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Editorial

KISS

MR Bill Shankly is reported to have said that Liverpool's successes on the football field could be attributed to *KISS*, "Keep It Simple, Stupid".

We live in a complex world, deluged by sophisticated technology and unintelligible (and often misleading) pronouncements. Nothing seems simple; filling in forms, crossing a road, eating (have you been reading the warnings on the danger of eating butter, bread, vegetables, meat, fish and fowl?); even the media, presumably designed to communicate, talks and writes of "the polarization of differing views may, in the event of non compatibility of the opposing opinions, lead to a situation in which the four sides of the equation could be prevailed upon to at least have meaningful discussions". In our kitchens, technology has gone mad with up to date gadgetry—ovens with finger tip, eye level, self cleansing controls (I've got that wrong somewhere!)—and cook books which say "place in medium oven until cooked"!

You wish to build a toy fort for your grandsons, sons or yourself! You buy a "Do It Yourself" kit—*no special tools required—full instructions enclosed—can be assembled by a five year old with some supervision.* You read the instructions—you don't really understand them—you start. Take a simple operation—"Drive home the screws (Packet A) through holes marked B on the diagram". There is no "Packet A" but all the screws are the same anyway—you find difficulty in seeing how pushing the screws through the diagram will support the drawbridge—the penny drops! You select a screwdriver from the miscellany found in any Sapper home—you discover that the screws have cruciform (Phillips) heads and all your screwdrivers have straight blades. Inspiration. The car tool kit has a Phillips—out comes the tool kit—the screwdriver is of the double blade type, Phillips at one end—straight blade at the other, the blade not in use is housed in the handle of the screwdriver. The blade is wrong way round (of course)—it won't move—pliers will not move it. You open the kitchen door—place the blade between the jamb and the back edge of the door (near the hinge so you won't damage the door)—you close the door—you twist and heave. The blade comes out—you pull off the planted stop from the jamb—you rupture yourself. You reverse the blade and tackle the drawbridge. The screwdriver is of hardened steel—the screw is aluminum (it is a foreign kit)—the screwdriver is also the wrong size. You tear the screwheads—you drive the screws home with a toffee hammer. The mangled screwheads have sharp edges likely to tear tiny hands—you decide to buy a childs nurses kit to go with the fort. The drawbridge is incorporated.

You now have to repair the damage to the door jamb. You get out the car—set off to buy the nurses kit, some timber, screws and a truss—car breaks down—tool kit is at home—call garage—complete purchases—return home. Put on truss. Cut the timber to size. Examine screws—relief—normal screwheads. One screwdriver will fit—it is of the "pump" ratchet type—it won't pump and the ratchet slips! Inspiration. Re-reverse the blade of the car screwdriver—it won't move—you look for another door. . . . !

In an advanced technological age nothing is as simple as it looks—or is it?

This is not a new situation, some Members may be able to remember a well known entertainer had problems with a hole in his bucket!

Intermediate and Appropriate Technology (page 25), may suggest an approach which might provide the answers to many current problems.

"Keep It Simple, Sapper"

The Growth of Industrialism and its Effects on Military Tactics and Technology

P W TURNER, B Sc (Econ) and R H HAIGH, MA, B Sc (Econ)

This Occasional Paper from the Department of Political Studies, Sheffield City Polytechnic was offered to the Journal with exclusive publishing rights in Great Britain. It is hoped that it will stimulate discussion.

We are indebted to Mr Haigh, Head of Department of Political Studies, to Mr Turner, Senior Assistant Area Education Officer, West Devon Education Authority and to Sheffield City Polytechnic for their co-operation.

As is customary with these Occassional Papers copies of all comments, criticisms and contributions on the subject will be forwarded to the authors who will be given the opportunity to reply if they so wish.

THE First World War of 1914/1918, "The Great War", irreversibly changed the social, economic and political face of Europe and indeed of the world. It was the most devastating clash in European history and in conjunction with its second round, the Second World War of 1939/1945, effectively shifted the centre of world power away from Western Europe to the United States of America and the Soviet Union.

With the exception of two relatively small scale dress rehearsals provided by the American Civil War and the Russo-Japanese War of 1905, it was the first time that the technological military developments made possible by the Industrial Revolution were deployed in a conflict between major industrial powers.

The results were so terrible that they entered into what one might fancifully call the European folk memory, given concrete shape by War Memorials listing the names of half the able bodied males in a district, the verse of Owen and Sasoon, the novels of Aldington and Henry Williamson, scores of films from "All Quiet on the Western Front" to "Paths of Glory" and, at a more popular level, the haunting musical images, conjured up by the score of "Oh, What a Lovely War!"

The central theme of most of these works tends to be provided by the search for guilty men. For to comprehend such a cataclysm one had to personalise it, to attach meaning to the sacrifice by seeking causes and ends. To identify those responsible for the conduct of the war and its eventual outcome, not surprisingly in a notably unmilitaristic culture, the Generals were cast in the role of principal culprits, with the politicians (unspecified) following in a subsidiary role. What we propose to argue is, that however understandable the search for personal devils may be, it is a sterile one, for the true culprits were the impersonal forces released by the general usage of applied physical science in what came to be known as *The Industrial Revolution*. In a more specific sense we intend to demonstrate how a number of quite simple changes in technology, reflections of that industrial revolution, could have almost incalculable results on the nature of war. To do this we intend to give a brief account of what had gone before.

From the beginning of the 18th Century, all European wars were fought, and were to be fought for the next 150 years, with basically similar weapons. These weapons dictated all the tactics of the conflict while their availability virtually dictated its strategy and its scale.

The key to it all was the *Flintlock* musket. A smooth bore muzzle loading weapon burning black powder ignited by a spring loaded flint and steel mechanism and throwing a heavy lead ball. The ball, incidentally was of 0·69in calibre, the barrel of 0·75in diameter. The enormous (by modern industrial standards) tolerance or

"windage" gives one some idea of the standard of engineering of the time. Muskets of this type were produced all over Europe. The one most generally used in the British service, the *Tower* musket, popularly known as *Brown Bess*, equipped British field formations from the time of Marlborough right through to the period immediately preceeding the Crimean War.

In the hands of well trained troops the rate of fire of this weapon, for short periods at least, was in the region of four rounds a minute. Loading the weapon was a fairly complex procedure, the soldier would carry his ammunition in an expense pouch in which individual charges of powder and ball would be separately wrapped in what were at that time known as cartridges. These were not however the familiar cartridges with which all good devotees of the "Western" would be familiar but were stiff paper cylinders usually waxed, containing a large charge of black powder and a heavy lead ball. When the soldier was required to load his weapon he would take one of these cartridges from his pouch, bite or tear off the end of the paper cylinder and pour a small part of the powder into the priming pan on the side of the musket barrel. He would then close the lid on the priming pan to stop the powder spilling and pour the remainder of the charge down the muzzle. The ball was then dropped on top of the charge, the paper screwed up and rammed down the muzzle of the weapon with a long iron ramrod carried beneath the barrel. The charge would then be held fairly firmly in place by the screwed paper wad, and the weapon was ready for use. When the soldier wished to fire the weapon he would pull back the hammer, which was a spring loaded arm containing, within a clamp on its end, a piece of flint; when the trigger of the musket was pulled the flint would swing forward, strike and drive back the cover of the priming pan (this was known as the frizzen), and the resulting shower of sparks would ignite the small amount of powder in the pan and the flash from this discharge would pass down a touch hole, on the side of the barrel and ignite the main charge. This was of course a somewhat chancy procedure. First of all, if the powder were damp or if it were raining, there was no guarantee that the priming powder in the pan would ignite, or possibly on a windy day it may well be blown away. Sometimes the touch hole would be blocked with partially burned powder from earlier shots, and all-in-all if three shots out of five detonated effectively, the weapon was considered to be functioning reasonably well. Even assuming the charge was effectively ignited only about 50% of it acted as a propellant, the other 50% was deposited on the inside of the barrel in the form of a sooty fouling or blown out in clouds of dense greasy smoke. The former problem, that of muzzle fouling, meant that the longer the weapon was used in action, the more difficult it was to load, as the ramrod found it progressively more difficult to force the ball down the barrel. The latter problem meant that the visibility on the battlefield was frequently obscured by a quite literal "fog of war". At the Battle of Waterloo, for instance, visibility was down to eighty yards in broad daylight, and opposing infantry formations were only visible to each other as the muzzle flashes from their weapons illuminated their positions.

A musket ball could kill at 500 yards, however the weapon was so inaccurate that a hit at that range was pure chance and the usual combat range was a hundred yards or less. The best of the muskets in production during the 19th Century, the French *Charleroi* was subject to an error of 9ft at a range of 250 yards. To illustrate this point the range record achieved by a company of German infantry makes extremely interesting reading. German infantry were generally reckoned to be rather better marksmen than the French and substantially worse than the British (this is not chauvinism but merely reflects the fact that a wealthy Britain, with a small regular army, could afford to burn more powder in practise). The company of rather more than a hundred men were shooting at a target which was not the conventional bullseye, to which we are accustomed, but a long rectangular screen approximately 100ft long by 6ft high, the sort of target that another company of infantry in extended order would present. At seventy-five yards 60% of the shots were on target, at 150 yards only 40% of the shots were anywhere on the target and when the range opened

up to 225 yards only a quarter of the shots actually made contact. One can see therefore that the musket had very definite limitations.

More accurate weapons were available incidentally and 18th and 19th Century gun-smiths were well aware that by making the ball fit very tightly into the muzzle of a weapon and cutting a spiral groove in the barrel it was perfectly possible to make the ball spin, the principle of course of the rifle: for all that rifling involves is cutting a spiral groove to spin the projectile. A spinning projectile is much more accurate than one which does not spin and consequently the advantages of the rifle were perfectly well understood. However, as practical breech loaders (rifles that could be loaded other than by forcing the projectile and charge down the muzzle), were not readily available, the necessity of forcing a tight fitting ball down a muzzle, especially one which was soon partially blocked by fouling, reduced the rate of fire significantly; four rounds a minute in the hands of trained troops became one round per ninety seconds. What was even more significant was the fact that the manufacture of the rifle in an age before machine tools was an expensive and laborious hand process. To equip an army with such a weapon would have proved prohibitively expensive.

The limitations of the musket, therefore, explains many of the things that puzzle the modern student of 18th and 19th Century military affairs. For instance we have all seen the films in which the pre-revolutionary American frontiersman ruminates aloud about the foolishness of dressing troops in red coats and making them stand up to fight. If one considers that they were equipped with a weapon that stood five feet high and had to be loaded through the muzzle, then one can see that it was quite impossible to load it quickly in any other position than bolt upright. If one further considers that, at an effective combat range of under one hundred yards, camouflage was unlikely to be particularly useful in concealing one man, let alone a formation, and as the musket was only really effective when many weapons were fired in unison, volleys fired by formations were virtually obligatory. The nature and limitations of this weapon and its derivatives dictated in turn the tactics of contemporary warfare. The problems of producing even this relatively crude missile weapon also did much to dictate the size of armies as one could clearly not field an army any bigger than one could equip.

The musket barrel was manufactured from wrought iron, as steel, for much of the 18th and early 19th Century, was only manufactured in laboratory quantities. This wrought iron was rolled into thin sheets, the sheets were rolled around a former usually a metal rod and seam welded, ie, the edges were overlapped and hammered while hot until an effective join was made. The various small parts of the gun, the lock, the wooden furniture (the butt and barrel fittings), and the bayonet were all separately made by different sub-contractors. These parts were then usually supplied to a government armoury in bulk and each weapon would be made up by putting these rough parts together. There was no real question of providing modern interchangeable parts, each component had to be worked upon with hand tools until the parts fitted smoothly and each weapon was therefore unique. It wasn't, for instance, possible to take the lock from one musket and fit it to the stock and barrel of another without modifying it with hand tools first. As a result it was not possible to make these weapons in very large numbers and armies tended to be very much smaller in size than even the limited conscript forces common in contemporary democracies. What was even more significant was, that in an age of transport by pack mules and horse drawn wagons, even if you could equip a large army it would have been quite impossible to supply it once it got more than a short distance from its supply base. To give one a definite idea of the relevant size of armies of the flintlock age, Napoleon's "Grand Army" numbered significantly less than 450,000 men whereas the German field army of 1914 numbered over two and a quarter million and even the tiny British Expeditionary Force could field nearly 150,000 at the opening of the war.

There existed as a consequence a situation in which smallish armies were equipped in the main with weapons which had an extremely low rate of fire, limited range and

even more limited accuracy which meant, in turn, that the tactical uses of the weapon had to make the best of its rather limited potential.

Musket armed infantry however, were not the only effective arm available to the Field Commander. In addition he would normally have a force of cavalry. By the opening of the classical age of flintlock warfare, that is the years of the Revolutionary and Napoleonic wars, cavalry had become principally a reconnaissance arm and a shock weapon. The reconnaissance function is obvious, they were able to move around the countryside considerably faster than marching infantry and would therefore be deployed in small parties ahead of an advancing army to tell the Commander what lay "on the other side of the hill". As a shock weapon, horsemen were grouped in large numbers and required to advance very quickly, frequently at the gallop armed either with a sword or a lance, and the sheer weight of a formation of horsemen would often be enough to overwhelm and scatter the vulnerable foot soldier.

The final element on the chess board was the field artillery, virtually rather larger versions of the flintlock musket mounted on wheeled carriages. These weapons would throw either a heavy iron cannon ball (usually of nine or twelve pounds weight), which would carry for upwards of a mile, or at shorter ranges they would throw a "grape" shot, a number of rather smaller balls, about the size of a child's fist, linked by a fibre-net and having an effective range of upwards of a quarter of a mile, and finally canister shot. This last type of ammunition consisted of a metal canister about the size of a catering coffee tin, packed with upwards of a hundred musket balls and having an effective range of rather less than 250 yards, which as one can see would only be employed under virtually point-blank conditions. In the last two instances, grape and cannister shot, the projectiles could separate into their component parts once blown clear of the muzzle of the gun. Round shot would therefore be used at relatively long ranges and, as it did not have any sort of bursting charge, would simply act in very much the same way as a gigantic cricket ball bowled through a formation of men. Grape shot would be used at slightly shorter ranges and the spread of the projectiles would make it rather more lethal as an anti-personnel weapon. Canister, used at short range, had the effect of a giant sized sawn-off shot gun which one can imagine would be quite devastating at short range. There was, incidentally, one final refinement, spherical canister or spherical case shot invented by a Major Norman Shrapnel. This was a small hollow spherical container, in effect a hollow cannon ball containing a quantity of smaller projectiles, scattered by a bursting charge operated by a slow burning fuse designed to ignite the bursting charge at a predetermined range. This last refinement was never in general use but had a limited currency in the British armies of the period.

Equipped with these weapons and organised in this manner armies of the period played out a kind of military chess game, in which the manoeuvres one sees on a modern parade ground or at a modern military tattoo had a real and immediate value. Close order drill was battle-drill; the necessary manoeuvres of the battlefield. A commander would for instance use three basic formations. He would move his army in column because it wasn't possible to traverse the roads of the period in any other formation. Nor, in the absence of any direct communication method was it possible to control a more scattered formation. It was necessary to command them by either shouted orders or bugle, trumpet or drum signals, or for even longer range communications, written messages carried by mounted officers. Having moved his formations in column the Commander had to deploy them in an entirely different formation in order that they might fight. If, for instance, he wished to achieve the maximum fire power from his infantry he had to get them in the longest and shallowest formation possible. If they were deployed in three ranks the rear rank would tend to be obscured by the front rank so a single line would give the maximum number of men the best possible opportunity to use their weapons. Once fired however, it took some time to re-load a musket and if in the meantime a large formation of cavalry could be brought close to the helpless infantrymen the sheer weight of the charge

would overwhelm the soldiers before they could reload. It was, therefore, customary to organize them in squares when in the presence of enemy cavalry, that is to form a company or a battalion into a hollow square in which the front rank would kneel down holding before them their muskets with bayonets fixed, forming a kind of hedge of blades, while from behind this mobile fence the other two ranks would fire at the advancing cavalry. Even if every man in the square had fired his weapon horses would be reluctant to advance upon the bayoneted muzzles and the sheer density of the formation tended to make it very difficult to scatter by any sort of shock action.

The square was however, extremely vulnerable to close range artillery fire, a ball would obviously do a great deal more damage to a solid formation than a linear one and if it were possible to close the range to one at which was possible to utilize canister, then two or three salvos from a battery of field artillery could almost destroy a battalion caught deployed in square. One can see therefore, that a Commander needed to manoeuvre his troops in column, deploy them in line to give them maximum fire power and form them into square to give them maximum solidity. If it were possible by taking advantage of the ground to threaten a column with cavalry and make it form a square then, by perhaps bringing artillery from behind the shelter of a hill, bring them under close range fire, and finally overwhelm them either with an infantry or cavalry assault, a battle could be brought to a very definite conclusion by skilful manoeuvres.

British armies with their rather stolid disposition and, as professional soldiers, more skilful musketry, were constantly able to defeat much larger Continental formations as British Commanders learned at an early stage the considerable advantages to be derived from using infantry essentially as wielders of fire power rather than carriers of bayonets. The massed columns of assaulting bayonet armed infantry, most of whom were unable to use their weapons because they were obscured by the ranks in front, were continually destroyed by the linear formations of British troops, all of whom were able to use their weapons long before the assaulting columns could close to the point where shock tactics were of any value.

As a consequence of the state of the art, 18th and 19th Century wars tended to be fairly short in active duration and to involve a relatively small proportion of the population. Wars did of course drag on for many years but in general this meant that when a military campaign was fought the defeated army would either, in the case of a British expeditionary force, return to the home island and lick its wounds before reassembling, or in the case of European armies seek some sort of accommodation with the enemy and retire for another round later on.

Long continuous slogging matches of the kind familiar to later generations of soldiers were rare, or indeed unknown. The only campaigns that did lend themselves to any sort of protracted duration were those of the Peninsular. These were a rather special case as they became an almost ideological conflict where a completely unorganized collection of Spanish irregulars harried the occupying French forces which were forced to disperse to consolidate the victories won in the field. At no time was a Spanish army able to face French troops in a pitched battle and survive, but the nature of the conflict was such that pitched battles rarely took place. Small ill-armed mobs of Spanish peasants, led principally by local land-owners, were continually sniping at the flanks of small French units deployed in what was virtually the role of a military police force.

