

Signalling in the Anglo Zulu War, 1879. Part 1

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Introduction

Woven into the history of the Anglo Zulu War of 1879, by an accident of chronology, is an interesting tale in the development of army signalling. In the decade preceding the war new developments in signalling had been taking place. The heliograph had recently been invented and used in military operations, but mostly in India, and British troops were not familiar with it. Electric telegraphy was becoming a useful military science and a Telegraph Troop had been formed in 1870 as part of the Corps of Royal Engineers – ‘C’ Troop, in which lies the origin of the present day Royal Corps of Signals - and the Zulu War was their first operation. The telephone had also just been invented and was used by the British Army for the first time in the war, with a surprising result. Along with these innovations, the organisation of signalling in the army had just been changed.

Despite all this the war started with no effective signalling in place – undoubtedly a contributory cause of the early defeats. When signallers arrived later with the reinforcements there were still problems, and things did not go entirely as they should have done.

This article describes the signalling operations – a rather specialised topic, which does not seem to have attracted much attention in an otherwise heavily researched and well published arena. Descriptions of battles have been omitted, and the course of the campaign is confined to the essentials; both these aspects will be well known to the present readership.

Early Signalling Problems

The campaign started badly. Three main columns advanced into Zululand from the colony of Natal under the command of Lieutenant General Lord Chelmsford. The central column, commanded by Colonel Glyn but accompanied by Lord Chelmsford and his staff, suffered the first and best-known defeat, at Isandlwana, when on 22 January 1879 a British regiment and supporting troops, many of them Natal natives, some 1,360 or so, were killed by the Zulus when scarcely a few miles over the Buffalo river into Zululand.

The massacre occurred when Lord Chelmsford had split the column. The leading party, under the command of Lord Chelmsford, advanced further into Zululand while the remainder at Isandlwana waited in a temporary, over-extended position to move forward as soon as a new position was found. In this situation, and demonstrating their mobility and surprise, the Zulus pounced with devastating effect. The Zulu method of communication was by runner, but they were fit, fast and well-trained runners with stamina, and their system was well organised, messages being disseminated down a chain of command rather in the manner of a chain letter. They could be concentrated, moved, or dispersed with remarkable speed, all a part of Shaka’s inheritance.

One of the reasons for the defeat at Isandlwana can be attributed to poor British communications - gallopers belatedly carrying garbled messages. Nowhere in the history of the battle does one read anything about signalling, yet there are photographs taken before the invasion of Zululand which show soldiers of the 1/24th Regiment at Helpmakaar with heliographs, so they were not entirely without either the equipment or the signallers.

The day of the battle was dull and the sky was overcast, so the heliograph would have been unreliable. There was also an eclipse of the sun of two-thirds totality at about 1p.m. - the Day of the Dead Moon - although by then events were out of control anyway. But neither of these circumstances actually made any difference, because the movement plan was only finalised late on the preceding day and no signalling arrangements seem to have been made. Signalling did not yet form an essential part of a commander’s tactical plan.

It is perhaps fruitless to speculate how matters might have been different if, after Lord Chelmsford split the column, the troops advancing into Zululand had been in communication with the remaining at Isandlwana. A heliogram spelling out the danger, or even a flag signal, might have made all the difference. Instead, the wrong deduction was made because, viewed from a distance through a telescope, the tents in the camp at Isandlwana had not been struck as they should have been when the camp came under attack. The heroic defence of Rorke’s Drift took place later the same day, but signalling was irrelevant to that epic.

Strategic Communications

Apart from the dearth of tactical communications in this early phase of the war, there was difficulty with strategic communications. The news of the dreadful defeat at Isandlwana did not reach London until twenty days after the battle. At that time there was no submarine cable to South Africa. The message was transmitted by the Natal and Cape colony telegraph system to Cape Town, put aboard a ship, and retransmitted by telegraph from Madeira *via* Lisbon, thence by another submarine cable to Porthcurno, near Land's End, Cornwall, and finally to London, where it arrived early on 12 February. Britain was shocked at the news.

The curious may ask why there was a telegraph from Madeira, and why was Lisbon involved? The British led the world in submarine cable manufacture and laying at that time, and had secured the contract to connect Portugal with its colony, Brazil. The route was completed in 1874, the cable from Lisbon coming ashore at Madeira and St Vincent in the Cape Verde Islands *en route* to Pernambuco (Recife). Madeira was also a coaling station for steamers on the shipping route between Britain and the Cape and so, although St Vincent was nearer to Cape Town, became the usual stopping point for the telegraph from London to Cape Town. Between Cape Town and Madeira, about three-quarters of the way to England, messages still had to be carried by ship – a passage that took something like sixteen days, and the mail boats usually sailed only once a week.

South Africa was not internationally connected by submarine cable until late in 1879 (1) when the Eastern and South African Telegraph Company was formed to link the 3,900 nautical mile route from Aden to Durban. (2) Aden was a landing for the cable route from Britain to India, the empire's principal asset. That route went *via* Egypt and the Red Sea, and was opened in 1870. South Africa, in London's view a relative backwater, was a lower priority. Eventually the spur from Aden down the East African coast to Durban was laid, making landings at Zanzibar, Mozambique, and Delagoa Bay (now Maputo) on the way, the costs being shared between the governments of Great Britain, Portugal, Natal, and the Cape. Durban was already connected to Cape Town by landline. It was a long and tenuous route, but at last there was a telegraph link between South Africa and London.

It was an accident of history that it was too late for the Zulu War although it was to be in time for telegraph communications during negotiations between London and the South African Republic (Transvaal) after the first Anglo-Boer war, just over a year later, as a result of which the Transvaal regained its independence. Better communications from London in the period leading up to the Zulu War might have curbed the British High Commissioner, Sir Bartle Frere, and prevented the war anyway. The recently appointed Colonial Secretary in London, Sir Michael Hicks Beach, had complained about Frere to the Prime Minister, Disraeli, earlier, in November: "I cannot really control him without a telegraph ...". The absence of timely communications was a major factor in allowing the situation to get out of control.

The Right Flank Column

Returning to the Zulu War in 1879, on 12 January, the day after Frere's ultimatum expired, the Right Flank or eastern column, under the command of Colonel Charles Pearson, the 3rd Regiment (The Buffs), crossed the Tugela River from its base at Fort Pearson. The fort was situated on an eminence on the south bank, where the colonial telegraph system kept it in communication with Pietermaritzburg and Durban.

