A savage adversary, infantry, squares, cavalry charges, flags, spears and Gatling guns; these all set the scene for a canvas by Lady Butler or yet another colossal epic in Glorious Technicolour. The date was 1898 and the place Omdurman—the last battle to fit into the pattern of Victorian colonial warfare.

So it is with slight amazement that we read that only two ophthalmic casualties resulted from out of all the sandy turmoil. The first man had sustained a retinal detachment, and in due course “continued his service with the colours”; whilst the second casualty whose “orbit was penetrated by three fragments of a Remington bullet” had, in the words of the report, “his globe enucleated with success.”

What, you may ask, was the soldier of fifty years ago expected to be able to see? Only the whites of their eyes? And what role did ophthalmology play in the military Medical Services of the day?

To answer these questions we have to go back and examine the reports of the Army Medical Department for the year 1860.

In the 1860 report was faithfully copied the following pronunciamento from the powers-that-be. “The extent of the range of vision of the soldier is subject to the decision of military authority and should be to the limit of the effective use of his rifle.”

The Enfield rifle had just been generally introduced with a maximum effective range of some nine hundred yards. So it was decided that the soldier must be able to see a three-foot bull’s eye target at six hundred yards.

For testing recruits at the various centres, this target had to be scaled down. A comparable series of dots of size 0.12 inch were arranged in various patterns on a card which the soldier had to read when held fifteen feet away. This test was soon found to be too difficult, and the distances had to be modified to ten feet for a “soldier of the line” and five feet for the Militia and Departmental Corps. The Cabalistic equations and erasures on Sir Thomas Longmore’s portrait in the Millbank Mess ante-room may well be the artist’s symbolism for the difficulties mathematical and otherwise he overcame in the introduction of the test.

There was another test in vogue, copied from the Austrian Army, which involved the use of ten dioptrre convex and concave spectacles to read Jaeger test type, but this was never the most fancied method. Incredible as it may seem, the “Dots Test” remained the official test until October 1906. Even as
late as 1910 we find some conservative medical officers writing to the Journal to say that they preferred it to the newly introduced Snellen’s chart.

The files of the period contain three links with a remoter past. In 1860 were laid down the official rules whereby and whereunder an outbreak of “Ophthalmia” was deemed to become an “epidemic” in a regiment.

A somewhat pathetic footnote mentions that “since the invention of the ophthalmoscope (1848) it is now possible to reject recruits with visual-defects with certainty.” The Pension Warrant of 1864 permitted serving soldiers who had lost one eye in battle to be retained with the Colours.

Remember that in 1898 no man in the Army was permitted to wear spectacles; that there were no ophthalmic specialists, and that in the decade 1892-1902 for an average of 66,000 recruits examined by the dots some forty per thousand were rejected.

**The South African War 1899-1902**

The original garrison of South Africans at the start of the war was about ten thousand men. Some 370,000 reinforcements had to be sent out during the three years to maintain a field-force of 56,000 men.

The ophthalmic problems were few, some of the Field hospitals had ophthalmic departments but not many. Some 2,363 cases of acute conjunctivitis were treated and 859 men were invalided home for errors of refraction—reservists. The report of the Imperial Yeomanry Hospital mentions amongst their notes one of the first instances of close collaboration between the ophthalmologist and the surgeon over head wounds.

Some idea of the type of fighting can be gained from the fact that this patient had been shot through the occipital lobes whilst engaged in a rifle duel with a Boer from behind boulders some fifteen yards apart! Cases of eye-injury are mentioned as being mainly due to bullet wounds rather than to shell wounds. Retinal detachment as in the 1914-18 War was practically non-existent.

Late in the war permission to wear spectacles “on or off duty” was granted but the value of this permission was stultified by glasses being prohibited “on active service or on parade.” Night-blindness was not a major cause of malingering, but the optical delusions of the cordite-eaters were duly recorded.

By 1905 the R.A.M.C. showed some seven ophthalmologists on its strength; three having qualified at the first course of the newly formed R.A.M.College. By 1909 these had increased to fifteen and by 1914 there were thirty. At this period the continental armies accepted a corrected vision of 6/12 for their infantry. So the argument raged for and against the use of spectacles in the British Army. Eventually the issue of spherical lenses was permitted by 1914, but again “Not on active service.”

The equivalent reading on Snellen’s chart to the dots-test was 6/24 either eye. This was to remain the entry standard until 1907. Recruits were then accepted with 6/36 vision in the one eye provided the other achieved 6/6 and they were allowed to fire off either shoulder.

In 1914 the first tests for flying personnel were mentioned. An hyperme-
tropia of three dioptres was stated to be acceptable and candidates wore opaque spectacles to be spun in a revolving chair to test for ocular nystagmus.

The 1914–18 War

As was only to be expected military ophthalmology made enormous strides during this period.

