had 12 Crooke's tubes of various makes and resistances, but one of them gave such satisfactory results, with both screen and photography, that they used it exclusively during the time they were in South Africa.

Induction coils

In general the standard Apps' coil supplied by the War Office gave little trouble and was capable of providing a 12-inch spark under favourable circumstances. Coils never seemed to be a source of trouble. The coils used by the German Red Cross units were supplied by Hirschmann in Berlin and provided a spark of similar length.

The interrupter

The platinum contacts of the interrupters tended to wear out rather rapidly and later in the campaign, a MacKenzie-Davidson's motor mercury break was supplied in some instances. This worked very well but even the inventor thought that it was not robust enough for field service.

Plates

The glass plates used by Kuettnner were all 24x30 cm, which made transport much easier. Plates were packed half a dozen at a time in tin containers with a tight-fitting covers, held in place with adhesive plaster strips to render them airtight. One plate was usually sufficient, but to take a complete pelvis simultaneously, two plates next to each other were used. Despite all these precautions, handling in adverse conditions and transport took their toll of these fragile plates.

Accumulators

Accumulators were liable to run down rather suddenly if much used

to page 18

from page 17

without frequent recharging and theoretically, this had to be done at least once a week, but in practice this was not always necessary. The Portland Hospital's staff found the current loss so slight that infrequent recharging sufficed and this was an advantage when they were in Bloemfontein where fuel was particularly scarce. In general, accumulators had to be transported with special care except the ones supplied by Hirschmann of Berlin to the German Red Cross ambulances. These had cells made of celluloid with solid filling and damage was not significant, as refilling with water reconstituted them.

Supply of electricity

Electric lighting installations were relatively common, so that even in some smaller towns in South Africa, stationary hospitals could benefit from this and recharging of accumulators posed no problem. The lithanode batteries belonging to the Portland Hospital only required recharging at the Rondebosch Electric Light Works, on three occasions during the three months that the hospital spent in Cape Town. In the absence of such a source of electricity, an oil motor and a dynamo was found suitable and could be adapted as circumstances required. Motor and dynamo could be fixed on a metal bed from which they could be detached for transport, the entire apparatus weighing less than 200 lbs.

Wimshurst machines

The Portland Hospital was lent an "Influence machine" which could not be used in Cape Town as atmospheric conditions were not favourable. Sand on the plates and collectors allowed numerous points of leakage so that sufficient tension for the tubes could

not be developed. This source of electricity was apparently used with some success by one of the Guards' Medical Officers at Modder River, where the atmosphere is very dry. Dust was however a greater problem! A Wimshurst influence machine was supplied as a power source for the x-ray apparatus on the hospital ship *Maine*.

Pedal power machines

The equipment provided for the Imperial Yeomanry Hospital, included a specially designed foot-motor and a small dynamo for charging the accumulators. This bicycle arrangement constructed upon a firm metal frame, was fitted with a heavy flywheel which was driven by two riders by means of a chain, and a belt from the flywheel worked the dynamo. Perfect as it was in theory, in practice it was a complete failure on account of the great effort necessary to generate power.

Steam engines

These varied from a small + hp horizontal steam engine and boiler which could drive the dynamo at a speed sufficient to charge the batteries, as used by the Portland Hospital, to the massive steam engine driving a large dynamo used by the Edinburgh and East of Scotland Hospital. This power source could not run continuously, owing to heating of the dynamo but the time the engine ran to supply lighting proved to be sufficient for the purpose of charging the accumulators. Hall Edwards of the IYH at Deelfontein, connected the coil directly to a dynamo driven by a steam engine of considerable size (about 1 hp) and interposed an electrolytic interrupter with very satisfactory results. Objections to this method were the size and weight of the plant, the fuel required and the time taken to prepare for even the smallest radio-

graphic study. The Town Hall Hospital in Ladysmith fortunately had a flour mill next-door and from the mill shaft the dynamo was run, which supplied electricity for charging the accumulators and lighting the operating theatre.

Exposure times

The exposure varied from half a minute up to three quarters of an hour in spinal and hip cases. Prolonged exposures proved a problem in Ladysmith when the town was being shelled, as patients could not be kept still while bombs exploded in and around the hospital.

Localisation

Methods of localisation varied, using different formulae which allowed the position of the bullet and its distance from the plate and therefore from the skin surface, to be calculated. Errors were not uncommon. The MacKenzie-Davidson couch proved of the greatest use to those who understood and employed it and was of value in the diagnosis of the presence and position of bullets and in the examination of fractures.

Dark-rooms

Kuettner's dark-room in Jacobsdal teemed with insects and the temperature at times reached 50°C. The absence of running water and ice for cooling resulted in plates being inadequately washed and dried, which caused deterioration of the pictures. Dust penetrated into every nook and cranny and settled on the drying plates, which acquired rasp-like qualities. The Portland Hospital reserved a bell tent inside which a small dark tent was set up, an arrangement which enabled to them to change plates or even develop films during the day but as a rule all x-ray work had to be done after dark.

to page 19

from page 18

They had many opportunities of proving the superiority of images on plates over simple observation by means of a fluorescent screen, though the latter had advantages of its own.