The ensuing advance was slow, due to bad weather, but on 22 January, the same day that the central column was fighting the battle at Isandlwana, the Right Flank Column was attacked by a force of some 6,000 Zulus at Nyezane. It was a fierce fight; the Zulus experienced effective British firepower and were repulsed with about four hundred dead, the British suffering only fourteen dead. By 23 January Colonel Pearson and some of his troops got as far as Eshowe, about twenty-five miles into Zululand, intended to be an advanced depot on the route to Cetshwayo's homestead at Ulundi.

Soon afterwards, on 27 January, a telegram was carried by runner from the telegraph head at Fort Pearson to Colonel Pearson at Eshowe; it was from Sir Bartle Frere, telling of the disaster at Isandlwana but giving no details. The next day, 28 January, another messenger brought a telegram from Lord Chelmsford confirming what Frere had said, and providing some detail. The garrison at Eshowe fortified the deserted mission station that they had occupied, known to the Zulus as KwaMondi (just to the east of the present town). The last runner to Eshowe got through on 11 February, carrying the message from Lord Chelmsford that no reinforcements were available. Marauding Zulus prevented further communication. The siege of Eshowe had begun. The campaign had degenerated into a mess.

Communicating with Eshowe

An immediate problem was to try and communicate between Fort Pearson and the besieged garrison in Eshowe. This story has been touched on by a number of authors but is clouded by misconceptions and inaccuracy; even the primary sources are in part conflicting. It is therefore worth looking at it in detail, but to do so now will digress from the main thrust of this article and make it too long. The story of signalling between Fort Pearson and Eshowe will be published in the next issue of the Journal. For the time being suffice it to say that, a few weeks after the siege began, improvised visual communications were established between the two places and messages could be passed in both directions on a daily basis until Eshowe was relieved.

A Pause in the War

While Eshowe was under siege, the Left Flank Column was engaged in a number of battles in western Zululand; Ntombe Drift, Hlobane, and Khambula, the first two being defeats and the last a convincing victory. Signalling played no part in any of them.

Despite giving the British a bloody nose, the Zulus had by this stage of the war suffered some 7,000 casualties. But the British, after their mauling, were in no position immediately to advance into Zululand and finish it off. Lord Chelmsford returned to Natal on 9 April, after the relief of Eshowe, to await reinforcements from England and plan the second invasion. There was a pause.

Up to now the signalling had been rudimentary, as between Fort Pearson and Eshowe, or non-existent. What improvements were to be expected in the next phase of the war?

British Army Signalling Arrangements in 1879

With the reinforcements was to come 'C' Telegraph Troop of the Royal Engineers. This was to be no panacea to the early signalling problems, but before returning to the war of 1879 and its continuation after reinforcements arrived from England, it will be instructive to elaborate on British Army signalling arrangements at the time.

Electric Telegraphy

The use of electric telegraphy had been demonstrated in the American Civil War (1861-65) and had stimulated European armies to develop the capability. After a review, the School of Military Engineering at Chatham formed a Signal Wing in 1869, which combined visual and electrical methods of communication under an 'Instructor in Army Signalling' and an 'Instructor in Telegraphy'. For some years officers and soldiers of all arms were trained there, although electrical methods remained entirely the province of the Royal Engineers.

Split in the Organisation

However, this sound policy of combining all signal methods under one direction (*i.e.* the Royal Engineers) was not maintained, and by degrees visual signalling was separated from electric telegraphy. In 1876 the Instructor in Army Signalling moved from Chatham to Aldershot where he became Inspector of Signalling and was responsible for signalling in arms other than RE, and the Signal Wing at Chatham dropped visual signalling altogether. (3) In addition, some of the regiments in South Africa at the start of the Zulu War had been there for a few years, taking part in the last of the Frontier Wars, so it is quite understandable that recent signalling developments had not reached them.

Regimental Signalling

The scale of signallers in regiments was eight per infantry regiment and twelve per cavalry regiment. For operations at a higher level a brigade or divisional signalling officer was appointed, and an *ad hoc* unit, sometimes referred to in those days as a 'corps of signallers', was formed from the regimental signallers to meet each situation as it arose. It was not a good recipe for fielding a tried and tested team in times of stress. In principle the organisation, training, and, as will be seen later, equipping of regimental signallers was not satisfactory, and was certainly not in effective operation at the time of the Zulu war. The number of signallers in the early part of the Zulu War was quite insufficient,

bearing in mind that the native contingents – ill equipped and badly trained - had none. It is not surprising that to begin with the signalling was ineffective. (4)

The Telegraph Troop

Also as part of the British Army's developments in telegraphy, authority was granted in 1870 to raise a mobile telegraph unit for field operations. This step had been proposed earlier, but was constrained by financial stringency until worries about the Franco-Prussian war overcame that barrier. As a result 'C' Telegraph Troop, Royal Engineers, was formed that year, originally consisting of 2 officers and 133 other ranks, with 12 cable wagons carrying 36 miles of cable and iron poles, four office wagons fitted with telegraph instruments, and eight cargo wagons. It was soon expanded to 5 officers, 245 other ranks and 115 horses. They were formed and equipped with a European role in mind, and with the task of connecting the Corps HQ with its base and rearwards using a convenient permanent telegraph system, as then existed in all the main European countries; they had no tactical role and were not responsible for visual signalling. As things were to turn out, their first operational deployment was the Anglo-Zulu war, where all this fine theory was blown apart! (5)

'C' Troop kept a manuscript Journal recording its day-to-day activities (for example, the entry for 23 April 1873 records that Lieutenant H. H. Kitchener, later Lord Kitchener, was posted in as Adjutant) and some of the material in this article has been drawn from it. Any reader who finds himself at the Royal School of Signals in Blandford might care to look at it in the Corps' archives (adjacent to the Museum).

The Second Invasion of Zululand 'C' Troop to South Africa

The signalling scene having been set, back now to the war. After Isandlwana reinforcements were sent, amongst them 'C' Troop, which was placed under orders for South Africa on 21 March 1879. A week later the mounted portion marched from Aldershot to Portsmouth and the remainder followed by train a few days after. They consisted of Major A. C. Hamilton (Troop Commander), Lieutenants J. C. MacGregor, J. Hare, H. B. Rich, and F. G. Bond, Troop Sergeant Major A. Lewis, and 209 NCOs and men, with 110 horses. They were accompanied by a surgeon and a veterinary surgeon. On 4 April they sailed in the SS *Borussia*, a hired transport ship.