In general however, the armies of this period would have an extremely limited impact on society beyond the immediate area of conflict and the concept of a nation in arms was never more than a vague idea. It is interesting to note that the novels of Jane Austin were written during a period in which Britain was quite literally fighting for national survival, yet it would be perfectly possible for one to read all of them and be almost unaware of the fact that a war was taking place; a fair indication of the extent to which it was possible to ignore the fact.

The collapse of the French armies after the Battle of Waterloo effectively ended

the Napoleonic Wars and introduced "The Long Peace" to Europe. It was during the subsequent period of relative military inactivity that major changes in industrial technique radically, but unobtrusively, altered this well understood pattern of warfare.

As we have remarked at an earlier stage in this paper it had long been known that a spinning bullet would go further and fly straighter than an ordinary thrown ball but it was difficult to produce a weapon that would fire such a projectile without a great deal of trouble and expense. The development of industrialized methods of manufacturing metals and the invention of machine tools, including such simple but vital pieces of equipment as the screw cutting lathe and the milling machine, made it possible to produce rifled barrels on a very large scale. Barrels could be drilled from rolled bars and the barrels could then be rifled, that is a groove cut in the inside of the tube, with relative ease. Methods of igniting the charge also improved when the Reverend Alexander John Forsyth invented the percussion cap. The 1838 musket, a direct descendant of *Brown Bess*, was fired not by the familiar flintlock but by such a device. It was essentially the same as the modern child's "cap" but in this case made of fulminate contained between two thin sheets of copper, rather than a slightly less lethal substance deposited upon a strip of paper.

The next step in the evolution of the military "longarm" was the *Enfield* rifle. The *Enfield* rifle was once more an extremely simple weapon. It was still loaded from the muzzle but ignition was by means of the percussion cap and the projectile was entirely different. It was a cylindro-conoidal bullet with a hollow base, still loaded in very much the same way, that is it was necessary to ram the bullet down the muzzle of the rifle having first poured the powder charge down. The problem of persuading it to fit tightly into the grooves was overcome by making it an easy sliding fit which would be transformed into a tight one by the explosion of the charge in the hollow base of the bullet forcing the soft lead into the grooves. The range of this weapon was about a thousand yards and certainly accurate aimed musketry fire was possible at ranges in excess of six hundred yards. It had a rate of fire of about three rounds per minute and although, with the exception of its method of ignition, it looked very much like the familiar musket it was a very different weapon. Indeed the colossal infantry combat casualties suffered in the American Civil War were largely because the Field Commanders of the period had not yet adjusted to the implications of a weapon having this kind of range. For instance the tactic of galloping field artillery to within "canister range", ie 2–300 yards of opposing infantry, was only stopped when it was discovered that the long-reaching *Enfield* rifles of the infantry could kill the entire gun crew, and destroy the team of horses that hauled the weapon and its limber, long before the gun could get into range. It is by no means certain that the Field Commanders appreciated the implications of this new weapon as quickly as did the ordinary soldiers, who rapidly discovered that the only way to survival on the battlefield was to dig in as quickly as possible. Most of the photographs of the period, taken by such war photographers as Matthew Brady, showed the hastily dug field fortifications of the infantrymen; and in the case of positional warfare the elaborate field fortifications that remind one so much of the First World War.

It was, of course, still extremely inconvenient to be forced to load a weapon through the muzzle, the fouling of the muzzle caused by black powder slowed up the process fairly quickly and it was extremely difficult to load such a piece in any other position but an upright one. The introduction of such an accurate but hard hitting weapon made this extremely imprudent. It was of course well within the capacity of the industry of the period to machine gas-tight metal-to-metal seals and, as a consequence, the first breech loading weapon issued to the British army was the 1865 *Snider* conversion of the *Enfield* rifle. This had a rather simple trap door action and instead of firing the paper round (which had to be torn, the powder poured into the muzzle and followed by the projectile), it fired a unitary cartridge made of metal very much like the familiar modern round, containing the ball, the powder and the

primer all in one neat package. This was of course a transitional weapon designed to make use of conversions of the existing stock of *Enfield* rifles and in 1871 a new weapon, the *Martini Henry* rifle, was introduced. This had an under-lever action and fired a rather smaller round, as it was once more soon discovered that there were two methods of killing an opponent with a projectile weapon; one was to throw a large ball at a relatively low speed, and the other was to throw a smaller projectile at a rather higher one. The invention of the rifle and the higher muzzle velocities possible, with improved propellants and the infinitely tighter gas seal of the rifled barrel, made it practicable to reduce the calibre of the weapon and hence the size of the round at a fairly early stage. As a consequence this made it possible for the individual soldier to carry more ammunition.

By 1871, of course, magazine weapons had already been developed and the ability to load once and fire often was of particular value either in repelling infantry assaults or for the use of cavalrymen who would find it extremely difficult to load while in the saddle. All "Western" fans are familiar with the *Winchester* rifle, although it was of course preceded by the *Spencer*, which actually saw action during the American Civil War. These were, as once again all Western fans will know, extremely fast firing weapons and indeed they fired nearly as fast in action as they are shown to fire on the screen! The difficulty was however, that the rounds were contained in a long tube under the muzzle, forced into a position beneath the breach by a long spring, and lifted up into the breach itself by the action of a lever. This meant that if one was to get enough rounds in to make such a complex mechanism worthwhile it was necessary to use an extremely short cartridge, which meant in effect oversized pistol ammunition having a relatively low velocity and short range, and indeed the *Spencer* and the *Winchester* were little more than overgrown pistols. The other major difficulty was the extreme fragility of such an action, which did suffer rather from hard usage, and although the private owner of such a rifle would be expected to look after it very carefully, the military user was generally less well trained and certainly a great deal less careful. As a result it suffered from the big disadvantage of not being "soldier proof". The final objection was the fact that with a long line of rounds ranged point-to-end in a confined tube, it was always possible for a violent impact to cause a magazine explosion with disastrous results to the handler. This weapon therefore, although effective and fast firing, was not terribly suitable for military use, although a Turkish army equipped with such under-lever action magazine weapons caused appalling casualties to its Russian opponents at the Battle of Plevna in the Russo-Turkish War.

However, it was not long before engineering techniques once more came up with a solution and this, the product of an increasingly sophisticated light engineering industry, was the bolt action rifle, a weapon in which bullets contained in rolled brass cases sealed by copper rims were forced up against the breach by a locking bolt action. Rapidity of fire was added by the simple addition of a cheap tin box magazine beneath the floor of the chamber and a "W" spring, which would force a new round into position each time the bolt was opened to eject the spent case of the previous round. In this way a combination of a simple bolt action and tin box magazine gave the armies what they had been looking for for some time, a cheap, robust, "soldier proof" magazine weapon. The British army were soon equipped with the *Lee-Enfield*; Germany with the *Mauser*; Austria with *Mannlicher*; and France with the *Lebel*. These weapons, sighted to a thousand yards, lethal at all ranges up to the maximum, with an extremely high velocity which could quite easily penetrate three bodies at short range, had a rate of fire of fifteen rounds a minute at the worst, and up to forty rounds a minute in the hands of well-trained troops. These of course were aimed rounds, rather than rounds pumped off at random. After its disastrous experience in the South African War the British army concentrated very heavily on the arts of musketry and fieldcraft or concealment, this latter art vastly helped by the invention of smokeless propellants. The Germans at Mons and Le Cateu thought that the British Expeditionary Force (BEF) was largely equipped with machine

guns because of the superb musketry of the troops who were feeding clips of five into the magazines of their weapons and firing in almost continuous drum fire. However, it should be remembered that the regular troops of the BEF were all professionals who had fired up to two thousand rounds each during their training, something which could not be equalled by the conscript Continental armies and which would not be equalled by their successors in the Citizen Armies that followed.

Let us then examine the implications of this change in weaponry. Infantry fire-power had been multiplied eight to twenty times, the range at which the weapons could be used effectively had been multiplied by a factor of twelve and the accuracy was so much greater that a class of weapons, that in a previous generation had not been sighted at all and were only fired in volleys at large formations, could now be used for sniping at individual parts of the body at ranges of over a quarter of a mile. To this progress in the military "longarm" could be added similar progress in the development of automatic weapons. Machine guns had been vastly improved, and the mechanical actions of the *Gatling* and *Gardner* guns (which were of course effective and extremely fast firing weapons but virtually pieces of field artillery compelled by their weight and bulk to be carried on field carriages), were replaced by gas or recoil operated water or air cooled weapons with rates of fire up to six hundred rounds a minute. The *Maxim* Gun for instance, was fully mobile and capable of being carried in a dismounted form by a team of half a dozen men with enough ammunition to keep firing for some minutes (and at usual rifle ranges). With a bonus of accuracy gained by mounting on a fixed tripod it could be used to devastating effect. The *Maxim*, which was adopted by the British army in 1891 and by the Germans in 1895, was frequently described as the concentrated essence of infantry. The *Maxim* patent was of course subsequently bought and the gun manufactured by the Vickers concern; the *Vickers* gun as it became known saw action in the British army continuously up to the early 1960's.

Field artillery made similar progress. Field guns were loaded at the breech, rifled, and the invention of the hydraulic recoil mechanism meant that the gun did not have to be re-laid, or rather re-aimed, after each round. In parallel with the military rifle, "made" metallic rounds were developed, that is, charges in which the projectile, the propellant and the primer were made up all in one piece rather like a large bullet. Field guns of this type could fire these projectiles up to four miles, with a rate of fire increased from two to thirty rounds per minute. This additional range had, of course, resulted in the development of such tactics as "indirect fire", in which guns would be fired at a reference point on a map which could not in fact be seen by the gun layers, with range corrections being given by an officer well forward of the guns, perhaps on the other side of a wood or a range of hills, telephoning back to his battery.

Technology could not only manufacture weapons of this nature but was capable of manufacturing them in extremely large numbers. With the development of such techniques as the mass production of interchangeable parts, the limit upon the size of armies imposed by the limits of manufacture in the early 19th Century were removed, and the vast, millions-strong conscript armies of the early 20th Century became a reality. Not only could these armies be equipped, they could also be transported and fed, initially by the use of railways and, in increasing numbers from 1910 onwards, motor lorries.

In 1914 as a result of what we have argued in earlier work were largely military and diplomatic miscalculations, a major European war broke out and for the first time large armies were called upon to employ these new devices in the field. Military thinking had not really adapted itself to the changed realities of the situation. Political and military leaders were forced abruptly to break away from patterns of thought geared mainly to the last major experience of European war and adapt to circumstances which had radically changed. They found that the massive growth of fire power had virtually abolished tactics. The only escape from this fire power was a hole in the ground and victories cannot be won from such holes.

All of the 1914/18 war was an attempt to escape from this dilemma. The first technique to be widely used was the use of massed artillery in which tremendous barrages were laid down not only by the type of field guns already described but by massive howitzers and siege weapons firing from well behind the lines. These colossal concentrations would lay down a carpet of fire often lasting for days on end, the barbed-wire entanglements in front of the field fortifications would be destroyed, the trenches themselves would be battered in and the defending troops killed. That at least was the theory. But in practice the barrage could never kill all of the defenders, sufficient of whom would always survive in their holes in the ground and deep dugouts to drag up machine guns and lay down a curtain of automatic fire that would kill the heavily laden assaulting infantry, who were themselves hampered by the crater zones caused by the barrage. Such a weight of explosive could hardly fail to reduce a battle field, that was already (in the case of northern France) not very well drained, to a morass of muddy shell holes. Even if they did manage to capture the forward trenches the absence of vehicles with cross-country capacity meant that the problem of reinforcing the assault over shell torn ground required roads to be constructed before largely horse drawn transport could bring forward supplies. As a consequence the difficulties of attack were much greater than the problems of defence as defending forces were able to use undamaged railway lines to bring up their supplies and reinforcements and then to pass them forward over relatively undamaged roads. The defence therefore always had an enormous advantage over the attacking side.

Perhaps a classic example of such an artillery killing match was the Battle of Verdun, in which the German Commander Von Falkenhayn decided, quite deliberately, to pick a spot which he thought the French would be psychologically compelled to defend, and use it as an opportunity to destroy the opposing infantry with heavy guns. Verdun had in fact very little intrinsic military value as it was an outdated frontier fortress and the railway lines leading to it were already cut by the St Mihiel Salient. The French would therefore be compelled to bring all reinforcements and supplies to the garrison along a congested single track road, and it would certainly have never been of any use as a jumping off place for an assault. The German reasoning was however correct, the French felt it necessary to defend the position and a large part of the French army passed through the Verdun "sausage grinder" and was severely mauled in the process. To give one an example of the intensity of the German barrage, two million shells were fired on 21 February alone. During this campaign French losses ran as high as 315,000 dead although one doubts whether they had any very clear idea of the total of the losses at the time. The German army however, fell into its own trap. It began to believe in the value of Verdun and as a result started to feed-in infantry which in turn had to face up to French artillery fire and hence ultimately the German losses of 281,000 dead were not much smaller than those of the French.

The next solution to the problem of how a man could survive on a modern battlefield, other than in a hole in the ground, was to enable him to take the hole in the ground with him. That is to provide the infantry, the attacking forces, with a mechanically propelled shell of three eighths of an inch of armour-plate. This resulted in the invention of the armoured fighting vehicle or "tank" as it became known. These were used in "penny packets" from the early part of September 1916 onwards, first seeing action at the Battle of Flers Courcellete at the close of the Somme campaign, and were invariably used in the initial stages on grossly unsuitable ground.

If one considers that these vehicles weighed twenty-eight tons, were driven by an engine that only developed 105 horse-power and were only protected by ten millimetres of armour one can see how relatively under-powered and thinly skinned they were. With a maximum speed of 3·7mph and a height of 8ft 2in they were extremely vulnerable to artillery fire. They were armed with either two six-pounder naval guns or four machine guns and required a crew of four merely to drive them, one driver

to operate the primary gear-box and to accelerate and decelerate and two gearsmen to change gear on a left and right track to provide a means of changing direction. All these were guided by an officer or NCO with his head in a slightly elevated box turret with a rather better vision than the rest. The maximum range of this vehicle on good going was twenty-three miles. In the kind of mud in which they frequently operated a speed of one mile an hour in low gear cut the range to something less than twelve miles.

It was not until the Battle of Cambrai on 20 November 1917, when 415 improved Mark IV tanks were used, without artillery preparation, over good ground that armour made a significant contribution. Even the Mark IV tank with its twelve millimetres of armour and improved range was a barely adequate weapon for the purpose; slow, vulnerable, exhausting for the crews with a very limited range (seventy gallons of fuel at one mile a gallon gave a radius of action on good going of thirty miles), interior temperature with an unprotected engine that frequently exceeded 100°F and almost total vulnerability to close-range field artillery. It was therefore far from being the devastating, overwhelming weapon that it has become on the pages of some fiction.

Tanks of course, continued to improve and by the Battle of Amiens, on 7 and 8 August 1918, 604 tanks were involved all of which were the Mark V. This tank, although it looked rather similar externally, required only one driver without the gearsmen, was driven by a 150 horse-power engine and with a weight of twenty-nine tons and a speed of 5mph was beginning to show a great deal more potential. The massed weight of nine tank battalions (324 fighting tanks leading two light battalions of "Whippet" tanks, which were to exploit the gap, 124 supply tanks to support the assault and twenty-two gun-carrying tanks bearing artillery, all supported by armoured cars with special reduction gearing to cross the crater zone), comprised an assault force which began in embryo form to resemble the Blitzkrieg, the devastating torrent of armour that subsequently smashed the Allied Armies in 1940.

Before Amiens the defence was still able to reinforce faster than the attack could develop as the cavalry, the only mobile arm available to the allied armies at that time, were unable to exploit any sort of breakthrough made by the armour in the face of even a residue of wire and machine-guns. Hence in the absence of lorried infantry carried in protected cross-country supply vehicles the problems of supporting the attacking forces was almost insoluble.

From Amiens onwards not only was this problem largely solved but lack of man-power forced the German armies to shorten their front as the process of "attrition" continually sapped their ability to continue to fight. The emergence of armoured warfare in mid-1918 presaged the type of campaign that overwhelmed the Anglo-French armies of 1940 but came far too late to radically affect the conduct of the Great War

Nor can this lateness be seriously attributed to military blindness but rather to the inherent difficulty of developing an entirely new branch of weapons technology. Before this technology emerged, the opposing commanders were deprived of any viable tactical solution to the problems of forcing a rapid decision and hence what resulted was a war of attrition between two blocks of major powers matching population and resources. It only ended with the collapse from exhaustion of three of these powers, Russia, Austria-Hungary and Germany.

One can see therefore that the popular image of a "golden age and a lost generation" destroyed by evil politicians and inept commanders is hard to sustain.

Many of the Generals were unimaginative to a fault but not even the most brilliant could break out of the constrictions imposed by the state of the art and this in turn was laid down by the limitations of contemporary industrial techniques.

* * * * *

The Jubilee Review at Sennelager—7 July 1977

BRIGADIER J P GROOM CBE, F I PLANT E, MBIM
MAJOR P H LEDGLEY RE, AMBIM, M INST PS
COLONEL R JUKES-HUGHES MBE, C ENG, FICE, MIHE
COLONEL D H BOWEN OBE

FOREWORD BY BRIGADIER J P GROOM CBE—CCRE 1ST BRITISH CORPS

My predecessor, Brigadier Mike Matthews, will not think it impolite if I write that when he handed over to me in December 1976 I was left with the impression of little to do but to prepare for the Jubilee Review. It was only after he had left that I discovered a very full diary—albeit dominated by "all the sevens"—7.7.77. He had by that time lived with the preparations for the Review for twelve months and much credit for the concept and success of the Engineer plan must go to him.

This account of the eighteen months of Sapper involvement is told by those who were most closely concerned. Major Peter Ledgley begins the story and it is right that he should since it was he who, as the AQ Staff Officer in HQRE 1st British Corps, bore the brunt of the planning and organization of the first year's activity. The story is then taken up by Colonel Robin Jukes-Hughes who took over from Colonel Alan Steel not only as CRE 2 Armoured Division but also as coordinator of the spectator and march past aspects of the Review Ground. Finally Colonel Hank Bowen, who as CRE 4th Division was responsible for the Parade Ground and for Sapper participation in the Parade and Static Display, tells of those events.

So without more ado let them tell you of the preparations for Her Majesty The Queen's Silver Jubilee Review and of a day which has been described as the most memorable in the post-war history of the Army.