The drain on the nation's man-power soon caused the entry standards to be lowered and settled the question of spectacles for the fighting soldier. By 1915 the General Service standard had fallen to 6/24 right eye uncorrected and 6/60 left eye uncorrected. With the establishment of the Army Spectacle Depot men were accepted for General Service with vision less than 6/60 but better than 2/60 provided they improved to 6/12. Men in the B.2 category need only have one eye and that only to improve to 6/60 with glasses.

The Army Spectacle Depot started in March 1916 by dispensing spherical lenses only but soon gave out cylindrical lenses. By the end of the war any type of spectacle was being made and the Depot had taken on the supply of artificial eyes as well. Some idea of the expansion that became necessary can be gained when it is realized that at its peak it supplied spectacles, lenses, etc., to a total of 131 ophthalmic centres including 98 in the United Kingdom and 5 in the United States of America.

The reports on the battle casualties are extremely interesting. Wounds of the eye comprised some 2½ per cent of all cases. 6 per cent of these were due to concussion effects of explosions, etc.

Whereas in the 1870-71 War some 55.6 per cent of all eye-wounds in the German Army had developed Sympathetic Ophthalmia, only one such case was reported from the British Armies in France throughout the whole war. This legend of Sympathetic Ophthalmia dies hard, but again in the 1939-45 War only one or at most two cases were the result of all ophthalmic casualties in all theatres of war. Similar evidence as to the scarcity of this lesion was given by Wurdeman in respect of the French battle casualties. His analysis of cases showed that 67 per cent of men wounded in the eye, lost that eye. Approximately 50 per cent of the intra-ocular foreign bodies were non-magnetic, and the removal of magnetic fragments was effected only through the anterior route which led to considerable terminal upset of the function of vision.

When the flood of gas casualties was analysed it was found that only in 10 per cent of the whole was the cornea affected. 15 per cent had lesions of the conjunctiva and the remaining 75 per cent suffered only from blepharospasm. Twenty years afterwards the old corneal and limbal lesions were, to break down with the passage of time and cause considerable trouble for ophthalmologists all over the country.

Ophthalmic centres which at first were located only in Base areas were soon found to be necessary in the forward areas. After November 1914 advanced ophthalmic centres staffed by a specialist, nursing orderlies and opticians were attached to the Casualty Clearing Stations in the Army areas.
The General Hospitals arranged special ophthalmic wards, and there were developed ophthalmic divisions in the Convalescent Depots.

At first there were only two Haab magnets in France, and the wounded with intra-ocular foreign bodies had special red labels tied to their field medical cards to be routed to the "Magnet Centres." Soon, however, a magnet-car was built to tour the ophthalmic centres and, later, a portable magnet was made and issued to each centre.

A special pathological centre was formed for the study of eye-conditions and the services of an enlisted ophthalmic fundus artist engaged.

No special hospital could be arranged to cope with the gas casualties, but in England one hospital (St. Dunstan's) was devoted to the treatment of bilateral eye injuries. St. Dunstan's had to treat and train in their new vocations some two thousand men from the Empire's war-blinded. Otherwise the ophthalmic casualties had to be spread throughout the various hospitals in the United Kingdom, and there were naturally many complaints as to the difficulties of segregation and obtaining specialist treatment.

Other points from the reports were of ophthalmic interest. During one year in France, 1915-16, there were only 23,809 cases for refraction: a mere shadow of what was to come.

This first truly National Army drew into itself all sections of the community and held a majority of the urban population. Many men who had been townsmen all their lives had no previous conception of absolute darkness and reported sick with "night-blindness." This disease-without-signs had been known as a cause of malingering as far back as the times of the Crusades. But horror of pitch-darkness combined with the old atavistic fear of things that "go wump in the night" led to shoals of men reporting sick; duly to be labelled "neurasthenia." Up to 1916 the main cause of ophthalmic malingering was said to be "blepharospasm."

The fear of an epidemic of "ophthalmia" as occurred in the days of the Napoleonic invasion of Egypt haunted the minds of the medical authorities in the Levant. It was not to be until the end of the 1914-18 War that the epidemiology of the acute conjunctivitis from the Koch-Weeks' bacillus and the gonococcus was to be clearly differentiated from the chronic conjunctivitis of trachoma. There used to be in the Moorfields Hospital Museum an extremely relevant newspaper cutting of 1806, wherein a Member of Parliament stated without equivocation that he considered that the Egyptian blight was not trachoma but a disease due to the intemperate habits of our enemies' soldiery.

The greatest tragedy was that of the Turkish prisoners of war in the camps in the Canal Zone. Most of them were suffering from the effects of malnutrition and the camps were swept by an epidemic of Koch-Weeks' and gonorrhoeal conjunctivitis. Their own doctors tightly bandaged up the discharging eyes and literally hundreds of globes had to be removed because of panophthalmitis.