Early problems were encountered. The 'C' Troop Record dated 5 April reports:

The second day a heavy gale blew up, which lasted until the night of Wednesday the 9th. The transport was a thoroughly filthy ship, with no proper ventilation on the horse deck. She rolled 45 degrees, and the horses were so distressed that 16 died before Madeira was reached, and 11 more succumbed before the end of the voyage from the effect of the gale.

Eventually they landed at Durban on 10 May. Here they managed quickly to replace the lost horses with four teams of mules.

They split into two Sections to support the new operation. It had been decided that the re-invasion of Zululand would be carried out by two columns: one in the east, the 1st Division, starting from Fort Pearson as before, to be supported by No 2 Section of 'C' Troop; and the main column, the 2nd Division together with a separate 'Flying Column', advancing into Zululand from the west, supported by No 1 Section of 'C' Troop.

The Western Column

Let us begin by following No 1 Section in support of the main column. From Durban an advance party with the mule teams and fifteen miles of airline went ahead quickly to Ladysmith and thence to Dundee. After about a week, by which time the horses had been fattened up after the voyage, they were followed by the remainder of the Section, which arrived on Sunday 7 June, "having marched 202 miles through a very rough country". It was good going after the long voyage the men and particularly the horses had endured. At Dundee they found that the lightly equipped advance party had already tapped into the existing colonial telegraph system at Quagga's Kraal and extended it by airline. The next day they laid cable from Dundee to Landman's Drift, on the Buffalo River, the western border of Zululand, where the Force HQ was initially established and where the telegraph head was to remain throughout. The telegraph office that was set up there was to remain very busy for the duration of the campaign.

Insufficient Line

However, they carried insufficient line to reach the objective of the expedition - Cetshwayo's homestead deep in Zululand at Ulundi, some eighty-five miles from Landman's Drift. Their normal scale, based on calculation for their intended European role, was thirty miles, comprising fifteen miles of airline and fifteen miles of cable; it was hopelessly inadequate for the present task.

The terms may be unfamiliar to some readers. Airline is uninsulated line, strung on poles and attached to porcelain insulators to prevent leakage of the electric current to earth; cable is insulated, stranded wire laid on the ground. Airline is electrically better, and is easily visible for rapid faultfinding, but it is heavy and conspicuous. The poles add considerably to the weight to be transported and, quite apart from any destructive work the enemy might do, become desirable 'scratching posts' for roaming cattle in places like Natal, to the detriment of the telegraph line. Tactical airline can never be built to the same electrical and physical standards as permanent telegraph lines. Cable is lighter, quicker to lay, and less conspicuous, but susceptible to physical damage and grass fires, and more difficult for faultfinding.

Hard decisions had been made before they departed. It was foreseen in England that thirty miles was too little so eighty miles was taken, but the trade-off in weight and space for the same number of horses and transport capacity meant that they left behind the telegraph office waggons (it was possible to dismount the telegraph equipment and operate an office from tents or other temporary accommodation, which is presumably what they did), and the poles also had to be left behind on the assumption that new ones could be locally procured. Depending on which type of wire and cable they took, which is not recorded, a typical weight would be over 100 lbs per mile of line, so eighty miles would be about four tons – a heavy load to be hauled from Durban to the Zululand border. The poles would increase the weight further.

Two other factors compounded the line problem. On arrival in Durban the Troop was divided into two Sections to support the operational plan for two Columns, so neither could reach Ulundi from their connection point with the Natal permanent telegraph system. Also, it had been intended to follow up 'C' Troop with a Postal Telegraph Company, one of the Army's two reserve telegraph units, bringing with it 100 miles of line. This was later countermanded and the reserve unit never came, but by the time the additional 100 miles of line arrived the war was nearly over. When it did come, fifty miles was allocated to each Section. The poles left behind in England were replaced from local sources, in the case of Number 1 Section, by bamboo poles cut in the forests around Pinetown, on the way to Dundee. (6)

In one of his reports, Major Hamilton notes:

At the same time the use of these [heliographs] would have been much less conspicuous if my Troop had been supplied with the 100 miles of additional wire that I asked for before leaving England, as I should have been able to lay it quite as fast as the army marched, and we should all have had a surer means of communication by day and by night, and in all weathers. Still the telegraph should always be supplemented by a few heliographs for use in the event of a break in the telegraph line. (7)

Perhaps it was wishful thinking, because an extended and vulnerable telegraph line in enemy territory may not have lasted long. As it was, the communications of the 2nd Division and Lord Chelmsford's accompanying headquarters were much hampered by the lack of any telegraph beyond Landman's Drift.

Visual Signalling – the Heliograph

Communications into Zululand were going to have to be provided by visual signalling, principally the heliograph, or else despatch rider. The topography of Zululand is admirably suited to setting up a chain of heliograph stations, with prominent hills, far-reaching lines of sight, clear air, and usually plenty of sunshine, although there were long periods of unusually bad weather during critical periods of the operations, just before and after the final battle at Ulundi.

Still there were problems: the heliograph was a relatively new means of signalling (having been brought into service in the early 1870s, and used mostly in India where the climate and topography suited it well), there were not enough of them, and the troops did not know how to use them. Under the new visual signalling arrangements, described above, the commander of the 2nd Division, Major General Newdigate, appointed Lieutenant J. H. Scott Douglas, 21st Royal Scots Fusiliers, an officer who possessed a 1st Class Instructor's certificate from the School of Army Signalling at Aldershot, as

his Divisional Signalling Officer. (8) Well qualified though he was, the means at his disposal, both heliograph instruments and trained signallers, were scant.

It becomes clear from Major Hamilton's reports that, despite the policy of separating visual signalling and electric telegraphy laid down by senior officers in high places in London some years before, the state of regimental signalling in 1879 was inadequate, and he actually had to assume the appointment of both Director of Military Telegraphs and Signalling for the entire Force. Some officers and telegraphists from 'C' Troop (who of course knew the Morse code, which was used with electric telegraph, heliograph, and also flag signalling at that time) together with the Divisional Signalling Officer and a very limited number of competent regimental signallers, had to set up, deploy, and jointly operate the chain of heliograph stations into Zululand. Extracts from Major Hamilton's reports written during and immediately after the operation paint the picture:

The supply of heliographs at the time of the arrival of the Telegraph Troop in the country was so limited that but little could be effected with them at first; later on, as a larger supply was received, an extensive system of signalling was elaborated, and a very large amount of correspondence was flashed by this means. Up to the time of the battle of Ulundi [4th July], the only instruments in use were a pair of 3", a pair of 6", and a pair of 10" instruments. With these, a chain of stations was established from the advanced positions of the army, where the parties of [17th] Lancers worked the 3" instruments, to Landman's Drift, the terminus of the Military Telegraph. The 6" and 10" glasses were worked by the signallers of 'C' Troop, R.E. (9)

The larger supply received later were instruments manufactured in the workshops of the Bengal Sappers and Miners at Roorkee. They were brought from India to Natal by Colonel Sir George Colley, who assumed the appointment of Inspector-General of the Lines of Communication when General Sir Garnet Wolseley took over command (see below). Colley was one of the 'Wolseley Ring', and had been summoned from Afghanistan at short notice, but arrived just after the final battle of Ulundi. The Roorkee instruments were brought into use in the events that followed Ulundi. (10) Major Hamilton's report continued:

During the month of August the heliograph was worked over a very extensive system, as illustrated by the attached sketch map.