Part I—Introduction, Background, Early Planning and Phase I Construction

MAJOR P H LEDGLEY RE, AMBIM, M Inst PS

It all started on 16 December 1975. On that afternoon Brigadier Richardson, the Deputy Adjutant General HQ BAOR, chaired the first of what were to be many planning meetings to discuss the requirements for HM's Jubilee Review which would be held at Sennelager on 7 July 1977. It was a bitterly cold day, the ground was frozen and the light was fading fast when the meeting adjourned to view the parade site and under such circumstances it was difficult to envisage the splendour of a summer day some eighteen months away!

Thus started the engineer planning for the Review which initially fell into two distinct parts and to which a third was to be added subsequently. These were:

(a) The preparation of a Review area to take a restructured armoured division on parade; provide a surface of sufficient robustness for it to drive-past four abreast; spectator accommodation for at least 20,000 people; an area suitable for lunch facilities for 20,000, and provide an area for a Royal "Walk-about"

(b) Providing the Royal Engineer participation in the Review and, subsequently

(c) Organizing the Royal Engineer static display.

In early 1976 initial recces were carried out by OC 65 Corps Support Squadron (Major C D Wareham RE) and OC 256 Mobile Civilian Plant Group (Major G W Jarvis RE) to consider the requirements and to identify the problems involved in meeting them. As a result of their initial report, a full engineer study was ordered on 18 February 1976 by the Chief Engineer BAOR (Major General E M Mackay, CBE) requiring an interim report by 16 March and a detailed report by 30 March.

Time was therefore of the essence and a planning team under Major Wareham, consisting of a cross section of individuals each of differing skills and fields of expertise was quickly assembled. The Terms of Reference for this report required, amongst other matters, advice on the maximum numbers of:

(a) Spectators that could be seated

(b) Spectators that could be accommodated in standing enclosures

(c) VIP cars that could be parked

supported by designs for all works, a detailed Engineer plan and an outline Administrative Plan for the deployment of works units.

The report analysed three options;

(a) *One*: The simplest solution from the engineer point of view but which would only accommodate 3,000 spectators seated and 12,000 standing.

(b) *Two*: The provision of seating for 25,000 spectators.

(c) *Three*: The provision of seating for 30,000 spectators but with a disproportionate increase in the engineer effort required to achieve it.

It also detailed the severe constraints imposed on engineers by selecting the Windmill site on the Sennelager Range area as the venue for this Review because of the exceptionally heavy task of EOD clearance required before work could start on a site which had been a range impact area for over one hundred years. This fact also meant that work could only take place whilst there was no firing in progress and therefore effectively reduced the time available for work to range maintenance periods, weekends and public holidays!

Approval to Option Two was given by HQ BAOR on 7 April 1976, the CRE 2 Division appointed Chief Engineer, and the project mounting team started on 17 April to implement the plan. This involved the large-scale earthworks necessary to clear the site, prepare the spectator bunds and the whole of the administrative area. Work started on site on 23 April with the deployment of EOD clearance teams provided by all arms and supervised by a management team from 33 Engineer Regiment (EOD). At the same time, surveyors from 14 Field Survey Squadron started setting out the works sites, the quarry opened and stockpiling of material began. Plant was deployed to the site during the weekend of 30 April 1976 with operators drawn from all units in BAOR and placed under the overall command of 44 Field Support Squadron (Major R J Hume RE). This was the pattern for each subsequent weekend until the Phase I programme of earthworks was completed on 17 July 1976 when access was given to PSA for the ground to be seeded. To illustrate the extent of these works the statistics show that an average workforce of eighty men per day were engaged on site, rising to 125 during the peak period of EOD clearance. Eighty-two assorted vehicles, items of Engineer construction plant and motorized equipments were used consuming 66,860 litres of diesel and 9,235 litres of petrol in the process. Some 150,000 cubic metres of topsoil, sand and stone were moved in this phase.

In September 1976 a one week closure of the range was authorized so that a reinforced concrete tank turning pad could be laid down at the junction of the review area and the drive-past route. This was constructed to a PSA specification by 37 Field Squadron (Major R J Carr RE) supported by elements of 44 Field Support Squadron. Opportunity was also taken during this period for 256 Mobile Civilian Plant Group to patch repair the existing tar macadam surface of the drive-past route and for 44 Field Support Squadron to excavate an additional 2m wide strip for the length of this runway to enable the review vehicles to drive by four abreast. Further work to prepare this extension for surfacing was carried out by 45 Field Support Squadron (Major R J Meston RE) during weekends in November and December with the constant threat of adverse weather hanging over them. With these tasks completed, and the grass seen to be growing, the scene was set for the second phase which would start in March 1977, and for which the responsibilities became:

(a) Preparation and construction of the spectator and administrative area—CRE 2 Armoured Division

(b) The engineer contingent for the parade, organization of the engineer commitment to the static display and preparation of the parade area—CRE 4th Division.

Part II—Construction of the Site

COLONEL R JUKES-HUGHES MBE, CEng, FICE, MIHE

THE first six months of 1977 for many of us in the British Army of the Rhine were

Photo 1. The Review Area—Before and After.

The Jubilee Review at Sennelager (1)

dominated by the Jubilee Review. Seldom can so much work have gone into the planning of a single day. An astonishing number of officers at every level of command seemed to be involved in it; conferences noted more for their size and length than their decision-making came and went several times weekly; and the file in HQRE 2nd Armoured Division ran into four thick volumes. The Commander-in-Chief was reported as saying that the planning of the Jubilee Review had consumed more paper than that of the Normandy landings—apochryphal perhaps, but one could well believe it. Whether it was because of, or in spite of, all this planning that the day was such a resounding success is difficult to say, but a success it undoubtedly was.

At least on the engineer side the chain of command was clear. Both GOC 2nd Armoured Division and CCRE 1st British Corps had issued directives making the CRE firmly responsible for the construction of the site, and he in turn had passed on this responsibility to the Project Officer, Major J F Johnson RE (OC 65 Corps Support Squadron) made available by the CCRE, and his Site Commander Major D Judson RE made available with his Squadron by CRE 4th Division. The division of responsibilities was simple and it worked well. The Project Officer was responsible for consultant functions including the coordination of all the off-site work, and the Site Commander was responsible for all work on site. The CRE's main function, apart from attending the interminable conferences, was to agree the requirement with the many agencies involved and to prevent it being changed unnecessarily.

The major part of the site construction was carried out by 5 and 25 Field Squadrons of 26 Engineer Regiment, with plant support provided by the Plant Troop of 44 Field Support Squadron, and resources support by the Stores Troop (Rear) of 65 Corps Support Squadron who were conveniently based at Sennelager. The first three squadrons came from 4th Division because 2nd Armoured Division Engineers were at that time training for a tour in Belfast. The project was supported by almost every engineer support unit in Germany, and units of other arms from 2nd Armoured Division assisted with labour on site. A list of all units who were involved in the project is at Annex "A". All Phase II site construction was carried out in 1977 during the two range closure periods 12–27 March and 18 June–17 July, and during the intervening weekends. 25 Field Squadron and 44 Field Support Squadron were working for 4th Division for most of the second range closure period.

DESIGN

The overall design was based on the Engineer Report produced by Major C D Wareham in 1976 and the finished project varied little in overall concept from the original plan. Inevitably the requirement for engineer work grew constantly throughout the construction period resulting in new designs being produced for many feature of the projects, and new stores lists prepared. All the subsequent design work was done by the Project Officer, with the exception of the designs of the Royal Box and the water and electrical distribution systems which were done by 522 Specialist Team Royal Engineers.

PLANNING

The project was planned by the CRE in consultation with the Project Officer and Site Commander. The plan was deliberately kept flexible, because it was fairly obvious from the start that there were likely to be considerable changes and additions imposed as the project progressed. Broadly speaking, it was planned to resurface the runway, plant the 3400 uprights for the bench seating and bury the water distribution mains during the first range closure period; prepare access roads and lay the Class 30 trackway on all roads in the tented areas during the intervening weekends 6 May to 12 June, and complete the remaining work including the erection of all stands and towers during the final range closure period. There were many other activities taking place on site during the final period, and a works study was commissioned in an attempt to reduce the chaos. In the event site construction was well ahead of the planning schedule throughout, which enabled the expected additional requirements to be met without too much difficulty.

RESOURCES

As is so often the case, the resources organisation was to prove the key to the whole project. The Sennelager Park of 65 Corps Support Squadron, commanded by WOI K Robinson RE, was tasked with providing resources support and all stores requests were channelled through it. This was a departure from its normal reserve park role, so it was necessary to open a special project account and to form a cell of military storemen to enable support to be given seven days a week. All stores requests were handled through one resources representative on site, and this ensured that demands were properly collated at unit level, that working parties and transport were properly organized and that all stores leaving the depot were signed for. The Sennelager Park, splendidly backed by 303 and 305 (Army) Engineer Parks and the Command Pool of Training Stores, worked unceasingly to meet every demand and earned the unstinting praise of everyone involved in the project. A total of 1286·85 tons of engineer stores were handled by the park and incorporated into the project.

CONSTRUCTION—PHASE II

Our chief concern in Phase II was that the weather would be sufficiently good to permit the resurfacing of the 700m × 26m runway area. The design for this, a single 26mm course of high density asphalt, was done by 256 MCPG and approved by the Area Works Office of the Property Service Agency in Bielefeld, but was finally the subject of some last minute Ministerial scrutiny in London. In the event the weather was mild and reasonably dry throughout the range closure period, and the resurfacing was completed on schedule to a very satisfactory standard. Fears that the surface might subsequently be damaged by the tracked vehicles during the rehearsals proved to be totally unfounded.

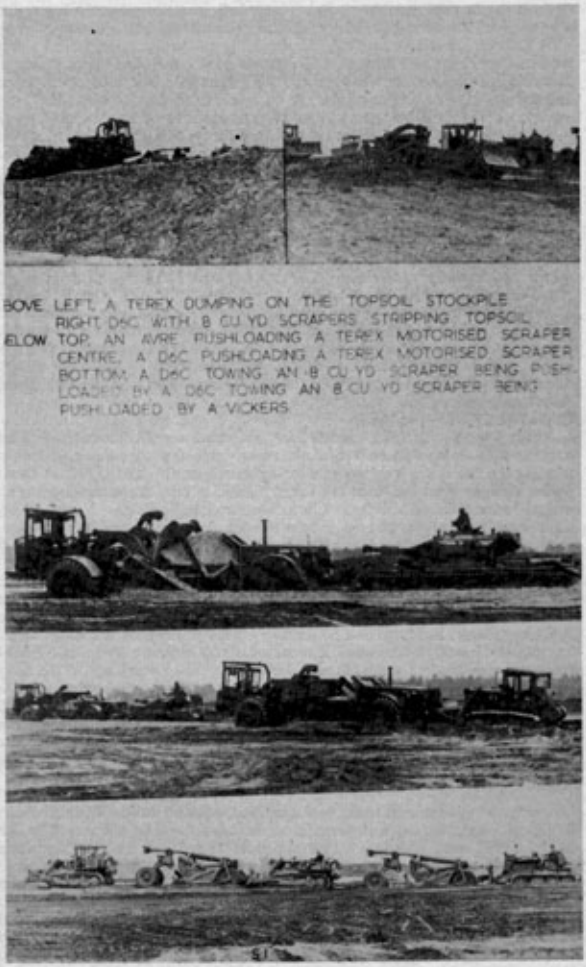
CONSTRUCTION—PHASE III

The two other main tasks scheduled for this period were both accomplished on schedule with the help of mechanical aids: four mechanical augers being hired for planting the one metre long uprights for the bench seating, and a 10 inch Davis bucket trencher borrowed from the Royal Signals to bury the water distribution mains which totalled some 170m of 4 inch diameter victaulic piping. The two Braithwaite water storage tanks and towers were almost complete at the end of the period, and a start had been made on laying the Class 30 trackway behind the Windmill Bund and on constructing the two Bailey press towers.

The weather continued to hold during the weekends between the two range closure periods, and excellent progress was made. The press towers, each 30 feet long cantilevered out to 50 feet on the top storey, were completed, as were the Braithwaite tanks and the Class 30 trackway roads throughout the tented areas. 242 rolls of Class 30 trackway and 30 rolls of Class 60 trackway, a total of 7·9km of trackway, were laid by the end of the project—surely the longest length of trackway laid since the end of World War II! Among the other jobs completed during this period were another EWBB tower for control purposes, the bases for some 400 flagpoles, MERO stands for 640 VVIPs and VIPs, and complete stands for 1680 less important persons. A start was made on decking down the bench seating for some 25,000 spectators which was done in Bailey chesses or 9 × 3in timber covered in polythene, and on constructing the eighteen blocks of toilets.

CONSTRUCTION—PHASE IV

Top priority at the start of the final construction period was the EOD clearance of critical areas of the site, including the car parks and the route to be taken by Her Majesty. This work was done by a troop from 73 Independent Field Squadron supervised by a team from 33 Engineer Regiment (EOD), and among the live rounds found and destroyed were a World War II German 150mm shell and four 105mm shells. As soon as the Royal Enclosure was cleared, in came 40 Army Support Regiment to erect the Royal Box. This magnificent structure had been prefabricated in the Regiment's Workshops in Willich and painted in a hideous mottled pink and turquoise combination specified by a colour consultant and later thankfully amended to a more reasonable colour on the order of the Commander-in-Chief. The finished



BOVE LEFT, A TEREX DUMPING ON THE TOPSOIL STOCKPILE
RIGHT, D6C WITH 8 CU YD SCRAPERS STRIPPING TOPSOIL
ELOW TOP, AN AVRE PUSHLOADING A TEREX MOTORISED SCRAPER
CENTRE, A D6C PUSHLOADING A TEREX MOTORISED SCRAPER
BOTTOM, A D6C TOWING AN 8 CU YD SCRAPER BEING PUSH-
LOADED BY A D6C TOWING AN 8 CU YD SCRAPER BEING
PUSHLOADED BY A VICKERS

The Jubilee Review at Sennelager (2)

ROLLING THE LOPSTONE RUNWAY EXTENSION WITH A 4 - TON WINGATE VIBRATING ROLLER.

ROLLING THE LOPSTONE RUNWAY EXTENSION WITH A 6/8 TON STOTHERT AND PITT VIBRATING ROLLER AND GRADING THE TOPSOILED BAND AREA.

FINAL TOPSOIL LAY AND SPREAD BEHIND THE MAIN BUND.

THE CONICAL BASE TO THE WINDMILL BEING RAKED BY 420 MCLG

THE MAIN BUND AREA AND ROYAL BOX AREA AWAITING FINAL RAKING.

The Jubilee Review at Sennelager

structure was a credit to all those concerned in its manufacture.

Meanwhile a mass of other jobs were in progress all round the site—intermingled with 4th Division's rehearsals of vehicles, bands and Colour Parties. A total length of 1½ miles of marquees were surveyed in by 5 Field Squadron and erected by the Royal Scots in only three days—surely another post war record! Next came the Corps Lighting Troop to provide electricity to each marquee. They had to scour BAOR to find the 24 No 27·5 kVA generators and 58,000 feet of 40 amp cable required, so this could well have been another first in the field of lighting. Water supply branches and stand pipes were also supplied to each marquee, and this caused the only problem of the project. The 1 inch diameter black PVC piping proved too hard to join by normal methods, and almost every joint leaked when the water was first turned on. After trying various methods, the problem was eventually solved by sleeving the joints externally with soft plastic tubing and tightening it down on both sides of the joint with "jubilee" clips.

The major plant jobs at this stage were the preparation of the two car parks for a total of 4,800 cars, and the improvement of some of the access routes coming into the area. This involved Plant Troop of 44 Field Support Squadron in a lot of work in addition to their main task of maintaining the Parade route and practice area. Signs both for the access routes and within the site, of which some 500 were made by 45 Field Support Squadron, were being erected by various units at this time. Many other jobs were going on at the same time: the construction of four bandstands and four loudspeaker towers for the PA system; painting and erecting the flagpoles, erecting four commentary boxes, made at short notice by 44 Field Support Squadron, on top of the Press towers; erecting fencing etc. Finally, a week before the event it was decided to erect another 8½ bays of MERO grandstands on the West Bund to enable some of the spectators to get a better view. This was obtained overnight by our resources organization, and erected in less than two days.

And so the great and glorious day came and went.

5 Field Squadron supported by 100 infantrymen and fleets of RCT 10 Tonners dismantled and cleared the site within a week, and cleaned and handed in the stores a week later. Peace returned to Sennelager and only the resources organisation were left to clear the account and return the stores to their rightful owners.

Part III—The Parade and Static Display

COLONEL D H BOWEN OBE

By February 1977 the basic plan for the engineer involvement in the parade and the afternoon display had been formulated as being:

(a) *The Parade.* 35 Engr Regt would be on parade with elements of 28 Amph Engr Regt, 26 and 31 Armd Engr Sqns and a Combat Engineer Tractor (CET) borrowed for the occasion from Chatham. The CRE would be on parade as part of Divisional HQ mounted in APCs at the head of the parade.

(b) *The afternoon display.* Displays showing the Sappers in the "Way Ahead" and comparison with "old and new" in an attempt to achieve an equivalent span to the twenty five years reign of Her Majesty were required from:

(1) 35 *Engr Regt.* Responsible for stage managing the display.

(a) 29 *Fd Sqn.* A bridging display with:

EWBB to be built by 73 *Indep Fd Sqn*

MGB to be built by 29 *Fd Sqn*

AVLB to be laid by 31 *Armd Engr Sqn*

M2 Rig (operated) by 28 *Amph Engr Regt*

(b) 37 *Fd Sqn.* Demonstrating barminelayer behind an APC.

(2) 256 *MCPG.* A static plant display.

(3) 1 (*BR*) *Corps PCCU.* A postal display selling the First Day Cover of the event.

(4) 26/31 *Armd Engr Sqn.* As well as the AVLB in the bridging display an

AVLB and AVRE on static display.

(5) 40 *Army Sp Regt*. A mobile field workshop, to produce a commemorative plaque by casting it on the day.

(6) 14 *Topo Sqn*. A survey display.

(7) 28 *Amph Engr Regt*. A diving display and an M2 rig on static display.

(8) 45 *Fd Sp Sqn*. Boer War steam traction engine to contrast with the Combat Engineer Tractor.

(9) 24 *Fd Sqn* (*RSME*) Static display of Combat Engineer Tractor.