The medical authorities in France were equally apprehensive of the spread of "trachoma" from the 100,000 men in the Labour Corps, which was composed of Chinese, Egyptian and Cape coloured boys. The initial Chinese
drafts provided a 13 per cent incidence: but directly the recruiting agencies were made to reject all with "granulations or acute conjunctivitis" the incidence fell level to that of the Cape Boys at 3 per cent. Roughly 8 per cent of the whole labour corps was affected with 8,500 cases of established trachoma.

For administrative purposes the men were split into three types of Companies each with their own individual laundry facilities. "X" Coys. of apparently "clean" men who received a daily drop in their eyes of boracic and zinc. "Y" Coys. of dubious cases who received daily argyrol or silvering of their lids and "Z" Coys. who were established cases of trachoma. The last two companies were under the direct supervision of an ophthalmologist. As a result no epidemics of acute conjunctivitis occurred and little work was lost from the Labour Corps.

The Americans touring the British medical "set-up" in 1917 noted that we were extremely keen on the efficient ophthalmic care of cases with head injuries. However, the Americans were the first to allocate a special hospital for the treatment of ophthalmic, facio-maxillary and head wounds. This precursor of the "Trinity" they disguised by name as the "Head Hospital."

For the first two years after the 1914-18 War the American, British and Canadian ophthalmic journals were full of valuable observations. Interest in military ophthalmology gradually died and all this knowledge had painfully to be regained at the start of the next conflict.

In 1920 the standards for entry to the Army were raised to 6/18 either eye uncorrected, with an alternative of 6/6 right eye and 6/36 left eye uncorrected for General Service. The numbers of recruits rejected were 6.4 per thousand in 1923 and 4.6 per thousand in 1925. Spectacles were permitted to give equivalent vision to the above but the arguments re glasses and shooting were duly resurrected.

Three ophthalmologists qualified at the first post-war College course, and ophthalmic departments were now to be found in all Commands at Home and most of those abroad. However, a partial ban on operating was introduced which later was to cause a lot of trouble when ophthalmologists first came up against a flood of battle casualties. Research continued and was appropriately mentioned in the yearly reports. In 1928 investigations were conducted into the problem of binocular vision and respirators; the illumination of test-type charts and the vision required of signallers. The effect of hypermetropia and astigmatism on musketry are spoken about in 1932. The Ishihara test became the official Army colour test in 1933, and all recruits with vision under 6/12 had to be tested at Millbank. Also in 1933 Indian troops with trachoma were made acceptable; a very different affair from the days of "Ophthalmia."

In 1934 the first successful treatment of retinal detachments with diathermy are recorded. An excellent selection of equipment was at this period designed and issued in due course to centres, and this was to prove up to all demands that the coming war might make upon it.

The Ministry of Pensions took over the Army Spectacle Depot and during this inter-war period were responsible for the supply of spectacles to the Army. In 1938 lack of recruits caused the standards of entry once again to be
lowered, and then were elaborated the forerunners of the famous Seven Visual Standards and Categories that served ophthalmologists so well in the second World War.

The 1939–1945 War

The whole nation was swept into the National Service Scheme and the ophthalmologists had to go in for mass production. After rather a sticky start the optical industry's full aid was enlisted. Thus by the end of 1941 every recruit was examined in the first fortnight of his preliminary training, and if he required spectacles the completed "job" could be fitted upon him at the conclusion of his examination. This necessitated opticians, lenses, spectacles, frames, etc., to be obtained to man and supply the optical sections.

There were some forty-eight optical sections in the United Kingdom alone and there were others at the ophthalmic centres abroad and with the Mobile Ophthalmic Units. Some idea of the organization required can be obtained when it is realized that the overall ophthalmic commitments were at the peak period some one hundred and eighty-one.

Gradually the set-up of the previous war had to be evolved again. Opticians and ophthalmologists had to be found. Nursing orderlies and nursing sisters trained for duty at the base ophthalmic wings of hospitals. St. Dunstan's played its full part and a special Eye Convalescent Hospital was organized. A fundus artist and special pathological arrangements had to be arranged. At home the inclusions of the great eye hospitals under the E.M.S. Service scheme enabled the transition of the nation from a peace-to-war footing to be carried out without a general disruption of the ophthalmic services.

Doubtless the official histories in the near future will tell the full story. But the following figures will give some idea of the work that the Army's ophthalmic specialists had to undertake.