Unfortunately that sketch map is not reproduced in documents now available, so the detail remains unknown. However, in the discussion period after a meeting at the Royal United Service Institution on 15 March 1880, Major Hamilton is reported as saying:

We employed the heliograph to a very great extent, having at times 15 or 16 different signalling stations. The greatest distance between the stations was 35 miles, the general distance being something like 20 to 25 miles and sometimes less. (11)

Continuing with extracts from Major Hamilton's report:

When the work was first commenced under my direction, neither the officers nor signallers of my troop had ever **seen** a heliograph, nor until lately had we any printed instructions on the subject. The instruments were therefore not used to the best advantage, and there was considerable want of skill in reading the signals. This has now been overcome by practice, and the work is going on with the utmost precision and dispatch. I may mention that messages have lately been transmitted at the rate of 14 words per minute, while the capability of the instrument, as claimed by the inventor and patentee, is only 10 words per minute.

As I have above stated there were no signallers acquainted with the use of the heliograph, except some men of the 17th Lancers (volunteers from the 16th Lancers), who had learnt the use of that instrument in India. This was a great disadvantage, as even the best signallers in the Telegraph Troop took some days before they became perfect in the manipulation of the instrument. Later on when more instruments were received, signallers from the infantry and cavalry were employed to work them, but in very few cases did these attain beyond a mediocrity of skill, owing to a want of systematic training and practice in peacetime.

Despite the problems with visual signalling into Zululand, the telegraph office at Landman's Drift, handling the traffic for the rear link to Natal while the Column assembled and organised itself, was extremely busy and worked well.

Into Zululand

When all was ready, the advance into Zululand started. 'C' Troop Record indicates a period of great activity:

12 June. Lieutenant MacGregor with a party of signallers and heliographs advanced with General Wood's great convoys (which occupied 12 miles of road). Major Hamilton and Lieutenant Bond with another party established a [heliograph] station on the Doornberg.

21 June. Major Hamilton and the Doornberg party shifted to Itelezi Mountain and on the 24th opened communication with Lieutenant MacGregor on Ibabanango [Babanango] and with Landman's Drift. By means of these stations and intermediate stations between them and the advanced posts, the entire communication was kept up throughout the remainder of the campaign, the highest rate of sending being 15 words per minute. Signal stations were opened at intervals at Fort Newdigate, Fort Marshall, Conference Hill, Fort Evelyn, Kwamagwasa, and Fort Victoria [near Mtonjaneni]. After the battle of Ulundi [4th July], stations were also opened to Fort George and Fort Cambridge by a party attached under Sergeant Major Lewis, ... *etc.*

1 July. Several 10-inch heliographs received, found to work very well. [Presumably the first of the consignment of Roorkee heliographs.]

It is worth noting that the link between Fort Evelyn and Kwamagwasa, 26 miles, was being worked by instruments with only a 3" mirror.

Sadly, near the site of the heliograph station at Kwamagwasa Hill today will be found the war graves of two signallers, those of Lieutenant Scott Douglas, the Divisional Signalling Officer, and Corporal Cotter of the 17th Lancers, both killed by Zulus. Scott Douglas was the eldest son of Sir George Scott Douglas of Kelso who at the time was MP for Roxburghshire, and the headstone records that "he met a soldier's death near this spot while in the execution of a dangerous and important duty as signal officer of Lord Chelmsford's army, ... 1st July 1879". (12) The heliographs unable to operate because of bad weather on the 30th June, and escorted by Corporal Cotter, he was carrying important despatches at the time – a little more about those despatches later. (13)

Meanwhile, back in Natal, supposedly friendly territory, the busy telegraph line from Landman's Drift was having problems. The 'C' Troop Record again:

7 July. Terrific thunderstorm wrecked the lines and fused the instruments in circuit.

Natal, between the mighty Drakensberg range to its west and the humid Indian Ocean to its east, is often subjected to stupendous electrical storms, with vivid forked lightning and torrential rain.

10 July. Kaffirs stole half a mile of wire near Dundee and later wrecked 8 miles of line between Dundee and Quagga's Kraal. A party under Lieutenant Bond remained out all night, and the following day repaired the line and drove in 600 head of cattle.

Was this as punishment? If so, the army must have fed well for a while! Or perhaps it was because the cattle kept knocking the airline down while they scratched on the poles.

The Eastern Column

It is time now to turn to the Eastern Column and No 2 Section of 'C' Troop. After landing at Durban the Section marched through the undulating country beside the east coast to Fort Pearson. Their destination was the HQ of the 1st Division under Major General Crealock, where they arrived on 21st May after five day's march. This force was to advance into Zululand from the east, but in the campaign as a whole it became a subsidiary effort and lacked clear orders from Lord Chelmsford, its slow progress earning it the unflattering title of 'Crealock's Crawlers'. The Column was, however, disadvantaged by disease, much of it caused by the rotting carcasses of dead transport animals, and the unhealthy climate of the low-lying coastal area where malaria was prevalent. They also suffered transport problems and a liberal share of storm, fire and flood.

Telegraph from Fort Pearson

As the 'C' Troop Commander, Major Hamilton, was based at Landman's Drift, this telegraph Section was attached to 30th Company RE, the 1st Division's field engineering company responsible for building the roads and bridges, under the command of Captain Bindon Blood RE who, as a Lieutenant, had himself served a tour of duty with 'C' Troop in 1870-71 as one of its founder members. (14) The telegraph Section's task was to extend the telegraph line from Fort Pearson, where the Natal permanent telegraph system ended, and to follow the advance into Zululand, opening telegraph offices where needed on the way. They reached Fort Chelmsford by the 31st May and Port

Durnford by 27 June, the line being partly a cable route (i.e. laid on the ground) due to shortage of overhead line. On 2 July, and again on 4 July, the cable was damaged by a grass fire. On 5 July they received a telegram reporting the battle of Ulundi.