About this time it was made known that HM The Queen would be spending some seven minutes on the Royal Engineer Display which was indeed an honour since this constituted a third of the total time devoted to the static display. The programme was therefore adjusted to include:

(a) HM The Queen welcomed by CRE 4th Division (Colonel D H Bowen OBE)

(b) HM conducted into the postal display where she would see the new Cuneo painting and be presented with a Commemorative Cover by the "mouse" (see photo 4)

(c) HM would then move through Survey to the workshops of 40 Army Sp Regt where she would be presented with a commemorative plaque cast for the occasion.

(d) As HM emerged from the workshops the bridging display would finish thus enabling her to see comparisons of EWBB, MGB, AVLB and M2.

In early March the division of responsibilities for supporting the parade and the display was clarified. CRE 4 Division was to take on all work required to actually stage manage the parade and prepare the rehearsal ground while CRE 2 Armoured Division continued with the mammoth tasks concerned with the reception, seating, feeding and ablutions for 25,000 spectators. There were four main tasks that had to be tackled by 4th Division:

(a) An inspection route was to be made to enable Her Majesty to have a bump free ride in a Range Rover.

(b) A major problem was that of dust. A hardcore approach route was required for the run up to the turning pad, and a solution was required for the run off from the tarmac runway march past route.

(c) The rehearsal ground was to be laid out to approximately the same shape as the real ground which was to include a turning pad and a skeleton tower to represent the windmill.

(d) The parade ground and the rehearsal ground were to be accurately surveyed and pegs laid out to mark the position of every vehicle on parade.

44 Fd Sp Sqn were given the task of preparing the inspection route and the run up to the turning pad. The military plant foreman, S/Sgt Calow, proved once again that the impossible takes a little time but it can be done. Within the ten days of range closure during March he built what was initially a temporary airstrip 800 metres long and 40 metres wide of twelve inches deep lopstone and three inches of top dressing of hardcore. With the help of the maintenance detachment of the MCPG at Sennelager one and a half kilometres of heathland was scarified, rolled, raked and sown with grass seed. It provided, in time, an excellent Range Rover track.

25 Fd Sqn (Major P J P Daniell) with under command a detachment of the plant troop became responsible for the other two major tasks as well as any other tasks that arose for the direct support of 4th Division on Parade. A major task was the duplication of the real concrete turning pad, by use of the German metal "schnellbaustrasse" or man-handleable tank trackway. Over thirty 10 Tonner loads of this trackway was loaned by the German Sappers to the Jubilee committee and enabled a turning pad the exact size of the real concrete one to be constructed of this material at the Belle Alliance training area so that the whole parade and drive-past could be practised without going near the real ground. Later, some of the schnell-baustrasse was laid at the end of each exit point from the parade and prevented the hardcore side road from becoming badly rutted by slewing tanks.

The survey of the site and the positioning of the pegs was carried out by S/Sgt

Walton of 44 Fd Sp Sqn who had the doubtful pleasure of having under command eight Regimental Sergeant Majors, who were responsible for fixing the pegs. The system worked and there was no need, either on rehearsals, or on the parade for the parade to "Right Dress".

25 Fd Sqn's tasks were by no means over when all parade vehicles and display vehicles moved to Sennelager under a vast movement plan which tested the RCT and RMP as never before since the end of the war! It tested 5 Fd Sqn too in damage control as Chieftain tanks took up cobble stones on sections of the training area roads. Schnellbaustrasse and Class 60 trackway came into their own again!

A major problem remaining for the Dress Rehearsal and the Day itself was the damping down of dust, particularly on the exit from the runway, since the soil in the area is basically a sandy silt, which, when dry and churned up by tracked vehicles, creates clouds of black dust. Oiling was out of the question because the site is a water catchment area. With the help of the local German Fire Brigade the approaches to the concrete turning pad, HM the Queen's route and the 100 metre section of heath at the end of the runway (where the drive-past vehicles were to crash off at high speed), were watered from midday the day before the parade. It worked well enough although there was still an excess of dust mingled with exhaust fumes, but the bright sunny day also had a helpful wind. This slight breeze and the watering kept a problem which could have destroyed the day, down to acceptable limits.

The week 30 June–6 July saw many rehearsals on the practice ground, eventually ending up with very careful rehearsals on the real ground because once a tracked vehicle had damaged the smooth green sward of the Queen's drive-past inspection route or the massed bands march-past area, repair would have been impossible in the time left!!

THE DAY

The day, itself, was a resounding success. The weather was perfect and the weeks of preparation and practice proved themselves a hundred fold. 25,000 people saw the 4th Armoured Division drive onto parade in perfect formation thanks to the accurate surveying of the vehicle pegs and, after the pomp of the March-On of the Regimental Colours and the massed bands of some 800 musicians, came the arrival

Photo 2. Aerial View of 4th Armoured Division on Parade (taken during the Dress Rehearsal).

The Jubilee Review at Sennelager (2b)

of HM The Queen. Once her inspection of the Division, carried out in a Range Rover which drove over the specially prepared route, had been completed came the moment for the drive-off parade and onto the runway for the drive-past.

It was a magnificent spectacle as row after row of some 600 armoured vehicles of varying types swept down the runway from the concrete turning pad on which they had all turned from the parade ground, while overhead the Division's Helicopters flew past.

The engineer contingent made a most impressive sight, providing as it did the widest variety of equipment on parade. Led by CO 35 Engr Regt (Lieut Colonel F G Bevan RE) in his APC, this included AVLB, M2 Rigs, Ranger anti-personnel mine launchers mounted on APCs, Barminelayers as well as a contingent of plant headed by OC 44 Fd Sp Sqn (Major A J Sandiford RE) in the Combat Engineer Tractor.

"Almost miraculous" was the description used when, in the hour after the end of the drive past and before HM reappeared from lunch, the displays were set up in the area where the bands had paraded earlier. It was no mean achievement to move so much equipment and to have it set up in such a short time, but again, meticulous planning and practice paid off. We were disappointed when Her Majesty's visit was curtailed so that she only had three minutes with the sappers. However, she did manage the visit to the Postal Display where she was presented with the First Day Commemorative Cover which had been signed by Chief of the General Staff, General Sir Roland Gibbs, the Commander 1st British Corps, Lieut-General Sir Richard Worsley and the Parade Commander Major General Nigel Bagnall.

Conclusion

BRIGADIER J P GROOM CBE

THE Jubilee Review had been a big project, in which the units on site were supported

Photo 3. Her Majesty being presented with the First Day Cover by the "Cuneo Mouse". Looking on are Commander 1st British Corps, Lieut-General Sir Richard Worsley KCB OBE and CRE 4th Armoured Division, Colonel D H Bowen OBE.

The Jubilee Review at Sennelager (3)

Photo 4. The Static Bridging Display.

at one time or another by about every engineer unit in Germany, and on site by many soldiers of other arms. It was not a technically difficult project in any way, but its success was due to the enthusiasm and hard work of all those involved in it, and to the unfailing cooperation of the engineer support organization in meeting every demand made on it. The achievement was publicly acknowledged by the Commander-in-Chief BAOR General Sir Frank King, who, in his address to the parade on the dress rehearsal singled out the Sappers to praise them for the magnificent site they had constructed. Recognition of this achievement was confirmed when a total of forty-four Jubilee Medals were awarded to the Sappers out of the specific allocation for those who had participated in this great event.

The Jubilee Review at Sennelager (4)

ANNEX A

JUBILEE REVIEW PROJECT—UNITS INVOLVED

The following units were responsible for the main project work:

5 Field Squadron
25 Field Squadron
44 Field Support Squadron
65 Corps Support Squadron

The following were on Parade and/or the afternoon Display:

CRE and GSO3 RE as part of Divisional HQ
35 Engineer Regiment—29 Field Squadron
37 Field Squadron
42 Field Squadron
44 Field Support Squadron
One troop of 28 Amphibious Engineer Regiment
A composite AVLB troop from 26 and 31 Armoured Engineer Squadrons
One CET from 24 Field Squadron
4th Division Field Post Office
Detachments from: 14 Field Survey Squadron (Taciprint)
40 Army Support Regiment (Mobile Foundry)
73 Independent Field Squadron (Bridging)
45 Field Support Squadron (Steam Tractor)

The following engineer units supported the project:

26 Engineer Regiment—Support to 5 and 25 Field Squadrons
33 Engineer Regiment (EOD)—EOD Supervision
40 Army Support Regiment—Construction of Royal Box and steps, provision of Engineer Stores, manufacture of plumbing specials
2 Field Support Squadron—General support to 5 and 26 Field Squadrons
43 Field Support Squadron—Sawing 3400 bench seating uprights, manufacturing Bandmaster's rostrum
44 Field Support Squadron—Manufacture of four commentary boxes, trellis fencing for Royal walk-about, manufacture of some signs
45 Field Support Squadron—Manufacture of over 500 signs, modification of Portakabin, emplacement of base course to runway extension to adjusted levels
65 Corps Support Squadron—Manufacture of 400 flagpoles and various small items
73 Independent Field Squadron—EOD clearance
256 MCPG—Asphalting runway
522 Specialist Team RE—Design work
Corps Lighting Troop—Power and lighting
Command Pool of Training Stores—Provision of Engineer Stores
1st British Corps PCCU—Provision of FPO, preparation of Commemorative Covers and selling booths

The following units of "Other Arms" assisted the engineer project on site:

All Phases
54 Squadron RCT (Cl 30 Trackway vehicles and tippers)
Phase II
40 Field Regiment RA
1st Battalion Irish Guards
1st Battalion Devon and Dorset Regiment
Phase IV
1st Battalion Irish Guards
1st Battalion Argyll and Sutherland Highlanders
1st Battalion Royal Scots

* * * * *

Intermediate and Appropriate Technologies

DEREK MILES B Sc, C Eng, MICE, MBIM

Derek Miles, a Chartered Civil Engineer and Member of the British Institute of Management, is a Senior Technical Adviser to the Intermediate Technology Development Group Ltd. He has carried out numerous consultancy assignments on their behalf in Africa, the Middle East and Asia for foreign governments, the World Bank and other international agencies.

IT is not surprising that the discussion on future trends at the Centenary Meeting of the Institution of Royal Engineers turned to the need for "intermediate technologies" as a means to help emerging nations to help themselves. Developing countries are increasingly coming to realise that decisions on the choice of level of technology are crucial to their hopes for steady economic and social development. Indeed, it may be that the military engineer is better placed than the civilian engineer to appreciate that technology should fit local social and environmental needs, as well as being broadly competitive in the economic sense. The single-discipline training and lack of opportunity for inter-disciplinary project work, followed by rapid and narrowing specialization, too often results in civil engineers with a tendency to believe that all problems must be solved by applying only known and conventional technologies.

If the first hurdle is the recognition that there is a real choice to be made, the second in many cases is the difficulty in making a rational choice. The Intermediate Technology Development Group (ITDG) has found that there is a vast "knowledge gap" which makes a rational choice between technologies very difficult. On the one hand the labour-saving, capital-intensive, highly sophisticated technologies, suitable for large-scale production in rich markets (and commonly used in the rich countries), are very well documented, easily accessible and usually pushed by the well-trained sales forces of large companies. But technologies applicable on a small scale by (or in) communities with plenty of labour and little capital, lacking technical and organizational sophistication are, on the whole, poorly documented, difficult to get hold of, and in many cases even non-existent.

It is not suggested that in every developing country faced with the choice of technology the right answer will always lie in seeking out the most labour-intensive solution. There are clearly examples which can be cited where an advanced capital-intensive technology best meets local needs by utilizing some locally available waste product or stimulating employment in other fields. What is suggested, however, is that there is a tendency for decision makers to be attracted by the glamour of a modern or advanced capital-intensive solution and to close their minds to simpler answers which would cost less and benefit more of the local people.

A decade of systematic work to fill the knowledge gap in the development effort has taught the ITDG that valuable know-how, as well as excellent equipment, fitting into the constraints and limitations of poverty and suitable for genuine development, exists all over the world. But it is often ignored because it is scattered, hidden and often very poorly documented as much as because it fails to meet the distorted criteria of conventional financial analysis. It is because different levels of technology are suited to different environments and locations, that the search should be in each case for a level of technology that is *appropriate* and indeed the Quarterly Journal of ITDG is entitled *Appropriate Technology*.

Writing in the first issue of *Appropriate Technology* the then Chairman of ITDG, the late Dr E F Schumacher, commented:

"Many people and their respective organizations have relatively easy access to the technologies and equipment of the affluent societies, but they find that much of this

does not fit in conditions of poverty; it pre-supposes the availability of ample capital resources; it depends on the existence of an elaborate infrastructure; it fits into big cities where markets are large, but not into towns and villages where markets are small because most of the people are very poor. So they are forced to look for *appropriate technologies*, for the know-how and equipment, *designed to help the poor help themselves.*"

In general it can be said that a technology should be judged as to its appropriateness according to the way it changes people's lives. A capital-intensive large-scale project will increase productivity per worker dramatically and consequently allow high wages and a good standard of living for those who are lucky enough to receive employment. But it increases the massive divide between the "employed haves" and the "unemployed have nots". The latter can only look on and hope.

One practical example of the application of intermediate technology is a small scale brickwords constructed in 1973 at Asokwa, Ghana (a small village 60km south of Kumasi), and still working satisfactorily. It produces about 10,000 bricks a week and cost about $20,000 (representing about $800 per work place). Besides the employment generation, the small-scale plant had four major advantages:

(1) The import component of the capital cost was 10 per cent compared to 70 per cent for a conventional factory
(2) The bricks are air-dried after shaping and the kiln burns local firewood. The only imported energy required is for a small 10hp diesel engine to drive the clay mixer. Thus oil consumption is 10 tons/million bricks compared to 150 tons for the conventional kiln alone (which would also absorb a good deal of electrical power)
(3) Training costs were cut, since all the necessary skills were learned by local villagers after only eight weeks' training
(4) Maintenance costs were cut, and the machinery was so simple that local car-mechanics were able to cope with most mechanical breakdowns.

Following the success at Asokwa three further brickworks have been brought into operation, the latter two without any outside assistance. An appropriate technology should have the capacity to be disseminated indigenously once it has taken root.

The optimum balance between various levels of technology cannot be defined according to some kind of universal law. It will vary from country to country, and the balance of advantage may also vary considerably between different regions of a single country. Many countries are handicapped in the free choice between levels of technology by the fact that "packaged" information and glossy brochures on high technology equipment are readily available simply because the high sales price of the product makes the effort and expense of producing promotional literature financially worthwhile. Cheaper equipment, although probably more appropriate, is less easy to find and evaluate because the manufacturer or distributor cannot afford such an expensive sales effort. Thus one of the difficulties in putting appropriate techniques into practice is the difficulty in finding out about, and acquiring small and intermediate scale plant, equipment and tools. The small market for them tends to inhibit local manufacture and is also insufficient to stimulate an international sales effort.

To meet this need, the ITDG Ltd set up a wholly-owned subsidiary, Development Techniques (DT) Ltd, to identify specific requirements and match them with specialist supplies. The specific services which it provides are:

(1) Design, development and production of plant, equipment and tools
(2) Selection, purchasing and shipping services
(3) Specialised services for the selection and application of alternative technologies and small industrial operations.

One example is the manufacture of shoes, where it is a major step for the small enterprise to convert its hand manufacture stage by stage up to a basic mechanized production of say 200 pairs a day. Attempts to increase production by injecting high

cost equipment usually fail as a result of the inevitable manufacturing and marketing problems created by a sudden jump in production and break-even points. What is needed is the gradual introduction of mechanical equipment in a way that allows manufacturing and marketing techniques to evolve in pace with productive capacity. DT Ltd undertook a special study of the needs of the small scale shoe industry and a range of low-cost, easily operable equipment was developed which minimized training and maintenance needs. The two-machine "lasting" system brought mechanization without power to the hand operations of "pulling over" and "lasting" with a four-fold increase in productivity. Non-powered equipment for sole and heel attaching is now available, and can be complemented by motor driven "skiving", "splitting", "roughing and scouring" and "finishing" machines. A simple and reliable double-thread lock-stitch sole sewing machine is in particular demand. This range of equipment can be gradually introduced on a phased basis to allow steady expansion of the small enterprise.

Other examples of equipment made available by DT Ltd for specialized small-scale manufacturing purposes are tinplate can-making plant, paper making machines, button making machines and a paper pulp moulding system.

Of interest in the building materials field is a transportable brickmaking kit. This enables a team of four men to produce dry, handmoulded bricks at an output rate of about 5,000 a week from typical clay, working inside any type of small building with a reasonably flat floor. It consists of hand tools for clay digging and breaking, a wheelbarrow for transporting clay and sand, two special brick moulds and bow cutters, a work table and a special hand truck with associated equipment for transporting wet bricks, dry bricks and process water for the plant. The full set of equipment will fit inside a standard Landrover, and is supplied with a fully illustrated booklet describing the necessary skills to form the bricks and build and fire a clamp kiln to burn the dried bricks.

In addition to the direct provision of appropriate plant and equipment, ITDG has a further subsidiary which provides consultancy services in a wide range of industrial and other fields. Intermediate Technology Services (ITS) Ltd is able to offer an inter-disciplinary service as well as advice on specialist projects and topics.

The ITDG Industrial Liaison Unit answers a wide variety of requests for specific information on small-scale manufacturing techniques and enquiries are now running at a rate in the range of 500 a year. In a recent month alone, these ranged from a simple mechanical maize pounder for Malawi to advice on extracting ascorbic acid from pineapple juice in India and animal feed production in Peru.

Although the concept of intermediate and appropriate technologies is essentially a simple one, their application demands good organization and co-operation between various ministries and institutions. The process of carrying intermediate technologies from the research stage to the commercial production and marketing stage requires numerous linkages, for example between research organizations, marketing organizations and firms in various countries. Links are also needed between all of these and the users of intermediate technologies, especially organizations directly servicing the needs of the rural poor. A further point is that a considerable time, sometimes up to ten years, may elapse between identifying a problem, or conceiving an idea, and providing the solution. Links are more difficult to establish for intermediate technologies than for more sophisticated products largely because of unfamiliarity and greater risks. It is therefore encouraging that the World Bank and United Nations agencies have acknowledged the importance of intermediate technologies as a concept which they should encourage in their programmes and projects. Examples are seminars organized for its own staff by the World Bank, the application of intermediate technologies in the International Labour Organization (ILO) World Employment Programme and a variety of seminars and workshops supported by United Nations Industrial Development Organization (UNIDO).