It was necessary for 10 per cent of the National Service intake to be examined and refracted, and half these men had to be fitted with two pairs of spectacles on the spot. The ophthalmic battle casualty ratio was approximately 2⅔ per cent of all the men who were evacuated and reached the C.C.S. alive. We are extremely proud that there were only 500 men from the whole Empire to need the care and training of the various branches of St. Dunstan's at home and overseas. Wurdevan, you will remember, stated that in the First World War 67 per cent of all eyes injured were lost. In the Second World War only 37 per cent were lost from injuries from any type of enemy action or "battle accident." This was undoubtedly due to the policy of bringing the ophthalmic surgeons to the patient at the farthest forward position possible in the line of evacuation.

The mobile ophthalmic units had trucks on which they carried equipment for any major or minor operations required, for refracting and a complete optician's workshop. Thus they could deal with any ophthalmic problem and were sited at the first "bottle-neck" C.C.S. or 200 bedded hospital in the evacuation chain. Their job was to operate upon the urgent emergencies and to exhibit sulphonamides and antibiotics to all other cases. They also pre-
vented the evacuation of refraction cases out of the Corps areas. These ophthalmic teams linked up with the other small "specialist units"—the facio-maxillary and neurosurgeons. They acquired the nickname of the "Trinity" and between them dealt with about 10 per cent of all battle casualties. After some slight breezes due to the feeling that they were poaching on the preserves of the Field surgical units, they in time took their rightful place in the surgical world. Christmas Day 1943 in Vasto was the date of this acceptance into the Mystery when there appeared on the Mess notice-board the message "Happy Christmas everybody even the — Trinity. Signed, the F.S.U.s."

Much research went on in ophthalmology during the war: designs for visors, portable ophthalmic diathermy machines, small magnets, different shapes of steel-helmets, design of instrument-panels for tanks and aircraft, and protective goggles for troops overseas and for scanning and sun-searching, etc., in the Anti-Aircraft Command. Also much work went into the problem of better night vision. The problem of the so-called night-blind had been heightened for the urban population by a series of very dubious drug-house advertisements in the yellow press, so a considerable portion of the ophthalmologist's time was wasted by persons who didn't want to see for military purposes by day or by night. Fortunately an official iron-curtain was dropped on the problem of night-blindness-without-signs-of-organic-disease, and thereafter these men ceased to trouble the ophthalmologists.

Some 40 per cent of the battle casualties were the result of concussion injury, whilst the incidence of the non-magnetic intra-ocular foreign body did not rise much higher than in the 1914–18 War. The removal of the fragments from the interior of the globe by means of the posterior route proved an excellent operation, to which the figures quoted above on the loss of eyes provide a suitable commentary.

Ophthalmia was non-existent and real trachoma presented no difficulties although thousands of Levantine, Indians and Negroes were enrolled in the Pioneer Corps. The returned prisoners of war who had been in Japanese hands had suffered extremes of malnutrition and some hundreds showed the signs of a Nutritional Amblyopia due to the lack of first-class protein and the vitamin-B complex.

Many new Arms and trades were produced by the changes of the war and the Seven Visual Standards proved excellent in the ready sorting of men who would be visually capable or otherwise of carrying out such duties.

Post-War

Army ophthalmologists cannot be exactly said to be entering the doldrums again: they dealt with 134,000 cases for examination and treatment at the centres in the United Kingdom alone in the past two years. We are trying to keep up to the standard of the best work done in the war years and to continue spadework for future improvement. After all there is always Pulheems and the following picture of the infantryman-paratrooper of the next fifteen years is not too fantastic.

His plastic helmet would give lateral protection to his orbit and would
incorporate a built-in earphone and a transparent plastic visor. He would use a throat-microphone and wear contact-lenses which would cover the sclera as a protection against vesicant gas. His lenses would do away with the need for spectacles and could be worn for days on end. He would carry a multipurpose pair of goggles with quickly interchangeable filters to protect against glare, snow, and the sun in A.A. duties. His pockets would contain an antibiotic ointment and he would have the equivalent of B.A.L. to cope with all gases that might injure the eyes. He would have a small infra-red apparatus to enable him to see well on night patrol.

The ophthalmic-team working behind him again with the "Trinity" would have its own portable anaesthetic apparatus, X-ray machine and trace-elements to aid localize the intra-ocular foreign body, and a smaller powerful magnet and diathermy apparatus. The nursing officers would be present, forward in the chain of evacuation, and the opticians would be able to make quick-drying moulds of the eyes for contact-lenses, and could maintain the infra-red apparatus. Evacuation would be by air to the Base Ophthalmic Wing for more radical treatments.

The recruit whose records of refraction, ophthalmic lesions, etc., were known from infancy to the State Medical Service would also have been watched over by industrial ophthalmologists throughout his working life. So the recruit could be quickly made ophthalmically fit and then trained in night-fighting, and in the full use of his vision during his initial training period.

All the above may seem at first sight a little exaggerated, but some of the groundwork is already laid and it is up to the military ophthalmologists to see that progress is maintained.

Is it only fifty years since Omdurman?

[Yes—less than the span of a man's life.—Ed.]