The field telegraph kept pace with the movement of the forward troops – not too difficult in this case - and as a result there were much better communications to this Division even though it was operationally less important. The line does not appear to have been tampered with by Zulus, who by now were very wary and keeping their distance.

The telegraph Section met problems with shortage of stores, although on 26th July ‘a supply of 50 miles of 3-strand galvanised iron wire, 18 BWG [Birmingham Wire Gauge, the predecessor of Standard Wire Gauge, SWG] with 1,300 insulators was landed at Port Durnford and poles were cut up by the Natal Pioneers’. This was their share of the additional cable that came later, as described previously.

By 4 August the line was completed to St Paul’s “through dense bush, swamps, and reeds” and the telegraph office there was opened. On 7 August storms wrecked the line and the rivers were impassable, although “2nd Corporal Head and SS [Shoeing Smith] Dawkins showed most distinguished pluck by swimming their horses across a swollen river and examining the line to Port Durnford.” By 11 August a further 20 miles of line was connected on towards Mtonjaneni, where presumably they finally ran out of line, and a telegraph office opened. A signalling station was opened nearby and communications then extended to Mtonjaneni and Ulundi by heliograph. It was noted, “the health of the men was bad, and owing to the malarious swamps, one man died, and 14 men were invalided to Durban”.

Eventually, by 15 August, they had built 102 miles of line, as follows:

Fort Pearson to Fort Crealock	13½ miles
Fort Crealock to Fort Chelmsford	8½ miles
Fort Chelmsford to Port Durnford	19 miles
Port Durnford to St Paul’s	28 miles
St Paul’s to Fort Victoria	32 miles
Fort Victoria to Signal station	<u>1 mile</u>
Total	102 miles

This was an extremely long line to operate and maintain in tactical conditions. Forty miles was considered the practical limit, but even in these early days of military telegraph it was not a record. A longer tactical telegraph line had been built by Royal Engineers in 1868, some 200 miles from Annesley Bay on the Red Sea to Antalo, supporting the advance of an expedition to Magdala, Abyssinia. (15)

One disadvantage of such a long line not mentioned in the contemporary reports or descriptions, but which becomes evident from reading post-war requests for better equipment, was that a message could not be telegraphed directly between more than three stations before it had to be re-transmitted manually by the intermediate telegraph office. (16) This was due to the poor quality of the line, the insensitivity of the Morse sounder (the telegraph audio receiving device – see below under Telephony), and the lack of relays, which would re-transmit automatically. Such manual re-transmission along the line was the cause of delays to message traffic.

Extension by Heliograph

As with the Western Column, this Section also had to supplement the telegraph by heliograph. “During these operations the signallers of the Section were employed with heliographs at St Paul’s, signalling to Port Durnford, Eshowe, and Kwamagwasa”, this being performed as a back up means when the telegraph line was severely damaged by the ferocious storm, and as already narrated, the heliograph was used to Mtonjaneni and Ulundi from the point where the supply of cable had run out. By this stage of the campaign, there were more heliographs available, and a greater number of the telegraphists of ‘C’ Troop had become adept in their use.

The Section’s Work

Probably because the action was elsewhere, with the Western Column, the good work of this Section in laying and maintaining such a length of line, extending it where needed by heliograph, and operating the telegraph offices, all in adverse conditions, has not received the attention it merits.

Captain Bindon Blood, Officer Commanding 30th Company RE with 1st Division, included the work of the telegraph Section in a report he made at the end of the war. (17) He noted that:

The field telegraph was managed throughout the operations by Lieut. J. Hare, R.E., and owing to his energy and good arrangement it was very successful. On the break up of the 1st division, on the 24th instant, the line extended from Fort Tenedos, via Port Durnford, to the Umlalaas river, and consisted almost entirely of airline on various poles, some of the service pattern, some 3-inch scantlings from Durban, and some cut in the bush. The great difficulty about the telegraph was due to interruptions caused by stray cattle, and by carelessness of wagon drivers, who drove their cattle against the poles and entangled their whips in the wire and pulled it down. Of course no poles that can practically be used for field telegraph purposes will stand this treatment; but I think the service pattern are decidedly too light, and should be replaced by bamboos fitted and jointed on the Indian pattern, which has now been in use some years, and has stood a good deal of practical work. ... etc.

The instruments and batteries, &c. sent out with 'C' Troop were old and considerably worn. This should be avoided in similar cases if possible. The equipment, generally, is too heavy, the wagons with loads as laid down being unfit for use off made roads. There is no reason why all telegraph equipment, both air line and cable, should not be carried on two-wheeled carts which are much better for rough work than wagons. This has long since been done in India with the greatest advantage. ... etc.

Two heliographs of an antiquated and very heavy pattern were provided, but were never really used, as they could not be conveyed on horse-back, and the light instruments of the Roorkee pattern did not arrive until the 1st Division was broken up.

It appears to me that it would be most advantageous if more line soldiers [i.e. infantry and cavalry soldiers from the regiments of the line, later known as regimental signallers] could be instructed as signallers and telegraphers. Very few of either class were in the 1st Division. ... etc.

The Campaign Ends

Sir Garnet Wolseley arrives and appointed 'Supremo'

After the early disasters it had been decided in London that Sir Garnet Wolseley would replace Lord Chelmsford as the Commander. Wolseley was at the time the Governor of Cyprus, an appointment he was not enjoying. In late April he was recalled to London where, on arrival, he learnt he was to go to Natal. He was made military and civil 'Supremo', being promoted to full General and appointed Governor of both Natal and the Transvaal, giving him overall civil and military powers. The ambitious Wolseley - by then growing in bombast and arrogance - was delighted. At the end of May he sailed for Natal, where he had previously been Lieutenant Governor for six months in 1875.

Wolseley reached Cape Town *en route* on 23 June, desperate to be in charge of the action and no doubt to bask in some of the glory of the inevitable victory, and sent the first of a series of telegrams. His ship next called at Port Elizabeth where he fired off more brusque and peremptory telegrams to Chelmsford and others asking for a report on the situation, the general tenor being that he was now in charge and the present incompetents were to do nothing but await his arrival when all would be resolved at a stroke, a cause of some amusement to Chelmsford's staff and presumably also to the telegraphists as this highly combustible material was retransmitted down the line.