To quote again from the late Dr E F Schumacher:

"The crucial task of this decade is to make the development effort appropriate and thereby more effective, so that it will reach down to the heartland of world poverty, to two million villages. If the disintegration of rural life continues, there is no way out—no matter how much money is being spent. But if the rural people of the developing countries are helped to help themselves, I have no doubt that a genuine development will ensue, without vast shanty towns and misery belts around every big city and without the cruel frustrations of bloody revolution. The task is formidable indeed, but the resources that are waiting to be mobilized are also formidable."

Ubique

OR WHY THE SAPPERS DO NOT CARRY COLOURS

CAPTAIN CHARLES STONE (RETD)

This amusing article was published in June 1977 edition of the Royal Australian Engineer magazine "The Sapper" and we are grateful for the permission of both the Editor and Author to republish.

WHEN the Duke of ——, a son of Queen Victoria, was undergoing training as a Sapper officer he had occasion to visit what is now known as a wine bar with some of his fellow officers. Whilst imbibing the fruit of the vine they were accosted by some infantry officers who, in the manner so typical of their ilk, proceeded to attempt to take what is now known as the "Michael" from the Royal Duke and his friends. The main theme of their attack was the fact that the Sappers did not have Colours and that there must be some dark and mysterious reason for this.

His Royal Highness was, not unnaturally, most "unchuffed". (I should perhaps digress here to explain that "chuffed" is an archaic English word much used by the military which means delighted.) So unchuffed was he in fact that upon his return to Chatham Barracks he penned the following note to his mother the Queen.

Dear Mama (he wrote, for in those days that was the mode of address used by all the best people), *I am shocked to find that I, a Sapper Officer and a Royal Duke to boot* (this is how they spoke in those days), *am in a Corps which has no Colours. Please fix.*

Your affectionate son

———

Once again I feel that I must digress to point out to our non-Sapper readers that our Sapper officer in writing this letter was mindful of his fine sapper training in spite of being a Royal Duke, and in spite of the fact that his Colonel in Chief was his mother. Not for him a verbose and platitudinous missive relying on nepotism to receive assistance. No Sir! Far from it. Rather, in the finest Sapper tradition, he confined himself to the essentials—courtesy, brevity and clarity.

The Master General of the Ordnance, an officer skilled in fielding such missives, immediately placed the blame squarely upon several subordinates and at the same time directed them to turn their immediate and full attention to the business of investigating and authorizing the issue of Colours with appropriate Battle Honours to the Corps of Royal Engineers. As a result of their efforts he was able, in a space of time which would make a Russell-bound bureaucrat blanch, to pen the following letter to his Sovereign:

Ma'am, Having severely reprimanded those responsible for this monstrous slight to His Royal Highness' Corps, and having caused immediate investigations to be carried out, I now have the honour and pleasure to report as follows:

Sappers have been present at every battle and engagement conducted by British forces against the enemies of the realm. They are therefore, without question, entitled to bear Colours.

The size of the Colour required, if all of the battle honours to which the Corps of

Royal Engineers is entitled are to be emblazoned on it, is computed to be 24 *feet by* 12 *feet and, to support such a Colour a staff* 22 *feet* 3½ *inches long would be required* (note the precision—a precaution in case the Queen checked).

It is however Ma'am, my regrettably odious duty to inform Your Majesty that, desirous as we are to accord the Corps of Royal Engineers those honours to which it is undoubtedly entitled, to do so in the normal manner is not possible. This Ma'am is because the officer required to bear this Colour would have to be at least 18 *feet tall and I am informed by the Commander in Chief* (at that time the Duke of Wellington) *that there exists at the present time a grave shortage of* 18 *foot tall officers. Indeed currently he knows of none, neither can he envisage any improvement to this situation for some time to come.*

Your Majesty will of course recall that your Royal Regiment of Artillery is also entitled to use the motto UBIQUE. In this regard, and in order to avoid confusion, and perchance some diminution to the lustre pertaining to the Corps selected by his Royal Highness, I would respectfully suggest that as a further mark of distinction the following translations of Ubique be officially prescribed for use by the Corps of Royal Engineers and the Royal Regiment of Artillery respectively.

For your son's Corps (note the obsequious reference to the son of the Monarch) *it is recommended that the translation "Everywhere" be granted. This in one word will serve admirably to still further enhance the already matchless reputation of your Corps of Royal Engineers. For the Royal Regiment of Artillery the translation of "All over the place" will, I think, suffice as a fair translation.*

I have the honour to remain Ma'am

Your obedient servant

Master General of the Ordnance.

You will no doubt, dear reader, having been obliged to wade your way through the overly long and convolutely phrased letter of the Master General of the Ordnance, be longing once more for another sample of the taut phrasecology so succinctly employed by our royal Sapper Officer. You shall not be disappointed.

In reply, brief as ever, and in a manner befitting the mother of a Sapper Officer the Queen wrote:

Dear General, I like it, so be it, fix it!

Victoria R

Across the Channel in October

WYVERN

THIS is an account of a short cruise in the Channel in October 1868, undertaken in the yacht *Lavrock*, *REYC* (referred to as the *Skylark* in the story). She was a 72-ton yawl, and the individuals referred to by pseudonyms were:—

Charlie Ardent—Lieutenant J J Curling, RE
Hamlet—Lieutenant R H Jelf, later Commandant of the RMA
Wyvern—Major J M C Drake, later Major-General

Curling entered the "Shop" in 1862 and was commissioned in the Corps on 24 March 1869. In 1873 he retired and took Holy Orders, and for twenty years he worked amongst the fishermen of Newfoundland. Later he became Rural Dean of the Straits of Belle Isle and built a schooner called *The Sapper* to enable him to visit his 600 mile coastal district. He died in 1906.

The Victorians, and the Victorian Sappers in particular, often appear to us to be so confident, serious and high minded that it is difficult to believe that they really existed. Stories such as this bring them closer, and many REYC sailors (and others persuaded to sail with them) will have had similar experiences and feelings. Except, perhaps, knowing a subaltern who owned a 72-ton yawl complete with professional crew!

This article was lent to me by Bill Curling, the grandson of the owner, who came

cruising with us in *Cymbeline, REYC* off Brittany coast last year. It is with his permission that it is published.

JCW

"GOVERNOR," said a cheery voice, as Charlie Ardent swung himself into my room, "she's all right again; new dress, new linings, and game for anything; get away from all this and run down to Portsmouth and see her."

"Governor" was myself; it was not respectful, but it couldn't be helped. "She" was not one of Master Charlie's female relatives, but his first love and the object of his heart, his yacht, or "vessel" as he prefers calling her, the *Skylark*, 72 tons, yawl-rigged, etc. "Excellent youth," I replied, "bring her to anchor at any reasonable place, say Gravesend or Greenwich, and I will go and see her; but if I run, as you call it, down to Portsmouth to look at her, you are capable of surreptitiously conveying me to sea to the detriment of my delicate organization and the amusement of those pirates in disguise, your crew." "Capital idea! cruise do you lots of good; we'll get Hamlet to come and have some fun." My private notion was that though other people might have fun, I should make more than I enjoyed; but it was of no use to argue, Charlie Ardent had set his mind on my going, and I had to go. So I packed a portmanteau, bid an affectionate adieu to my wife (who, not being at all more nautical than myself, fully believed she would never see me again, and sent all her savings out of the last week's house-keeping money to the Life Boat Society and bought a copy of the *Instructions for the Restoration of the Apparently Drowned*, and a map of Europe), and taking an old pea-jacket, which I thought gave me a nautical air, I met my two friends at Waterloo and we started.

During the shakiest and most uncomfortable railway journey that I ever undertook, we discussed where we should go. I had fondly thought we should sail smoothly and comfortably along the coast, landing perhaps at Dover, Ramsgate and Margate, and "putting in" (nautical phrase learnt from the *Shipping Intelligence* and *The Times*) at places when it was rough; that we should stand on the back part of the deck in straw hats and picturesque attitudes, and be admired by the crew in red caps and picturesque attitudes in the front part of said deck, in the binnacle, or whatever it is. This was what I had seen people do at Plymouth inside the breakwater, and I had thought it very nice. Judge then my horror when Charlie coolly suggested going to France! "Cross to Havre, you know, run up to Rouen, awfully jolly old places; have a look at the cathedral and churches, run back to Havre, get on board, cross to the Foreland, and then we might take her up the river." Pleasant suggestion this! Why it involved crossing the Channel! I had done that once, in a Guernsey steamer at night, and the general impression left on my mind, when it recovered its balance, was that the Channel was not an agreeable place to cross. I say that was the general impression conveyed by the fearful pictures which rose before me at the bare thought of the Channel, and which were far too complicated in their misery to be detailed. I suggested that the wind might not suit; "west and by north, very thing." That we might have bad weather; "glass rising steadily." I chuckled at this last remark, as I thought of the barometer at my house, whereof I had put the index at 29, the hand at 30, and cautiously unhung the weights, for the edification of the wife of my bosom, who was, I knew, pretty sure to look at it about four times an hour on an average. I hinted that having been lately "done up" she might not be fit for going regularly to sea. "Nothing like a cruise to shake things into their places"—and I was beaten.

Hamlet asked how long it would take to go to Havre, much as one asks the captain of a river boat at what time he is due at Southend. "How on earth could anybody know how long it would take? Depends on the wind, the tide, and a lot of things." So Hamlet was beaten too, and our fate was sealed. We were to be conveyed across the Channel in October in a little cock-boat of a thing of seventy-something tons; why, I have heard a steamer of 700 tons described as "a little fiddling thing." I consoled myself with the fact that the tops of the trees were motionless and that in all probability we should not be able to go anywhere, lay back in my corner and smoked in silence.

At Portsmouth Hard we were met by some of the Skylark's men in the conventional costume, and rowed off to the yacht, which was lying, we were informed, "jist off Gawsput." Arrived on board, after greeting the Master, Mr Gasket, an imposing person in a gold-laced cap and a beard, we went down some crooked stairs and were shewn the main cabin, a charming room lined with polished oak, fitted with comfortable sofas, a handsome table which struck me as appearing broken, mirrors, book-shelves, and every sort of luxury, looking more like a lady's boudoir just fresh from Gillow's hands than anything nautical. This was reassuring. It was obvious that all these pretty things and knick-knacks were never meant for rough weather, and we admired them proportionally. Then we inspected the after-cabin fitted up for ladies; Ardent's own cabin, a wonderful little place with every half-inch of space made useful and a high shelf for him to sleep on, with a compass hung upside down over his pillow, looking as if he would have to turn himself inside out to read it; and the forecastle, or "foksle," where the crew lived, or said they did; and the pantry and all the dodges. And then Charlie said, "Suppose we wash our paws and have some dinner. Hamlet, you'll hang out in the after-cabin; Governor, you'd better take the port berth, it's bigger, and, I think, more comfortable." I looked in all directions for the port berth, but found nothing, till Charlie shewed me a shelf in a passage concealed by red curtains, and explained to me how that by "drawing over the door of the companion, shutting the doors of the ladies' cabin and main cabin, you made a jolly little berth, you see." I saw and I wondered, for the whole place, from the side of the ship to the wall of the passage, was not more than five feet wide, and the whole length of the "jolly little berth" was not more than six feet. However, there was a very nice bed on the shelf, and as I suspected that if we went to sea and pitched or rolled I should pass the greater part of my time in it, that was the main point, and I was happy. After dinner we climbed up the crooked stairs and smoked a cigar on deck, Hamlet and I agreeing that "there was a deal of fun in this yachting business after all."

There was not a breath of air, so we were somewhat astonished to hear "up anchor!" and to find that it was proposed to get out of harbour if possible. It did not at any rate appear to be easy, for we ran the most imminent risk of crunching up Charlie's beautiful gig against a fat coal brig, and then after turning about we came most mysteriously all but up against the same brig again, at least Mr Gasket said it was the same, but I confess I have always been sceptical on the point, for it seemed to me to be on the wrong side of us somehow. At last by the help of a strong tide we succeeded in creeping out of the mouth of the harbour, which also turned out to be quite in the opposite direction to what I supposed it to be in, and as it was quite dark and getting cold Hamlet and I sought our respective berths and "turned in"—this nautical expression I learnt from Mr Gasket while wishing him "good-night."

Waking at eight in the morning after a night passed chiefly in frantic endeavours to keep safe on my shelf, I found that standing on the floor of the "jolly little berth" was impossible, and washing a mockery. It was evident that something had happened since bedtime, so succeeding, after a terrific combat with one leg of my trousers and various gymnastic feats, which at my age one is not supposed to be capable of, in getting dressed after a hugger-mugger sort of fashion, I scrambled on deck and crawled on all fours to Charlie, whom I found placidly steering and standing without any difficulty, whereas to me the condition of things appeared positively dangerous. Why, at any moment one might get jerked over into the water—ugh! It made me shiver to think of it. I was informed that a nice breeze had sprung up and that it was fair, and that we were "bowling along" and might expect "if this lasted" to be at Havre early in the afternoon.

This was all satisfactory, and it certainly was a glorious sensation when one had got tight hold of a rope and felt safe; the first morning at sea, the sea itself bright and life-like; the *Skylark* skimming along at a rattling pace and looking so clean and smart; all the ropes neatly coiled, and everything in its place. By the way, what a confusing thing it must be hunting about in the dark for the rope you want, amidst

that awful quantity of them, all exactly alike. I suggested this to Ardent, who smiled superior; I asked what would happen if they did pull the wrong string or unfasten the wrong one; he smiled again worse than ever, and said we should all go down most likely, so I asked no more questions, especially as somehow I felt talking an exertion. Altogether I began to wish for a sight of land, until I saw what seemed to be a ghost emerging from the companion. This was only Hamlet, who looked decidedly uncomfortable. Now Hamlet is a young military friend of mine, whose talent for theatricals has obtained him his sobriquet, and Hamlet is of the swell order of things on shore, but he did not look much of a swell as he crept miserably on deck and surveyed things in general with an expression which made him look more like a bilious Don Quixote than a smart young officer.

What is it that makes all one's feelings comparative, why does a sinner think himself quite good when he sees a bigger rascal than himself, why does a man who knows himself to be hideously in debt feel quite solvent and rich when he reads of some big mercantile smash or sees in the *Gazette* that Larkins of the Fusiliers has exchanged into a Regiment in India? I don't know what it is, but whatever it is, it made me feel quite a good sailor in comparison with Hamlet and gave me strength to get through a very tolerable breakfast.

The wind, which had taken us across the Channel in style, fell light as we neared Etretat (temporary abode of the immortal Beales, M A), and we were a long time getting into Havre; once there, we declined all assistance from pilots, anchored in the roads, and, cramming a few things into a small portmanteau, landed, were civilly passed without trouble by a douanier and walked to the railway station, seeing on the way as much as we cared to see and smelling far more than we cared to smell of Havre. Talk of Cologne! Havre beats it into fits for evil smells; every other house is a Brasserie de Cidre, and every Brasserie sendeth forth a viler smell than that of every former Brasserie. We took train to Rouen, but, as it was dark, saw nothing of the scenery; arrived at Rouen, we walked off piloted by Charlie to the Hotel d'Angleterre, secured beds, had a capital dinner in ten minutes—why can't English people give one a capital dinner in ten minutes?—and strolled about Rouen on a beautiful night.

How grand and quiet the old town seemed! Rouen—the name called up all manner of historical remembrances of one's early scholastic period, which we discussed over a cup of coffee at a clean, comfortable cafe on the Quay, and then to bed. We were up and about early in the morning, swallowed café au lait and a roll, and started to "do" our Rouen. Saw the usual sights—Palais de Justice, the old Cathedral, the beautiful Church of St Onen, the interesting, devotional little Maclou, had some breakfast and parted, Ardent to get back on board his vessel, Hamlet and I to visit the Chapel of Bon Secours. We had to climb up a tremendous hill, but were well rewarded when we got to the top. Anything so lovely as the interior of Bon Secours I never even imagined, every pillar, every arch, every inch where colour can be got in is illuminated, and by an artist, no dabber-on of colours to make things gorgeous, but a man who loved his work and knew the value of colour, knew too that when used in quantity gold and primaries need not produce mere gaudiness. And the effect is really magnificent. The windows are all coloured, the subjects being the best known incidents in Old and New Testament history, and are very well painted by an English artist, Mr Edward Jones. We lingered long in this lovely chapel, inspired with a soft reverent feeling which outward beauty does tend to produce notwithstanding all the Anti-Ritualistic outcry of the day.

Leaving Bon Secours, we went in vain to the celebrated point de vue, for an envious fog hid Rouen and the river from our sight, so we drove back to the town, and, having passed away an hour very pleasantly in the fair which was then going on, and whereat we made a few small purchases, not without chaff in voluble French from the fair venders and in indifferent ditto from ourselves, we took train for Havre, and this time had an opportunity of seeing the scenery. Some parts yet are very pretty, and just that, queer little Norman villages nestled among the hills, and

winding streams that looked trouty; but nothing very grand or imposing. By the time we reached Havre it was dark; however, we managed to find our way through the smells to the Quay, where we found Charlie wandering about in a dense fog with a big lantern in his hand. We scrambled with some difficulty down the slippery stairs into the boat and started for the *Skylark*, which it was no easy job to find, and which we certainly should not have found but for Charlie's lantern, which turned out to be a boat compass. After pulling out against a tremendous tide, we heard at last the boom of a fog-horn and ventured timidly to inquire if it was ours. Charlie oracularly replied "rather," so we shut up, wondering how a man could tell his own from any other fog-horn, especially as we almost immediately passed close to a French fishing-boat on board which a horn was booming violently, and when some few minutes afterwards we reached the *Skylark* learnt in a private conference with Mr Gasket that he had blown no horn of any kind, fog or otherwise; but we were too discreet to make any remark, having a wholesome dread of being taken to sea at once without dinner and kept drifting about in a thick fog all night; and we had our reward in a thoroughly enjoyable dinner and quiet cigar.