Fessler in Krugersdorp, found developing of the photographic plates very difficult due to the heat of the sun, the lack of water and the fine, ever-present dust due to the constant wind. He sometimes had to borrow some water from the operating theatre!

At Deelfontein, Hall Edwards erected a small corrugated iron dark-room and excluded light by sticking scraps of brown paper over every little hole in the structure. When the door was shut, it was like an oven and the film peeled from the plates. On opening the door, khaki-coloured dust settled on everything, including the plates. At first he had to use a bucket for washing his plates but later he acquired a new dark-room with running water and telephonic communication with the operating theatre!

Transport

During this war the long distances to be covered by animal transport over poor roads, in a hot, dry country posed major problems, which were greatly enhanced for the surgeon-radiographer by the weight of accumulators, dynamos and engines as well as the fragility of x-ray tubes and plates. Nevertheless, Hall Edwards and Major Beevor thought that these difficulties were over-accentuated.

The local population and the new rays

The population of Krugersdorp, regarded these new rays, which could produce pictures of their bones on a glass plate, as something of a miracle.

At first they were wary of this examination but one by one, all kinds of aches, pains and diseases, real and imaginary, were brought for examination by "the rays". In the evenings, the medical and nursing staff put on a show and invited the citizens of Krugersdorp to demonstrations of these remarkable rays which penetrated wooden doors, etc. Dr. Fessler, the chief surgeon's, dog even had to swallow small lead pellets which were then shown on x-ray - all for the benefit of the Red Cross Fund!

In Jacobsdal the people thought that this German invention would be put into the wound and illuminate it from within outwards. Others regarded the whole story as yet another "Uitlander swindle." Kuettner, who had encountered similar skepticism and amazement about his apparatus during the Graeco-Turkish war, attributed it to a genuine sense of wonder. The excess current provided by the dynamo supplied enough electricity for electric lighting for part of the Jacobsdal hospital. From far and wide people came to look at this latter-day wonder and the throng became so great that Van Alphen, the technician, had to run a wire charged with a low faradic current around the circumference of the hospital to keep transgressors at a distance.

A last thought about the beginning

In December of 1901, when the War in South Africa was entering its final phase, another event of great moment occurred in Stockholm where the first Nobel Prizes were awarded on the 10th of that month. Wilhelm Konrad Roentgen received the first Nobel Prize for physics and Henri Dunant, the father of the Red

Cross, the first peace prize (shared). What these two remarkable men had established, was finding intense application in a war being fought 6 000 miles away.

Acknowledgement

Part of the research for this publication was done while the author was in receipt of a travel grant from the Wellcome Trust.

References

1. Bensusan AD. Early history of radiography in South Africa. *SA Med J* 1967; **41**:777-781.
2. Hahn OH. Some historical notes on South Africa's pioneer radiographers. *SA Med J* 1973; **2**:2428-2430.
3. Burrows EH. The first use of x-rays in war. *Brit. J.Radiol.* 1972; **45**:393-394.
4. Kuettner H. (1897). *Ueber die Bedeutung der Roentgenstrahlen fuer die Kriegschirurgie*. Tuebingen, H Laupp.
5. Abbott FC. Surgery in the Graeco-Turkish war. *Lancet* 1899; **1**:80-83 & 152-156.
6. Burrows EH. (1986). *Pioneers and early years. A history of British radiology*. Alderney, Colophon.
7. Reynolds L. The history of the use of the Roentgen ray in war. *Amer.J. Roentgenol* 1945; **54**: 649-672.
8. Korteweg JA. Eerste Nederlandsche Ambulance in Zuid Afrika. *Neederl, Tydschr. v. Geneesk.* 1900; **1**: 233-363.
9. Odendaal SJ. *Die mediese rol van Dr AEW Ramsbottom voor, tydens en onmiddellik na die Anglo-Boereoorlog in die Oranje Vrystaat. Verhandeling vir die graad Magister Artium (Gesiedenis)* Bloemfontein. Universiteit van die Vrystaat. 1986. Pp 83-84.
10. Fessler J. (1902). *Unter dem Roten Kreuz in Transvaal*. Munich, Seitz & Schauer.
11. Kuettner H. (1900). *Kriegschirurgische Erfahrungen aus dem Suedafrikanischen Kriege (1899-1900)*. Tuebingen, H. Laupp.
12. Flockemann A, Ringel T & Wieting J. *Kriegserfahrungen der zweiten deutschen (hamburgischen) Ambulanz des Vereines vom Rothen Kreuz aus dem suedafrikanischen Kriege. Sammlung klinische Vortraege. Chirurgie* 1901; **86**: 99-160.
13. Lingbeek GWS. (1901). In: *De Vereeniging het Nederlandsche Roode Kruis in den Transvaalsche Engelschen oorlog (1899-1901)*. 's Gravenhage. Gebrs J & H van Langenhuisen.

to page 32