Wolseley's first telegram reached Landman's Drift and was forwarded, to Chelmsford's headquarters, then near Mtonjaneni. Before the reply could be telegraphed back from Landman's Drift Wolseley reached Durban on 28 June and soon fired off a further telegram to Chelmsford *via* Landman's Drift which reached him on the evening of 2 July, as he was preparing for the battle of Ulundi two days later: "Concentrate your force immediately and keep it concentrated. Undertake no serious operations with detached bodies of troops. Acknowledge receipt of this message at once and flash back your latest moves. I am astonished at not hearing from you." (18) It is likely that the death of Lieutenant Scott Douglas, mentioned earlier, occurred as a result of his endeavours to get Chelmsford's reply to Wolseley's first telegram from Mtonjaneni back down the chain to the telegraph station at Landman's Drift.

An extract from a further telegram to Lord Chelmsford from Wolseley sent from Durban on Tuesday 1 July 1879 reads:

Your letter and enclosures of 28th June received. Wish you to unite your force with the First Division, as I strongly object to the present plan of operations with two forces acting independently.

Am now starting, 4 P.M., and join First Division at Port Durnford by sea tomorrow. As soon as I get things in order there I intend to force my way to St. Paul's Mission Station. Communicate news to me daily through Marshall. Send messages in the cipher which you use with Crealock by native messenger across country to First Division. I shall endeavour to communicate with you the same way. Acknowledge receipt of this message immediately by flashing to General Marshall. If you have no cipher with Crealock, send message in French. (19)

The landing at Port Durnford was aborted due to the sea state, so in the event this ploy failed.

For all his bumptiousness, Wolseley was probably right about concentrating the two Columns. The limited resources of such things as transport and signalling could have been more efficiently deployed by keeping them concentrated. The Telegraph Troop, for example, would not have been so short of line if they only had to support one Column rather than dissipating it between two.

The Final Battle at Ulundi

The war ended with the defeat of the Zulus at the battle of Ulundi on 4 July 1879, Lord Chelmsford still in command. It was all over quickly; the Zulus were overwhelmed, although there was a subsequent hunt for King Cetshwayo who was eventually captured on 28 August.

Wolseley had made desperate attempts to get to the scene of the action in time, but to his chagrin arrived at Fort Pearson by road from Durban only after the battle had been fought and won. There he was handed a telegram received on 5 July announcing Chelmsford's victory at Ulundi the previous day. Wolseley assumed command anyway, and Lord Chelmsford departed on 8 July.

Further Line Work

Meanwhile, Zululand now a safer place, No 1 Section made some rearrangements to the communications on the western flank, their additional fifty miles of line having arrived. The 'C' Troop Record again:

10th July. A line commenced a few days previously to Koppie Allein (12 miles) of compound steel and copper wire on bamboos without insulators was completed and [telegraph] office opened.

12th July. A line commenced to Conference Hill, 13 miles on from Koppie Allein with copper wire on bamboos, and completed the following day, owing to defective insulation and want of battery power it was found necessary to put telephones on this line with ordinary [Morse] sounders; this worked well. [See below.]

14th July. A line was commenced towards Itelezi and 6 miles poled, the remaining 4 miles was poled and the line was worked with telephones.

1st August. 6 miles of cable were paid out from Landman's Drift to Doornberg and an office and heliograph station established signalling to the Oscarsberg over Rorke's Drift by which means Sir Garnet Wolseley, who had arrived there, sent all his messages down and up the country.

24th August. Troops being reduced to leave Zululand, all lines commenced to reel up as the forts were evacuated, Cetshwayo having been caught." [This appears slightly inaccurate. Cetshwayo was not caught until 28 August, although the Zulu army was broken and the war effectively over after the battle of Ulundi.]

Telephony

First Use by the British Army

The Bell telephone was introduced in 1876, three years before the war, and its use in the Zulu War must have been its first operational use in the British army. (20) Telephones at this time would only work over short distances, say a few miles, so they were only used for local point-to-point communications, typically outposts to the local HQ. The Illustrated London News reporter with the Eastern Column described his experience of it:

A neighbouring hill, a mile and a quarter distant, on which a vidette [observation post] is stationed, is connected with the fort [Crealock] by telephone. It is the first time that instrument has been used in warfare. It is of the greatest service, as voices are easily recognised by the sound.

The telegraph has been laid between Fort Pearson and Fort Crealock, and the posts [i.e. poles] for it have been fixed nearly up to Fort Chelmsford. (21)

The entries in the 'C' Troop Record for 12 and 14 July are the only occasions on which the use of the telephone in the Zulu War is mentioned. Despite this low-key description, it may well be a historic event in the development of military telegraphy – yes, telegraphy!

Morse Telephony

The entry for 12 July quoted above, where it says that “it was found necessary to put telephones on this line with ordinary sounders; this worked well”, used the extreme sensitivity of a telephone receiver, or earpiece, and coupled it with the Morse sounder, thus becoming the first operational use of what might be called Morse telephony, an apparent contradiction in terms.

After the war, back in England, when the future development of telephones was being discussed, Major Hamilton wrote a letter describing its use in the Zulu War in more detail:

In South Africa I made several experiments with the telephone supplied to me by Major (now Lieut. Col.) Webber, R.E., but the only one which had a practical and useful result was on the line between Koppie Allein and Conference Hill.

A line of telegraph between these places was urgently required for a few days, but we had not sufficient material without using some cable of which the insulation was in part burnt off by grass fires and was practically bare wire.

The weather being very dry we were enabled to get a sufficient electric current through this wire to work the troop instruments during the day, but in the early morning, when the dew was on the ground, the current went to earth, but by putting a telephone on, the working of the Morse instruments could be distinctly heard and messages read off in that way.

The amount of faulty cable on the line was 5½ miles, and besides this for the first, second or third day there was three miles of bare wire on the ground for which no poles were, for a time, available.

The, rest of the line was bare wire on poles, the whole quantity in circuit being about 23 miles. (22)

It is likely that the telephones supplied by Major Webber were an experimental type of Bell telephone, a modification of what was then known as the rifle range telephone, made by the Telephone Company. It was described as:

...very well contrived. Their new telephone ... will work admirably at distances of about a mile, and their arrangements for confining the sound will quite prevent the voices of the speaker being heard at a distance greater than 20 or 30 yards. (23)

After the war, back in England, the newly-discovered technique was developed by a Royal Engineers officer, Captain Philip Cardew, an instructor in telegraphy, to produce a new instrument called the vibrating sounder. The vibrator, or buzzer, as it was also called, had considerable application in military telegraphy, and was first used in operations by 'C' Troop in Egypt in 1882 at the battle of Tel el Kebir, when again the quality of the circuit was poor due to the conditions but the newly developed vibrating sounder was able to communicate. In its primitive form, though, it had its operational roots in the Zulu War, between Conference Hill and Koppie Allein on 12 July 1879, when the telephone receiver overcame the defective insulation of the cable and the damp conditions.