About ten o'clock—I beg their pardons, four bells—a faint breeze sprang up and we got under way, the fog disappeared, and we sailed smoothly and slowly along the coast. I was rash enough, before going to bed, to say I should like to get up and see the sun rise, so while in a comfortable sleep I heard dimly Charlie's voice calling "eight bells, Governor! nice breeze, jolly morning, turn up,—come, shew a leg." I jumped off my shelf most unwillingly and found by the difficulty of dressing that circumstances had altered considerably since I turned in. If a man were to complain to me of being thoroughly blasé and wanting a new sensation, I should set that man to try dressing himself on board a lively yacht in a sea way. First, you try to get out of your night shirt—roll!—and you fall in a heap against a partition with your arms tightly fastened in the sleeves over your head and as much in the dark as if you had on Mr Calcraft's white cap; if you are sensible you stay where you are pitched until you are free. After a similar struggle you get into your shirt, lie on your back and get on your socks, and then comes the tug of war. Society has not as yet arrived at doing away with trousers even on board yachts, and they have to be put on somehow; so you prop yourself tightly against your bed and fix one foot firmly on the floor, cautiously get the other foot into its place and—roll!—and forward you go as badly fettered as you were before; you get up again in a favourable roll—heave!—and half of your heavy task is done. Now is the thrilling moment; you have to change feet, and you realize what Blondin must have felt the first time he turned round with a wheelbarrow on the high rope; if you jump you fall, if you go slowly to work—roll!—and you overbalanced yourself and pitch forward again—ugh! it's a horrid process. And then the washing; after jamming your fingers and barking your knuckles in getting out your wash-hand-stand, you pour out your water and prepare to wash, when—roll!—and the whole transaction shuts itself up like a window in a pantomime when Harlequin has jumped through, and you have to begin afresh and are lucky if you succeed in washing without the water slopping all over the place, or yourself being sent head foremost into the basin.

At last I overcame all my difficulties and scrambled on deck to find the *Skylark* bounding along at nine knots with the wind fair, Charlie at the helm looking cool but more than usually occupied with his work, watching with great care the big squaresail, which was to me a new acquaintance. Hamlet coming on deck about this time, and noticing with me Ardent's intentness, we asked what was the difficulty of steering just now—"Keep her from jibing, of course." "Oh! and what's jibing?" "Wind take her on the other quarter." "Ah! and what if it did?" "What if it did! why, mains'l jibe over, carry away squares'l yard, tawps'l yard, and most likely tawpm'st." Under these circumstances we thought it advisable to let Charlie attend to his steering and we gave up talking to the man at the helm. The sunrise that we had got up so early to see was well worth the loss of sleep; no one has seen a sun rise who has not seen one at sea when the sky is clear and the breeze fresh; the tips of the

waves as they curl over and break into foam take a rosy tint from the level sun that one sees nowhere else; the vast sea looks so fresh, so bright, so blue and so clean, and there is a crispiness in the air unknown on shore, which seems the quintessence of health as you drink it in.

Charlie had gone to his cabin to consult the chart, and Mr Gasket was steering, when we heard suddenly "Look out! she jibes!" Down went our heads, over went the great boom, crash went something, and the good little vessel steadied herself and went to work again at her ten knots as if nothing had happened. What had happened? Had all the horrible things happened that Charlie predicted? We thought not, for as we looked up we only saw one broken stick swinging about, and it seemed a little one. Ardent was on deck in an instant and up the rigging with two of the men, quietly remarking, "Keep her on this jibe please, Mr Gasket, while we clear away." He soon got things right again and we went to breakfast. And now I found out why the cabin table had looked as if it was broken when I came on board; it was broken; the centre part of it was separated from the rest and swung wildly about, making it a matter of some doubt whether you would have to make a jump up or a dive down to reach your tea.

The breeze freshened after breakfast, so the squaresail came down, the mainsail was made smaller (I was told it was "double-reefed"), a smaller sail was set in front ("the third jib," I believe), and we very soon made out a lightship and then Dover. Here we were to stop, as I had to return to business and Hamlet had no notion of going any further; he (Hamlet) was beginning again to think yachting a stupid amusement, this opinion dating from the time when the mainsail was reefed, the *Skylark* being "laid to" during the process.

Into Dover we went at a furious rate, but when we got there we found landing out of the question, for the sea was pouring over the Admiralty Pier as if the Admiralty Pier had not been there at all, so there was nothing for it but to turn round and go out again. I don't know how I looked when "ready about" was given, but if I looked at all like Hamlet I should not have cared to be photographed at that particular moment. At the pace we were going we were not long in joining a large fleet of vessels of all kinds at the Downs, where we dropped anchor. I believe Hamlet and I fondly hoped that once at anchor we were all right, but we soon found that "stopping the ship," which ladies always beg for on steamer passages, is no remedy. I thought the *Skylark* had rolled before, but I had evidently still to learn what rolling was; once anchored she did roll, as did all the vessels in sight, and I felt really sorry for Charlie when, after some chattering, Hamlet and I made a bargain with the proprietor of a Deal lugger to take us on shore, and left him to a solitary luncheon.

This getting on shore was a new sensation; it was all very good fun till we grounded; "Sit still," said the skipper. "All r . . . ," said we, but before we could finish, "ush-h!" went the boat sideways, shaking one all to pieces and throwing the pieces all about the boat, across the seats and among small casks, oars and boat-hooks, all hard things to fall against. It was not till after a good deal of this kind of thing that we were allowed to jump ashore, where we were received by a gaping and shilling-seeking crowd, in the midst of which the representative of Majesty, Justice, Law, Revenue and the Chancellor of the Exchequer presented himself in the shape of a coast-guardsman who would not believe that our little hand portmanteaux contained nothing contraband, and insisted on turning the contents out on the beach in the rain, greatly to the amusement of the natives and equally to our indignation.

At Deal we got a fly which took us to Dover and there we took train for our respective homes, agreeing that we had had "an awfully jolly time of it, old fellow," but in our heart of hearts uncommonly glad we were not rolling about with Ardent in the Downs with the cheerful prospect of continuing to roll until the gale, for so our breeze had become, chose to moderate. Charlie turned up all right in my rooms a day or two afterwards, having brought the vessel up the Thames, and having at

last got over the sensation that rooms were unsteady places and that floors had an unaccountable tendency to try to hit one on the nose, I was able to thank him heartily for the cruise and assure him that I had gone back to my books and papers very much the better for having gone across the Channel in October.

STRE (Malta) Disbands

LIEUT-COLONEL J C PEACEY RE, C Eng, FICE, FI Mech E,
(lately CRE, STRE (Malta))

A SPECIALIST TEAM, RE, was first attached to provide technical assistance to the Public Works Department, Malta, in May 1968. This Team, which had by then been officially designated as STRE (Malta), left the Island in March 1972, shortly before the completion of the agreed four-year tour; this had become necessary because of the withdrawal of all British Forces from Malta at that time. Relationships between STRE members and those of the PWD with whom they worked remained most cordial, and the Team left with requests from all concerned that it should return again soon. The STRE did not disband, but remained as a formed unit at Chatham pending a decision on its future.

As soon as the new Military Facilities Agreement had been negotiated and signed, diplomatic discussions took place, resulting in the Team returning to Malta in November 1972 for another four-year tour. Later on, a one year extension was approved, and the Team finally disbanded and left Malta in early November 1977.

The STRE, which grew to a strength of around twenty eight all ranks, consisted of Professionally Qualified Engineers, GEs, E & MOs, numerous Clerks of Works of all three disciplines, Surveyors, Draughtsmen and so on, everyone being a specialist of one sort or another; only seldom was there anyone junior to Corporal. The Team worked as a small firm of consulting engineers, looking after all stages of many different development projects from first inception, through design and planning, preparation of contract documents and drawings, advising on tenders received, supervising construction of works and installation of equipment, preparation and processing of payments and making recommendations on any claims. Most of the work was carried out by local contractors, but some was done by direct labour using PWD plant, and in these cases the Team took a more direct hand in organizing the execution of work. The Malta Government remained financially responsible for funding the various projects, and in addition paid "Extra Costs" towards provision of the STRE's services. The clients for the works included the Departments of Health, of Housing and of Ports, as well as the PWD; STRE officers often found themselves in discussions with senior officials of these departments and of the Treasury. The Team's administrative support was generally provided from local British Services resources.

Projects for which the Team was responsible included Housing, Marine Works and Hospital Services; the STRE was organized into sections for each of these major groups, with an additional HQ/Support Section for general back-up.

On the Housing side, work was on three separate sites; 140 houses, 185 flats, six shops and 106 garages were constructed under STRE supervision, together with all the estate roads, footpaths, landscaping, drainage, water and electricity supply and a 1¼ million gallon covered storm water reservoir (see *RE Journal* September 1972). Marine Works included Laboratory Wharf (see *RE Journal* December 1976), two more adjacent wharves to a similar design, bringing the total length of quay to 1352ft, and the crane rail installation with all the necessary foundation work for a large gantry type container handling crane. The Hospital Services work was mainly electrical and mechanical, including air conditioning and heating plants, lifts and laundries, but the Team also took on responsibility for most of the building and structural work associated with the larger projects. A new boilerhouse (3 × 7000lb/hr

boilers) was built at one hospital, whilst the complete operating theatre complex was modernized at the main general hospital on the Island (St Lukes); another STRE project at the same hospital was the extension and modernization of the boilerhouse, including the design and supervision of construction of a 150 ft high reinforced concrete windshield for the boiler flues; this has become a prominent landmark visible over much of Malta. Miscellaneous additional tasks were many and varied, but included several design and feasibility studies, the load testing to destruction of a quay deck, much general consultancy, and the supervision of rock blasting adjacent to in-use facilities within the perimeter of the main Luqa airfield.

The rate of expenditure on works under STRE supervision varied from year to year, being largely restricted by budgetary limitations; it averaged around £1 million per annum.

Several Project Final Reports were written describing the various activities and the lessons learnt. Copies have been circulated to certain RE HQs, establishments and units and are available for reference in the Corps Library. It is hoped that some of the benefits of experience gained by members of the STRE will thus be available to the remainder of the Corps.

Officers of the STRE held a reception on 20 October 1977 to say farewell to their many friends in Malta, and to thank all those concerned for the help and assistance the Team had received, and without which it would have been unable to function. The Malta Government kindly allowed the party to be held in Verdala Castle, the old summer palace of the Grand Masters of the Knights of Malta; this provided a magnificent setting for the occasion, even further enhanced by the floodlighting of the castle and its grounds. The Representative Colonel Commandant RE, Lieutenant General Sir David Willison, was present on behalf of the Corps, and we were honoured to have with us, amongst the many guests, the President of Malta (Dr Anton Buttigieg) and Mrs Buttigieg, the Ministers of Works and of Health, the

Photo 1. The Silver Salver.

STRE Malta Disbands 1

Photo 2. Presentation of RE HQ Mess dinner plate to President of Malta by Representative Colonel Commandant.

Commander British Forces Malta, and numerous officials representing departments of both the Malta Government and the British Services.

During the course of the evening, General Willison presented to the President one of the new RE HQ Mess Coalport dinner plates as a token of the Corps' appreciation of the friendship received by members of the STRE whilst serving in the Island. The President then presented to the CRE an engraved silver salver bearing the emblem of the Republic and the inscription (in Maltese): "With appreciation and thanks to STRE (Malta) for the valuable help they have given to the People and the Government of the Republic of Malta". The President also presented an album containing photographs of many of the projects on which the Team had been employed.

As a conclusion to the evening's proceedings, everyone went outside to watch a short display by the Band of the Armed Forces of Malta and to listen to their excellent renderings of "Hurrah for the CRE", "Wings" and "Auld Lang Syne".

The silver salver is to be kept at and used in the RE Mess at Barton Stacey, whilst the photograph album will be retained in the Corps Library at Chatham.

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Engineering Geology and the Royal Engineers

MAJOR E P FROSE TD, RE(V), MA, D Phil, FGS, MIWES

INTRODUCTION—THE ENGINEER SPECIALIST POOL

ENGINEERING GEOLOGY within the United Kingdom has developed rapidly within the last fifteen years. Prior to 1960, few UK universities or polytechnics taught the subject. Few engineering geologists were employed as such by industry. Today, there are several teaching departments with specialist interest in "engineering" as distinct from "general" geology. Courses are taught at both undergraduate (BSc) and postgraduate (MSc, PhD) level. Large civil engineering firms now more commonly employ engineering geologists on their staff or as consultants.

"Civil" engineering units of the Corps have a corresponding requirement for geologists. Geologists, however, are serving officers rather than civilians, for they have been called upon to serve under operational conditions (Aden and Northern Ireland within the last decade), potentially hazardous conditions (parts of the Gulf, Thailand), in military restricted areas (BAOR, Gibraltar), or at the least as full (if temporary) members of Corps recce or Specialist Teams. Yet the geological needs of the Corps are both sporadic and highly varied. It is therefore not practicable to recruit geologists, with the range of expertise required, into the regular army and to provide them with the necessary technical back-up facilities and with satisfying career prospects as geologists. Corps geologists are therefore TAVR officers, who serve in the Engineer Specialist Pool.

The Engineer Specialist Pool, a unit of Central Volunteer Headquarters (CVHQ) RE, contains in total about sixteen officers with particular civilian expertise ranging from petroleum, construction and utility services to geology. Geologists on recruitment are normally expected to hold a First or Upper Second Class Honours degree in geology or engineering geology, an appropriate higher degree (MSc or PhD), and preferably to have had about six years experience as regular or reserve army troop officers. They must be in full-time geological or geotechnical employment, yet be able to devote fifteen to thirty days per year to Corps projects. Some site investigation equipment, construction materials testing equipment or laboratory facilities can generally be made available when necessary through the Royal School of Military Engineering (RSME) or 62 CRE (Construction), but otherwise geologists are expected to arrange their own supporting library and laboratory facilities.

On joining the Pool, a geologist is committed to average fifteen days of service per year, and may (and usually does) devote extra days of "voluntary" service. For major projects, two years' commitment may be aggregated so that a geologist is able to serve continuously for thirty days. All such service is normally spent on attachment to units of the regular army. Additionally, geologists attend a TAVR range day and two military training weekends per year like other reserve officers. Pay and allowances are appropriate to the rank held.

Requests for geological assistance are made through the Chief Instructor, CVHQ RE, who allocates individual geologists to projects according to expertise and availability. Ideally, the geologist is used as a "consultant" during the Initial and/or Detailed Reconnaissance phases of a project. Less ideally, he may be employed during the Execution phase, to explain if not solve construction problems. Some of the tasks undertaken by Pool geologists between 1967 and 1976 are reviewed below to illustrate the range of activities involved, and hopefully to stimulate further productive use of its geologists by the Corps.

GROUND WATER—LOCATION AND ABSTRACTION

At least one geologist has been employed each year as a hydro-geologist. Advice has been given to the well-drilling detachments of the regular and reserve army, to

STRE's operating overseas, and as aid to military or civilian communities, home or overseas. This role has been practised world-wide, although change in areas of military interest over the last decade is reflected in the location of tasks. In the early years, there were opportunities for service in the Middle East, Africa and the Far East. More recently, tasks have been more frequently, although not invariably, located in the Mediterranean area, Europe or the United Kingdom.

In the Middle East, geologists have been employed both in Aden and the Gulf area. Major Moseley served in Aden during the emergency, and his objectives and geological findings have already been fully described in the *RE Journal*.[3,4] Lieut Colonel Manning visited Masirah in 1970, and Muscat and Oman in 1971, to advise on potential sources of wadi or borehole water. On the basis of his advice, a well-drilling programme was conducted in Salalah which produced wells yielding in excess of $\frac{1}{2}$ million gallons per day. Half the wells produced very good yields of good water. The remaining wells proved saline to varying degrees, but the water was still acceptable as irrigation water, its primary requirement.

In Africa, Lieutenant Boulton visited Kenya and Major Moseley Libya, both in 1968. Major Moseley's task was to detail knowledge of water resources in parts of Cyrenaican Libya and to show how supplies could be obtained for military units then exercising in the area. The *Journal* has already published his findings.[2,7] TAVR geologists have provided desk studies to assist more recent well-drilling programmes elsewhere in Africa, by Corps units deployed in aid of the civil community, but there has been no involvement on the ground.

The Far East has been the site of more activity. Geologists visited Thailand in 1969 and 1970; Hong Kong in 1968, 1970 and 1973; Nepal in 1973 and 1976.

Activity in Thailand was in support of STRE (Thailand), deployed in the country from 1969 to 1971 to conduct a programme of well-drilling and minor works in aid of the civil community. Geological advice was sought at two stages of the Team's operations, reconnaissance and execution. A geologist accompanied the recce party to Thailand in 1969 to determine areas suitable for ground water development. Relevant hydrogeological information was sparse. The geologist's role at this stage was therefore to locate sources of information in government and university departments, collate it, carry out a photogeological interpretation of air photographs, and conduct rapid confirmatory surveys on the ground. A combination of geological, political, and administrative reasons led to the STRE subsequently being established in Ratburi province, some 250km west of Bangkok. Geologists revisited Thailand during the early execution phase of the project, to examine the well logs and rock cuttings produced by well-drilling. From information provided by this initial, essentially exploratory boring and from an associated, more detailed ground survey, areas for productive drilling were predicted. Technical and administrative difficulties slowed the progress of the STRE, but water flowed in the end. Moreover, one of the Thai university students who provided geological assistance during the recce subsequently developed studies on the Ratburi limestone, the aquifer exploited by the drilling, into a London University PhD thesis,[9] supervised by the TAVR geologist. The objective of the exercise, to provide technical help and training for a developing country, was certainly achieved.

Hong Kong has also provided scope for community relations projects, most recently for villages experiencing water difficulties in Yuen Long district. Sites for new wells have been recommended by a geologist, to avoid the serious pollution problems reported at Chau Tau village, and to supplement the current supply to Tai Tseng Wai which is inadequate during the dry season.

In Nepal, geological advice has been sought on alternative sources of water supply to the Dharan Cantonment. Built during 1956–9 as a recruiting centre for the British Gurkhas, this site is now HQ BRIGNEPAL. Camp water supply is drawn from the head waters of the Scoti Khola through an 8km gravity pipeline. An alternative or emergency souce was sought, and on the basis of geological information plans for an expensive deep-drilling project were replaced by a programme of

hand-dug shallow wells at a fraction of the cost.

In the Mediterranean area, recent hydrogeological studies have been confined to the two military base areas of Gibraltar and Cyprus. Lieut Colonel Manning visited Gibraltar in 1967 to report on the feasibility of drilling for ground water. The object of his study was to determine the likelihood of augmenting the water supply of Gibraltar from further wells to be drilled, if prospects were assessed to be reasonable, by 521 Drilling Team. His report was not encouraging, and the drilling accordingly deferred. The continuing isolation of Gibraltar, however, required that the possibilities of obtaining increased quantities of potable groundwater from the peninsula be reassessed. Consequently, both geologists and well-drilling specialists from the Engineer Specialist Pool have been tasked in recent years with research to this end. Studies have been made in conjunction with the Gibraltar Public Works Department and in association with officers of the Hydrogeology Department of the Institute of Geological Sciences, London. Chances of obtaining substantial quantities of groundwater by deep-drilling are still assessed as slight, but as current economic and water abstraction trends continue, a scheme to explore and tap potential groundwater reserves through drilling becomes more attractive.