Final Report on Signalling

Major Hamilton's final report, written on 1 October 1879 whilst at Wakkerstroom, addressed a number of signalling issues:

Heliograph

Heliographs came into their own in this war – when, eventually there were enough of them and signallers learnt how to use them. Major Hamilton reported that:

No instrument gave such universal satisfaction as the 5-inch Indian pattern ones, manufactured at Roorkee. They are lighter and on a better principle than the Mance heliograph, and are probably also far cheaper. I would recommend that only this one size and pattern should be adopted in the service, at all events for field operations, for they are powerful enough to be easily read with the

naked eye at 40 miles distance, and at the same time small enough and light enough for a mounted man to carry without the least inconvenience. The 3-inch Mance heliographs, used by the cavalry, were completely worn out by the end of the campaign.

The basic design of the Roorkee 5-inch heliograph did in fact become the standard army heliograph and was later manufactured in England by a number of companies, its heyday in the British Army being the Anglo Boer War of 1899-1902.

Flag Signalling

Tactical flag signalling had been introduced by the Royal Engineers, and was first used in operations in Abyssinia in 1867. Perhaps it should be mentioned that flag signalling in those days was carried out by a single large flag used to signal letters in the Morse code, not semaphore using two small flags as readers today might imagine. The large flags gave greater range but they were too cumbersome and Major Hamilton reported: "in sending long messages the signallers had to relieve each other after every 50 or 60 words, being perfectly exhausted by the exertion required". Field glasses were not issued to signallers, who whenever possible had to borrow them from officers, so the range capability of flag signalling was often not fully exploited. The method of signalling the Morse code with a single flag is shown below (reproduced from the Manual of Army Signalling).

In the Zulu War flag signalling was used during reconnaissances and on the line of march of the 1st Division, the signallers employed being those of the Telegraph Troop, under Lieutenant Rich, RE. On these occasions the object ... was to keep the General Commanding in communication with the cavalry advanced guard and flanking parties.

It was also used by the 2nd Division and the flying column, when its mobility and simplicity was appreciated in controlling movement and sending orders. Flag signalling was also used to keep signal stations on high ground in touch with nearby forts (supply stations), which were in the valleys below, but, observed the fastidious Hamilton, "I regretted to observe in several instances a want of accuracy, together with departure from the established system of signalling in this portion of the work".

Lamp Signalling

Night signalling with lime light lamps was used in two cases, the first during the march of the 1st Division from Napoleon Hill to Fort Durnford, when the Division was broken up and halted overnight in two camps, between which communication was maintained by this means. The second was between Fort Victoria (the terminus of the Fort Pearson and Port Durnford field telegraph line) and Ulundi when:

This work was carried on for several hours every night for about a fortnight in a very satisfactory manner. ... The General Commanding [then Wolseley] was encamped at a distance of 10 miles from the terminus of the telegraph line, and but for this all messages arriving after sunset would have had to be forwarded by mounted orderlies in the dark, or have been detained until the following morning.

The limelight was a complicated device to use under field conditions. The light was derived from a pencil of lime raised to white heat by means of an oxy-hydrogen flame, obtained by causing a jet of oxygen to pass through the flame of a spirit lamp on to the end of the pencil. The oxygen was made by heating chlorate of potash and granulated binoxide of manganese, and was stored in gasbags of 2½ cubic feet capacity – all a complicated process, and the basic commodities were hardly in everyday supply in Zululand.

The body of the lamp, fitted with two plano-convex lenses of 3" diameter to emit parallel rays, was mounted on a tripod, the same tripod that was used to mount a heliograph instrument. There was a sighting tube to align the lamp correctly with the distant station; this of course had to be done in daylight. Signalling the Morse code was by means of an obscuring disc in front of the light. The range was given in the Manual of Army Signalling 1887 as 20 miles. It was later to be replaced by the Begbie lamp (Major E. W. Begbie was a signalling officer with the Indian Army), simpler but not so effective, the light being much less brilliant with range reduced accordingly.

Other Matters

A range of other matters were criticised: the inadequate scales of signalling equipment and supplementary equipment such as field glasses and telescopes; different procedures for visual and telegraph message handling as a consequence of the organisational split in responsibility; the design and weight of signalling stationery such as message forms, and different design of forms between visual and telegraph for essentially the same function.

Finally, after stating that “the importance of signalling has been strongly exemplified during the late campaign”, a number of recommendations were made: to give greater encouragement to the practice of signalling, as is done already to that of musketry; that an officer is detailed in every regiment to superintend the instruction in signalling; a badge of ‘crossed flags’ for qualified signallers (24); signalling to be tested during the regiment’s annual General inspection, and a number of other matters aimed at giving the subject more prominence and attention.

The Troop had learnt a lot, and their experience was to be put to good use in future operations.

Return to England

After the war was over No 1 Section went on to further work in the Transvaal connected with the operation against Sekukuni and the Pedi tribe. No 2 Section closed its telegraph offices, recovered all its cable in mid-September, and made its way southwards from Fort Pearson.

The two Sections of ‘C’ Troop eventually reunited at Pinetown, a garrison town near Durban, on 26 October. On 22 November:

... the Troop embarked on the hired transport SS Galatea for England, and arrived at Portsmouth on Monday 26th January 1880, having suffered much from typhoid fever on the voyage. The horses had previously been sold by auction at Durban.

They reached Aldershot at the end of their first overseas operation on 28 January 1880, just about ten months since their departure.

Epilogue

Lieutenant John MacGregor was posted out of the Telegraph Troop prior to return to England, to take over command of a RE Field Company operating in the Transvaal against Sekukuni. He was subsequently appointed Secretary to Major General Sir George Colley, Governor of Natal in 1880. Sadly he was killed during the first Anglo Boer War at the Battle of Ingogo, 8 February 1881, while carrying Colley’s orders at the front of the battle. Colley himself was killed at the battle of Majuba Hill a few weeks later, on 27 February 1881.

Major Alexander Charles Hamilton, on a happier note, the Troop Commander, was promoted to Lieutenant Colonel on 21 August 1883. He later claimed the title to the Lordship of Belhaven and Stenton in 1893, becoming the 10th Lord, and became a Representative Peer for Scotland in the House of Lords. He died in 1920.