Geologists, including Major Moseley, have reported on groundwater supplies for military camp sites on Cyprus. In 1971 and 1974 the tasks were concerned with the Akamas training area at the western tip of Cyprus. The Invicta camp is situated in this dry scrubland area, and was supplied with water brought in by bowser. Moseley recommended a local source of supply through collecting galleries for ground water to be constructed near the camp; later studies confirmed the site selection for a possible alternative deep well. Hydrogeological studies were extended in 1975 to the Ayios Nikolaos camp in the Eastern Sovereign Base Area where a geologist served as an advisor to the Property Services Agency (Department of the Environment). He investigated the present and future groundwater supply situation. Collection of data from the producing wells in and around the camp and from records held by the Water Development Department in Nicosia led to reassuring predictions about future water supplies.

Within Europe, geologists have been involved in Germany with problems associated both with the lack of water and with its overabundance. They have commented on potential groundwater supplies for training areas, and on problems caused by groundwater during excavation works. They have evaluated groundwater resources for sites in Northern Ireland and Scotland, and even reported on groundwater supply and distribution problems associated with two bird sanctuaries in England. Their experiences have thus been many and varied.

By their hydrogeological studies, TAVR geologists have thus contributed expertise to projects ranging widely in their geographical and geological setting; to projects initiated by a variety of military and civilian authorities; and to projects executed under both peaceful and not so peaceful conditions. The general role of the geologist has been to locate, collate and interpret highly specialized geological or hydrogeological information so that it can be applied to a particular local situation and problem; to conduct local hydrogeological site investigations where necessary; and to make recommendations concerning hydrogeological projects whose execution is outside current Corps capability. These roles have been successfully practised despite the limited time and supporting technical facilities available through the TAVR. Specifically, geologists have been required to site boreholes to achieve maximum yield of groundwater; predict depth to groundwater to estimate drilling time and equipment requirements; predict bed-rock conditions to determine drilling or other water abstraction methods; and estimate quantity and quality of groundwater resources. Recommendations where directly tested by drilling have shown a satisfying success rate—and overall cost saving to the British taxpayer. Their work has often been complemented by that of engineers in the Specialist Pool who have advised units of the regular army on techniques of drilling as such.

AGGREGATES—LOCATION AND EXTRACTION

Tasks relating to the location and extraction of aggregate have been equally widespread over the past decade but have involved fewer geologists.

In the Far East, Colonel Hughes reported on potential sources of construction materials and water in part of north-east Thailand in 1966, the construction materials being required for a local airfield project. More recently a geologist was required in 1973 to recommend potential quarry sites in Hong Kong. Road metal was required for a proposed new military road and to surface an existing rough road in the region of Castle Peak peninsula. The entire site for the proposed road lay across Cheung Chau granite, a normal medium-grained plagioclase-quartz-orthoclase-biotite granite which is in most places very heavily weathered, even to depths of 100m. From a brief surface reconnaissance and study of aerial photographs, patches of unweathered granite were identified as possible quarry sites.

Mediterranean studies have been confined to Cyprus. Major Moseley was tasked in 1970 with problems associated with the Akrotiri mole. The mole, badly damaged in a severe storm during the winter of 1968–69, was in urgent need of repair, rebuilding and possible extension, on a limited budget. A significant part of the cost was calculated to be the acquisition of suitable stone, and it was essential that a source be found within the Sovereign Base Area. Purchase from an existing quarry, such as that seven miles WNW of Limassol then providing stone for Limassol harbour, was an impossibility on financial grounds. From observations on land and by boat from the sea, coupled with study of aerial photographs, Moseley concluded that there was an abundance of stone suitable for the Akrotiri mole to be obtained from the Akrotiri cliffs, and much stone to be obtained within a few hundred yards of the harbour. Priorities and methods of working the stone were recommended. His report illustrated the geology of the eastern Akrotiri cliffs in unusual detail, the photographic record including a stereoscopic line overlap of the cliffs, taken from the sea, supporting ground photographs and close up views of rocks. Details of his stereoscopic technique have now been published, based on the Akrotiri investigation.[6] Moseley notes that the method has wide application to coastal and mountainous sections, where it may greatly speed up the geological survey. Major Hutchings[1] described the quarrying operation which followed the geological report.

Moseley also reported in 1970 on sources of roadstone required for extension of a then new road along the west coast of Akamas. "Stone" had been derived from locations most convenient to the road to reduce costs, but inevitably some of the "stone" sources had proved superior to others. He determined "stone" sources in order of decreasing suitability from river gravel; massive limestone outcrops; thin patches of terra rossa (laterite-like soil); and serpentine or serpentinized gabbro. A follow-up study in 1974 identified the hard basic volcanic lava termed locally "Upper Pillow Lavas" as the best rock type in the area for providing roadstone for repairs to the Akamas track.

TAVR geological studies were extended to the Caribbean by Captain Pickford. He reported, also in 1974, on a detailed reconnaissance for sources of road construction materials in Dominica and Belize. Great difficulty had been experienced in locating and working suitable sources of good crusher-run and natural gravels for road base and sealing materials. Captain Pickford was required from assessment of existing reports and a field investigation to indicate likely locations for new borrow areas and quarries; further research and investigation required; probable best methods of working new quarries; and to comment on existing quarry potentials and methods. Four deposits of good crusher run material suitable for road surfacing were located in Dominica, and four other marginally interesting deposits. All these localities were situated on the younger of two series of volcanogenic rocks, the older series of lavas and tuffs being too deeply weathered to a lateritic and bauxitic condition to provide suitable hard rock. In Belize, numerous deposits of weathered but unmetamorphosed limestone of Cretaceous and Eocene age, suitable for a road base aggregate were located, together with a small deposit of sand and

gravel. A possible site for a quarry to yield high grade road sealing material was located in the central part of the country, utilizing quartzites in the complex of metamorphosed sediments and granites of Palaeozoic age which form the Maya Mountains.

Less exotically, European studies have included siting of a quarry in Germany to provide road metal for the Sennelager range area, and a report by Moseley in 1970 suggesting locations for road metal quarries on the Scottish island of Rhum and commenting on road alignments and construction across the island.

In general, groundwater is developed from areas of "soft" rocks, normally sedimentary rocks which are both porous and permeable to water. In contrast, aggregates are derived from "hard" rocks, commonly impervious igneous rocks. Different geological situations are therefore sought and encountered in the search for aggregates as opposed to groundwater, and different geological expertise is required. The primary role of the geologist, however, is in both cases to locate potentially suitable source rocks. Devising methods for aggregate extraction is only partly a geologist's problem, and the TAVR is fortunate in having a quarrying expert who has provided complementary studies in this field when necessary.

SITE INVESTIGATION—SEISMOGRAPHS AND SURVEYS

Relatively few TAVR geologists have been involved in site investigations for Corps construction projects. Some recent contributions, however, include participation in user trials of new equipment purchased through the Engineer-in-Chief's Experimental Fund; assessment of rock rippability; and occasional foundation problems.

In 1971 and 1974 geologists contributed data to part of the trials programmes for the BISON Model 1570A single-channel seismograph and the ABEM TRIO Model 5352 multi-channel seismograph, conducted by 62 CRE (Construction). The BISON programme included its use on Europa Point, Gibraltar, to measure sound velocities in bed rock underlying the route of a road then under construction by 1 Fortress Squadron RE. In this particular situation, high sound velocities were correlated by a geologist with the presence of massive crystaline limestone beneath the route, and lower velocities with a more recent, less resistant, cemented limestone breccia. Excavation problems and delays occasioned by the harder rock could hence be predicted.

The TRIO was also evaluated on Gibraltar, both on bed rock and more spectacularly on parts of the slope dominating the east of the peninsula and forming the main water catchment area. The object of the exercise was to search for a velocity change in sound waves transmitted through the scree material underlying the corrugated iron sheeting cover of the catchment area which might be correlated with a change from unconsolidated surface sand to a more stable, cemented breccia or bed rock at varying depths. To have ascertained depth to harder rock by augering or drilling would have been slower and even more difficult.

A geological assessment of rock rippability on the Corradino Heights, to the south west of the Grand Harbour in Malta, was made for STRE (Malta) and the Malta Public Works Department in 1973. A new road was being constructed to provide access to proposed new shore facilities. Deep excavation was required, and rapid completion of the road, although close proximity of other structures minimized the use of blasting. A combination of geological and costing studies indicated that the use of rippers to speed the work would be technically feasible but uneconomic for this project, and its completion time was duly extended.

Foundation problems were encountered during construction of the adjacent Laboratory Wharf. A new wharf was begun in 1973, designed as a mass concrete structure and built in sections up to 25 feet long in up to 60 feet of water. Work was initiated by the Public Works Department, with subsequent assistance from STRE (Malta). Shortly after completion of the first section, slight subsidence was observed and geological and geophysical studies were requested to establish the cause. Reasons for the poor foundations were assessed from shore-based geological observations and

their extrapolation offshore; an ingenious submarine geophysical survey by 62 CRE using a modified ABEM TRIO multi-channel seismograph; systematic penetration probing of the local sea floor; and extensive search of earlier construction records for the area. The engineering solutions were successful[8] although more demanding than originally envisaged, proving again the relative value of a thorough preparatory site investigation.

In Britain, Major Hobden commented in 1972 on a proposal to improve the water supply to Rothiemurchus Lodge at Aviemore in Scotland by enlarging the existing reservoir. His report covered both the suitability of a location for dam foundation, and the suitability of local soil as a construction material for the dam. Comment was also provided in 1975 on proposed earth dams. These were suggested for proposed coarse fishery lakes to be built as an MACC project by the Royal Engineers near Liskeard, Cornwall. A geologist's report was required to determine whether the proposed valley site would retain water, and the local availability of construction materials for the dams and bunds.

Geologists have thus been used recently for site investigations only in Gibraltar, Malta and UK, although for projects embracing the range of roads, wharf, and dams. Hopefully the next decade will see an extension in both the geographical and technical range of this aspect of Corps engineering geology.

STABILITY—TUNNELS AND SLOPES

During the last decade, stability problems requiring advice from TAVR geologists have been encountered by the Corps only on Gibraltar. Here both tunnels and slopes have given cause for concern.

Gibraltar is honeycombed with some thirty miles of tunnels. Fortunately, they are either safe or disused. A recent exception to this rule was the Keightley Way tunnel, traversing southeast to northwest across the southern part of Gibraltar from Nun's Well, in the Europa quarters area, to Little Bay. It served as a vehicle and foot tunnel that was heavily used in summer, particularly by service families, providing access to the Nuffield Pool and to Camp Bay Promenade. The tunnel was scaled down by DOE miners in early 1974 who reported apparent hazards from rock instability and from old blasting charges left in place. After investigation, the tunnel was closed to all access. Alternative routes from the Europa to the Camp Bay and Little Bay areas were very indirect and inconvenient, and an early re-opening was required. However, remedial support works for the tunnel offered by a civilian firm were prohibitively expensive. Potential instability was feared from weathered rock near the tunnel entrances; from shallowly inclined faults with clay gouge that cut through the limestone forming the tunnel roof and sides; from solution cavities; and from fractures due to overblasting the rock during construction of the tunnel. A reconnaissance survey of the tunnel by a TAVR geologist differentiated areas which constituted an immediate danger to the stability of the tunnel from those which might at worst constitute a long term danger. Findings were confirmed by a detailed DOE survey, and remedial support works executed by 1 Fortress Squadron RE at a fraction of the original civilian estimated cost. The tunnel was re-opened in 1975.

Geological advice was also sought in 1974/75 on the effect that quarrying, and removal of the corrugated iron sheet cover, might have on the stability of the main water catchment area slope. The geological structure of the slope was inferred from an exhaustive search through old prints and photographs; various construction records and geological reports; a re-interpretation of bed rock geology from detailed surface and subsurface observations; and a seismic survey already mentioned above. DOE subsequently undertook the lengthy and difficult task of confirmatory drilling.

These recent projects on the Rock can thus demonstrate successfully integrated effort: geologists working with engineers, reservist with regular sappers, soldiers with civilians.

CONCLUSIONS

The preceding sections outline the role of TAVR geologists in the Corps over the last decade by reference to papers published in the *RE Journal* and elsewhere; information gleaned from unpublished, unclassified reports by officers no longer serving, whose names are cited in the text; and unpublished work by current, unnamed members of the Engineer Specialist Pool. Geologists have contributed to all these projects in fulfilment of their annual fifteen days obligatory service. In addition, they have contributed to symposia sponsored by the Corps, such as those on Site Investigation (in 1971) and Well-Drilling (in 1973), held at Barton Stacey. They have contributed to Corps literature, for example to the 62 CRE (Construction) publication *Site Investigation* and to the new *ME Vol XV Applied Geology for Engineers*. They have prepared desk studies relating to a number of overseas projects; syntheses of background geological information for recce teams; some laboratory reports on rock samples; and given advice by correspondence or discussion. Members of the Engineer Specialist Pool have thus given an extensive "consultancy" service distinct from, and additional to, that given by members of the Engineer and Railway Staff Corps.

The geological resources of the Royal Engineers are limited by the small number of serving TAVR geologists; their civilian commitments; and their variously restricted back-up facilities. Nevertheless, this review shows how geologists have over the past decade been employed in projects located from the Caribbean through Europe and the Mediterranean to the Far East. Projects have ranged from water and aggregate supply to site investigation and structural stability in technical scope. Geological service has thus been versatile. Viewed against normal consultancy charges, it has also been cheap. It continues "ubique".

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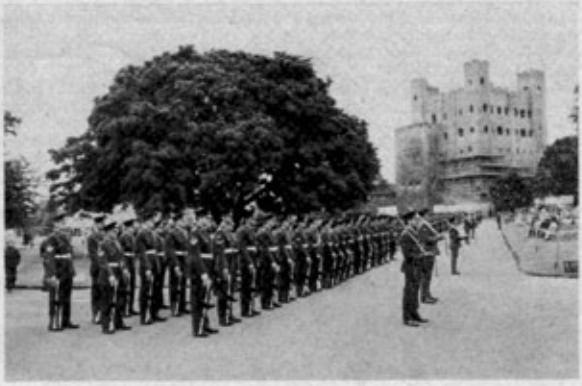
The Freedom of Medway

LIEUT COLONEL J E KITCHING, RE, AMBIM

FOR many years the Corps held the Freedoms of the four "Medway" authorities but with the reorganization of local government in 1974, three of these Freedoms—those of Chatham, Rochester and Strood—lapsed. So it was with great pleasure that we received the news that the Council of the new Borough of Medway wished to confer its first Freedom on the Corps of Royal Engineers particularly as it would be in the Jubilee Year.

The Local Government Act 1972 provides that the Council of a Borough may admit as Honorary Freemen persons who have rendered eminent service to that Borough. The Act provides that a special meeting of the Council must be convened for the purpose of passing the resolution conferring the Honorary Freedom, the most honourable distinction that a Borough can bestow. The resolution recites the particular grounds upon which the Council have come to their decision and states why the Freedom is being awarded. After the passing of the resolution the new Freemen take the Oath and sign the Freemen's Roll, the signature being witnessed by the Mayor and the "Town Clerk". Where military units are involved there is a second Freedom—the "Freedom of Entry"—which has been granted by a number of towns to regiments which have rendered conspicuous service and which are associated with the Borough. This second "Freedom"—to march through the streets of a Borough with bayonets fixed, drums beating and Colours flying—is a convention which has arisen over the years. The practice of marching through a town by Army units was originally an exercise to stimulate recruitment. The drums attracted attention, the Colours showed that it was on the Queen's service and the pipes and "halberds" (now bayonets) were carried by the recruiting parties. Although it is unlikely that any Council could prevent Her Majesty's troops from marching through their Borough, the practice of granting this Freedom provides a very dignified and satisfactory means of enabling a town to honour a Regiment.

The Freedom of Medway was conferred on the Corps at a parade in the Castle Grounds, Rochester on Saturday 17 September 1977. The choice of site was a happy one as the Castle was built for King William Rufus by the first recorded King's



The Freedom in Medway (1)

Photo 2. The Mayor of Medway inspects the Parade.

Engineer, Bishop Gundulph. The day was fine and bright although a chilly wind blew off the River Medway as the parade formed up in the Castle Hill outside the Castle grounds. Once the ground keeping party had taken position the parade marched in to form up in line on the wide path which cuts the grounds diagonally from the Medway gate to the Castle Keep. Detachments each of two Officers, one

Photo 3. The Chief Royal Engineer accepts the Freedom Casket and Scroll from the Mayor of Medway.

The Freedom in Medway (2 & 3)

Warrant Officer and forty two or forty eight soldiers from 17, 18, 24, 40 and 49 Squadrons formed the main parade, while 590 EOD Squadron (V) provided the ground keeping party and the Royal Engineers (Chatham) Band the music. The Casket Party, dressed in scarlet and blue, took up its position between the two halves of 24 Field Squadron. Although 17 Squadron is still a Royal Engineer unit it is now commanded by Major Martin White RCT.

The Mayor and Council processed from the Guildhall to the Castle Grounds on foot following the Council Meeting at which they had passed a Resolution to accept the Corps as a Freeman of the Borough. The Council had resolved:

"That in accordance with the provisions of Section 249 (5) of the Local Government Act 1972, the Corps of Royal Engineers be admitted as Honorary Freemen of the Borough of Medway in recognition of the great record and traditions of the Corps in loyal and devoted service to our beloved Sovereign and Country and in order to perpetuate the close bonds of friendship and mutual respect which exist between the Borough and the Corps of Royal Engineers; that the Common Seal of the Council be affixed to the Scroll recording such admission; and that the name of the Corps of Royal Engineers be entered in the Roll of Honorary Freemen of the Borough".

The Mayor, Councillor Arthur Thomas, was met by the Chief Royal Engineer, General Sir Charles Richardson, GCB, CBE, DSO, at the dais. Following a General Salute the Mayor inspected the parade, accompanied by the Chief Royal Engineer and Lieut-Colonel J E Kitching RE, the Parade Commander. On returning to the dais the Mayor then called on the Director of Administrative and Legal Services (the "Town Clerk" in effect), to read the scroll.