Lieutenant F. G. Bond had a distinguished career, retiring in 1919 as Major-General Sir Francis Bond, KBE, CB, CMG. After the Zulu War, still in ‘C’ Troop, he took part in the Egyptian Expedition of 1882 and then served for a long period in India, mainly with the Bengal Sappers and Miners. He served again in South Africa during latter part of the Anglo Boer War (appointed CB) before returning once more to India in command of the Madras Sappers and Miners. He was recalled to England during the First World War and became Director of Quartering. After his retirement from the active list he undertook charitable work. He died in 1930.

Lieutenant Henry Bayard Rich took part as a field engineer in the Egyptian Expedition in 1882. He was later promoted Captain and returned to India, where unfortunately he died of a fractured skull as a result of an accident while playing polo at Rawalpindi on 17th November 1884.

Lieutenant John Hare was promoted Captain on 1 January 1880 and retired from the army on the 8th September 1886.

Troop Sergeant Major Lewis, obviously a tower of strength in the Troop, has also disappeared into obscurity, presumably because WOs and NCOs records were not as well kept as officers' records. He was specially mentioned by Major Hamilton in his final report: "Troop Sergeant Major Lewis ... also rendered especially good service in instructing the regimental signallers at various posts in the use of the heliograph, and afterwards marched with Colonel Baker Russell's flying column, in all signalling operations, all of which duties he performed with great energy and intelligence."

References.

1. Some accounts state 1880, but it was in fact opened in December 1879. The annual report of the *General Manager of Telegraphs for the year 1879*, Ministerial Department of Crown Lands and Public Works, in the Cape Archives, states, "before the end of the year the submarine cable was completed right through to Aden, and was opened for traffic".
2. The company later merged to form part of the Eastern Telegraph Company, which served many countries in Africa and further east. The Eastern Telegraph Company, under commercial pressure when wireless communications were introduced, subsequently merged and became part of Cable and Wireless.
3. *The Royal Corps of Signals. A History of its Antecedents and Development* by Maj. Gen R F H Nalder, pp 18-19.
4. Much the same situation prevailed twenty years later, in the early part of the 2nd Anglo Boer War, 1899-1902. Lord Roberts, in a letter to Lord Lansdowne, Secretary of State for War 1895-1900, after the battle of Paardeberg in early 1900, commented: "... Our signalling arrangements are very faulty, and the necessity for their being capable of expansion in times of war was evidently overlooked at [the Army Signalling School at] Aldershot. This country is admirably adapted for heliograph and flag signalling, but we cannot take full advantage of it for want of sufficient number of heliographs and properly trained men. Signalling is essentially a duty which belongs to the Q.M.G.'s Department".
5. It could be observed that something not dissimilar prevailed over a century later. In 1985 the Royal Signals fielded a digital tactical trunk communications system called *Ptarmigan*, designed and developed over many years and tailored to a specific European role against the threat of the Warsaw Pact, its cost justified in the previous decade or two through many expensive studies, reviews, and weighty meetings in the Ministry of Defence. Analysed almost to extinction before it took to the field (already obsolescent due to its long gestation and the rapid advance in technology), its first operational deployment was in the desert in the Middle East in the Gulf War in 1991! On that occasion, the first group of enemy to surrender, clearly less imbued with fighting spirit than Zulus, turned up at one of its trunk nodes (signal switching stations) pleading to be taken prisoner and thus spared further hunger and risk.
6. Described in a presentation on 15th February 1884 about the work of *Field Telegraphs in Recent Campaigns* by the then Lt Col A C Hamilton, formerly the 'C' Troop Commander. *Journal of the Royal United Service Institution*, Vol XXVII, p 332.
7. Written at Landman's Drift, 14th July 1879. Extract from the Proceedings of the RE Committee for 1880, Appendix 1.

8. A biography will be found in *The South African Campaign, 1879* by MacKinnon and Shadbolt, published 1881.
9. Major Hamilton, the Troop Commander, wrote a series of reports during and immediately after the operation, reproduced in *Extracts from the Proceedings of the RE Committee 1880*, Appendix 1, RE Library, Chatham, England.
10. *Journal of the Royal United Service Institution*, Vol XXIV, p 255. Some accounts erroneously state that the Roorkee heliograph was used throughout.
11. *Journal of Royal United Service Institution*, Vol XXIV, p 254.
12. An obituary was published in the *Illustrated London News*, 23rd August 1879.
13. Lord Chelmsford's despatch, written on 6th July, published in the *Supplement to the London Gazette*, 21st August 1879.
14. Later General Sir Bindon Blood GCB GCVO. He enjoyed a most distinguished career, much of it in India, becoming CRE Bengal Sappers and Miners. He served again in South Africa in 1901 for a short period during the Anglo-Boer War. He died in 1940, at the age of 97, having written his reminiscences in the book *Four Score Years and Ten*.
15. *Record of an Expedition to Abyssinia* by Holland and Hozier, Chap XXII. Pub by the War Office, 1870.
16. Extracts from the *Proceedings of the RE Committee 1880*, p 129. Major Hamilton, in a post-war letter dated 15th May 1880, explained the problem and asked to be equipped with a suitable relay or translator equipment.
17. Extracts of the *Proceedings of the RE Committee 1880*, Appendix II. This report also includes an interesting account of road building and bridging work.
18. This telegram is quoted by Donald Morris in *The Washing of the Spears*, pp 555-556. It is assumed, since Morris did not produce a comprehensive list of references, that this quotation has been derived from some primary source.
19. *Narrative of the Field Operations, The Zulu War of 1879*. Prepared by the Intelligence Branch of the Quartermaster-General's Department. p 114. Published 1881.
20. An early device was used by the Bengal Sappers and Miners in India in 1878 in the Jowaki Expedition.
21. *Illustrated London News*, 26th July 1879, written on 3rd June 1879.
22. Extract from the *Proceedings of the RE Committee 1880*, p 142. Letter by Major A C Hamilton dated 25th November 1880. Major Webber was at the time commanding a Postal Telegraph Company, and presumably had a source of supply of the new telephones. Shortly afterwards Major Webber himself came to Zululand with General Wolseley, as a DAQMG on his staff, responsible for Lines of Communication staff work and initially located at Landman's Drift. He remained in the appointment until after the first Anglo-Boer War, and later became Director of Army Telegraphs, again under Wolseley, in the Egyptian expedition of 1882.
23. Extracts from the *Proceedings of the RE Committee 1878*, p 23. Letter by Major C E Webber dated 14th November 1878.
24. Whether Major Hamilton was the first to suggest this is not known, but the idea was certainly taken up. Crossed flags were authorised to be worn by signallers in an Army Order of 1887.