TO THE OFFICERS AND MEN OF
THE CORPS OF ROYAL ENGINEERS

GREETINGS

WE, The Mayor and Councillors of The Borough of Medway in the County of Kent, being mindful of the great record and traditions of the Corps in loyal and devoted service to our beloved Sovereign and Country, and in order to perpetuate the close bonds of friendship and mutual respect which exist between the Borough and the Corps of Royal Engineers, do by these presents confer upon you

THE FREEDOM OF THE BOROUGH

and thereby the right, privilege, honour and distinction of marching through the streets of The Borough on all ceremonial occasions with the bayonets fixed, drums beating and bands playing.

in witness whereof the Common Seal of The Borough Council of Medway was hereunto affixed this Seventeenth Day of September, One Thousand Nine Hundred and Seventy Seven in the presence of:

A W Thomas	The Common
Mayor	Seal of the
Roy Hill	Borough of
Chief Executive	Medway

The Mayor, in presenting the Casket containing the scroll, said that of all the events of his Mayoral year, the granting of the Freedom to the Corps gave him the most pleasure. The Chief Royal Engineer received the Casket on behalf of the Corps. He thanked the Mayor for the honour that the Council had bestowed on the Corps and reminded him of how all Sappers looked on Medway as their military home. The giving of the Freedom would draw the bonds of friendship between the Borough and the Council still closer.

As the Chief Royal Engineer finished speaking, the Casket Party Commander, Lieutenant R D Hill (63 YO Course) and the escort marched forward and Lieutenant Hill mounted the dais to receive the Casket and Scroll. After he had rejoined his

Photo 4. The March Past the Guildhall. The Casket Party, dressed in scarlet and blue are in front of the dais.

escort and the party had returned to their place on the parade, a General Salute was given. The Parade Commander then asked permission of the Mayor to march through Medway with bayonets fixed, drums beating and bands playing.

The Mayoral Party and the Chief Royal Engineer left the Castle Grounds. The parade turned inwards and marched off to reform just outside the grounds on Castle Hill with the Casket Party at the head and the Band in the centre. 590 Squadron (V) reformed as a troop to march at the tail of the column, although their carefully rehearsed drill for leaving the Castle Grounds became submerged in a crowd of spectators rushing to get to the High Street to see the march past! They successfully extricated themselves and the parade marched off via the Esplanade to High Street, Rochester, where the Mayor took the salute outside the Guildhall. On approaching the saluting base, the Casket Party wheeled to halt in front of it and about turned so that the parade, as it marched past the Mayor and Chief Royal Engineer, could also see the Casket. The parade then continued its march through Medway via Eastgate, Chatham High Street, Medway Street and Dock Road to finish in the Riverside car park a distance of two miles. That they were able to do so at the height of Saturday morning shopping and yet barely see a car shows the effectiveness of Police diversions and communications.

Following the parade the Mayor entertained the Chief Royal Engineer, the Engineer-in-Chief and the Commandant RSME to sherry in the Guildhall, and the Chief Royal Engineer, on behalf of the Corps, presented the Council with a gavel and base to commemorate the occasion. The Chief Royal Engineer said that the Memento would serve to remind the Council of the Corps' very real appreciation of the honour they had done us.

The Mayor and Council were then taken to Chattenden Barracks where they saw displays showing various aspects of Corps activity and were able to buy a Special Freedom Day Cover from the Postal Stand. The visitors then retired to the Officers Mess for lunch. The Casket was on display in the entrance to the Mess, but once lunch started it was carried into the dining room and set before the Chief Royal Engineer and the Mayor.

The Freedom Ceremony was over, the Corps had regained the Freedom of the territory "lost" in 1974.

The Freedom in Medway (4)

Pre-War Life in India for the Young RE Officer—Part II

LIEUT COLONEL (Retd) R W OBBARD MA

INTRODUCTION

I HAD been posted to India in September 1934 and after a voyage out to Bombay which took nearly four weeks on *HMT Neuralia* was detailed for duty as AGE Poona. I was enjoying station life and all its amenities when I was suddenly posted in April 1936 as a Company Officer in charge of a detachment of 44 Divisional HQ Company QVO Madras S & M at Midnapore. The Company formed part of the Additional Garrison Bengal, a garrison which had been formed to cope with the terrorist troubles—in Midnapore alone three District Magistrates had been shot and killed in succession—and which had certain privileges re leave etc. Even so the Government would not move my car free and so I had no alternative but to drive it 1500 miles across India in the hot weather—I found that moves in India usually took place at the hottest periods of the year!

MOVE TO MIDNAPORE

I started off on the 29 April 1936 and reached Midnapore nine days later driving on bumpy earth surfaced roads in a haze of heat and dust. My route was via Mhow, Jhansi, Cawnpore and Benares and I achieved my boyhood ambition of crossing the rivers Tapti, Nerbudda, Jumna and Ganges and the Satpura and Vindhya mountain ranges.

I rested for one day in Benares and saw the bathing and burning ghats whilst sitting up in a chair on the roof of a boat and later I visited the Golden Temple.

The Grand Trunk Road made famous by Kipling was a disappointment. At Benares it crossed the Ganges on a one way pontoon bridge and one had to cross the Son river on a railway flat as the road disappeared into the sand. At its best it was only an earth road with an especially wide berm.

Finally on the ninth day I reached my "rubicon"—the Damoda river—across the soft sands of which my car was pushed for about two miles and at my final obstacle, the Silai river, I was very fortunate to get across at a ford as the car hesitated in mid-

Photo 1. The Grand Trunk Road crossing River Ganges near Benares.

Photo 2. Barrack accommodation. Additional Garrison Bengal.

stream but just made it. However when once across the route to Midnapore was clear and I arrived safely at the Officers Mess of the 2nd/16th Punjab Regiment in the late afternoon. One look at the barrack area made me appreciate the truth of the saying "It is better to travel hopefully than to arrive!"

LIFE IN MIDNAPORE

Midnapore was not a family station for the officers of the Additional Garrison. Such few bungalows as there were had a permanent armed police guard and the town itself was under curfew. When one travelled at night one was constantly challenged—this especially when motoring back from Kharagpur—and if one went outside the barrack area an armed orderly had to accompany one.

All officers had at all times to carry a small automatic pistol and special holsters were made of khaki, white or black cloth to match one's clothes. Old cantonment buildings were used for officers accommodation but the troops lived in temporary accommodation made of sal wood bullies, bamboo matting and shingles. At night the horrible howling of the jackals pervaded the whole area of the camp.

a. *Military and MES Duties.* I was responsible for supervising MES work at Midnapore and after early morning drill and sapper training the detachment helped with essential repair work. There were two outstations, one at Bankura had been abandoned by troops before I arrived, the other at Saidpore was garrisoned by the 4th/7th Rajput Regiment; to reach it one had to pass through Calcutta and I would then have an opportunity to visit the CRE. There was a rifle range at Kharagpur and when I left one was being constructed at Midnapore. The detachment was never called on to help with the occasional raids made by the 2nd/16th Punjab Regiment on suspected terrorist hide outs.

b. *Social Life.* Although there was a small club at Midnapore social life was concentrated on the railway club at Kharagpur—to get there one had to take one's car across a ferry or go by rail. The club had the usual amenities including a swimming pool and rugby football ground and tennis was played regularly. A welcome change from the club would be a long week end at Digha sands near Contai on the Bay of Bengal where the sands were covered with little red burrowing crabs which were hunted for food both by locals using bows and arrows and by birds.

c. *Shikar.* There were Sunday shoots, usually for snipe, and on one occasion

the police commissioner organized a peacock shoot. This shoot involved a journey by car, train and bus and the crossing of a river by bullock cart and palanquin! It is noteworthy for the fact that on the way back the bus ran out of petrol and the mail train that we were catching at Ramnagar had to be held up for half an hour by a member of the party who set off ahead on a horse! The holding up of a mail train in the UK under such circumstances is outside the bounds of my imagination!

At Christmas I was fortunate enough to be invited by my cousin, who was a Commissioner in the Indian Civil Service, to a duck shoot north of the Ganges about a dozen miles from Monghyr. The shooting camp was luxuriously fitted out and the whole area belonged to a land owner with a vast estate who was himself a superb shot. He brought along seven elephants to put up the duck and geese from the jeels and to carry the party over difficult ground.

We would reach our shooting position on the selected jeel by punt and I will never forget the sound made by the vast flights of duck as they started to arrive from other jeels. On our first day with six guns the bag was 134 duck and one goose and the next morning it was fifty four duck and thirty seven geese and from what I remember the two following days were similar.

On the fifth day when the shoot was due to close I went off after "mugger" (crocodile) with the landowner's nephew and a car was seen so seldom in the area we visited that the village children followed it shouting excitedly "Hawa ghari" ie air carriage.

LONG LEAVE, TRIP TO JAPAN

Ronnie Dinwiddie and I decided to go to Japan for our long leave, and as he was now in Waziristan on the North West Frontier and I was with the Additional Garrison Bengal we had ample leave due to us.

We met in Calcutta, sailed on 13 September 1936 and disembarked at Kobe on 8 October having travelled by a variety of boats ie Mail-boat to Rangoon, British India Steam Ship to Singapore via Penang, Port Swettenham and Malacca and P and O Liner to Kobe via Hong Kong and Shanghai. Then after twelve days touring in Japan we re-embarked for the return trip at Yokohama on Sunday 20 October.

Our holiday in Japan followed the usual lines. We stayed at Kyoto and whilst there shot the Hodzu rapids and in the evening we were entertained by three Geishas —very respectable girls. Our next stop was Gifu where we saw the cormorant fishing, which takes place at night by the light of braziers and in which cormorants, with rings round their necks to prevent them swallowing the fish, are controlled at the end of strings by fishermen wearing protective grass skirts—very necessary when the cormorants are hauled in to disgorge. It looked as though the boats were being towed by cormorants! Then on to Atami, a spa, where there was mixed bathing in the so called "Grand Bath Tub" filled by hot springs and then to Hakone where there was a fine view of Fuji across the lake. Next we drove round Fuji and went on to Nikko with its famous shrines and beautiful lakes and waterfalls. We ended up in Tokyo where for a change we stayed in the best hotel ie The Imperial Hotel and whilst there we enjoyed seeing the "Girls Operas" in which all parts both male and female were played by girls.

Two days after we had re-embarked the liner stopped at Kobe. This time we thought we'd see what we could of the Japanese fleet at Osaka but having been nearly arrested we left hurriedly for Nara, the ancient capital of Japan, where we spent an hour in "rickshaws" being taken around the main sights such as the deer park and the big Buddha.

Ronnie and I stayed in Japanese inns whenever possible and we enjoyed the experience. The inns were lightly constructed of wood, bamboo and paper and were very clean—one had to take off one's shoes at the entrance and put on sandals and finally go barefoot inside one's own room.

Rooms were always of about the same design with the floors covered with

Photo 3. Author and Ronnie Dinwiddie having an evening meal of "sukiaki" in a Japanese inn.

matting, an alcove in which hung a banner or a picture and containing an arrangement of flowers, and sliding paper doors which divided the room into three parts—one main part in which one ate and slept, one part with a window and chair and one part an entrance lobby.

The maid would produce two kimonos in the evening, an inner thin one in which one finally slept and an outer padded one for warmth and after changing one normally went to the bathroom—sometimes escorted by the maid who removed the kimonos at the entrance. Then in the bathroom one first washed in little tubs or under a shower—on occasions there was a bath boy in attendance to help scrub one—and then when clean got into the large communal bath which was always full of very hot water. Dinner and breakfast would be served in one's room with the maid kneeling at the table and preparing the food on a brazier and serving the meal. Ronnie and I not wishing to starve learnt very rapidly how to use chopsticks! At night time bedding was taken out of cupboards and beds were made up on the floor by the maid who laid down a mattress, a hard cylindrical pillow and a quilt for each of us.

I wonder how much life has changed since then as surely the days of the maids who knelt on all occasions before entering one's room and who cooked and served one's meal must long be over.

The cost of the whole trip was ludicrous by present standards. The return fare Second Class from Calcutta to Japan was only £32 and it cost us an average of 8/6d a day each to live in Japan—at that time the Japanese yen was only worth 1/2d though nominally "at par" it was worth almost double that amount. We actually managed the trip on our pay as subalterns!

LONG LEAVE. TREKKING IN SIKKIM

Ronnie and I arrived back in Calcutta on 12 November and as I still had twelve days available from my two and a half months leave I planned to see Darjeeling and go on a trek in Sikkim before returning to Midnapore. Accordingly I said goodbye to Ronnie and caught the Darjeeling mail train to Siliguri where I changed to the hill railway for Darjeeling. The hill railway really was tiny and how the miniature

engine pulled its load was a mystery even though two boys stood or sat in front of the engine and threw sand on the lines whenever the wheels started to slip.

I arrived in Darjeeling in time to attend the pony races at Lebong and the next morning I saw the sun rise from Tiger Hill—Kanchinjunga was a magnificent sight as it stood out in the sunrise above seas of cloud. Later the same day I arranged to start on a nine day trek and by the next morning passes and essential stores had been obtained and arrangements had been made for a cook sirdar and three porters to accompany me—all were absolutely first class two having been on the previous Everest expedition and two on the Nanda Devi expedition.

During the trek the cook sirdar walked with me and the porters followed in their own time and altogether I stopped at eight different rest houses the altitude of which varied from 5,100 to 11,900ft. I crossed a pass at 12,100ft and the total distance covered by the trek was 120 miles.

The first half of the trek was along the high ridge which separates Darjeeling from Nepal. In the early mornings I had wonderful views from this ridge of Kanchinjunga and the Himalayan range away to Everest, then as the day got warmer the clouds would rise and I usually ended up by walking in thick cloud. Much of the trekking at this stage was in thick moss grown jungle with great streamers of moss hanging from the trees, hiding their leaves and making the whole forest appear dead.

The mountains in the Sikkim area of my trek were lower and fields were cut out from them wherever possible and rice, oranges and Indian corn were the main crops. The rest houses had amusing old chowkidars most of whom wore pigtails—my head porter incidentally also had a very fine pigtail.

On 21st November I visited the monastery at Pemiongshi and later I met a Lama from Tibet who insisted on my having a drink out of a dirty old bottle he produced from somewhere inside his clothes. Not wishing to offend him I tried the drink and I feel now that I really have had a swig of the original "fire water"—no germs could have survived! Later he introduced me to some female Buddhist travellers who were resting by the wayside and who according to him being females without husbands were "without merit"!

And so back to Darjeeling and after one night in comfort at a hotel I returned to Midnapore having completed a wonderful two and a half months leave. The cost of the trek including passes, porters and provisions came to the vast total of £9!

MOVE TO DACCA

In March 1937 Joe Nicholls arrived in Midnapore and I was transferred to Dacca to take over the Company prior to its move to Bangalore—a journey which involved river boat and rail travel.

The club at Dacca was very rich as it owned the racecourse which it overlooked and on Saturdays crowds of Bengalis under forests of umbrellas attended the races. I was called on to compete in the races and my best efforts were a win and a third place. I lived in the mess of the 5th/1st Punjab Regiment and the regiment had a really magnificent pipe and drum band which played on race days. The bandsmen wore Royal Stewart tartan and played the bagpipes extremely well but I remember most of all the stick work of the drummers which was superb—I have never seen anything like it before or since.

Tennis at the club and drag hunting with a "bobbery" pack were my chief social amusements during the short period I was in Dacca.

MOVE FROM DACCA TO BANGALORE

This move which took a whole week in April was by river boat, rail, steamship and finally rail again. Details will be included in Pt III of this article which will cover the period up to the outbreak of war.

* * * * *

RF to RE, November 1916–May 1919

GODEFROY SKELTON

By November 1916 the 20th Royal Fusiliers had been in France some twelve months and at long last my commission seemed imminent. I was sent for and reported to Divisional Headquarters at Doullens where I had an interview with the Colonel Commanding the Royal Engineers. I was recommended for training to become an officer in the Royal Engineers. I returned to the line for a few days and admit that I was scared lest I should become a casualty before I left for England via Boulogne.

I had a few day's leave at home and then reported to the School of Military Engineering at Brompton Barracks at Chatham. There we immediately started training in drill, explosives, defences, bridge building on the Medway, etc. The winter of 1916 was one of the worst for years and we suffered very much from cold. The river was frozen over and we had to break the ice before launching our pontoons for bridge building. We were also taught to ride, as all RE officers were mounted at times.

In February our course was moved to Aldershot for a mounted duties course, where we really did learn to ride, jumping and squadron drill on Caeser's Camp; all aspects of horse-mastership were taught. On 17 March I went to the military tailors and was "kitted out" as an officer, then on to Southampton to embark for France. We were delayed for two weeks due to the sinking of ships by German submarines in the English Channel. I sailed to Le Havre and then by rail to my unit, the 205th Field Company RE then working in the St Quentin area. This Company was one of three in the 35th Division, British Expeditionary Force. Major White was the Commanding Officer and my brother officers were Lieutenants Cleghorn, Short, Dillon and Davidson. I was placed in charge of 4 Section. This Company had been raised in Dundee, all were Scots and all tradesmen. They were fine men to serve with. The St Quentin area was one from which the Germans had made a strategic retreat in March 1917 on a scorched earth policy. All crossroads had been obliterated by large craters; houses, bridges and railway lines had been blown up; trees had been felled across roads; it was a scene of utter destruction and communications were very difficult. This was a fairly quiet area and I soon settled down. An officer's life was a great improvement on one in the ranks, with a personal servant plus two horses. The company was employed on excavating and building dug-outs and shelters in the embankments of sunken roads.

In May 1917 we moved to the Villers-Guislian area where conditions were much hotter. Heavy shelling all the time and we lived in the cellars of houses protected by the rubble above; we worked on trench systems, improving water supplies and installing pumps in any deep wells that were available. We were always working in a gas-laden atmosphere from gas shells fired by the enemy. The lines were three-quarters of a mile apart here and this area was to be the scene of the big enemy attack in March 1918. At night we marked out trench lines using a horse and plough. These we called "Brown and Green" lines and were meant to deceive the enemy; the air photographs taken would not show that the trenches were only 18in deep.

I was now getting used to being an officer and to the work of the Royal Engineers in particular. Generally the RE were held in great respect and although the infantry regiments had to supply large working parties for improving the defences, entanglements, etc and making deep dug-outs, they realized all were for their own protection, and their officers appreciated the special knowledge which we had. One or two sappers would act as guides and be in charge of sections of the work. The working parties of infantry were sometimes a hundred or two hundred NCO's and men with an officer to every fifty men. When moving up to the front line area under intense shelling a heavy responsibility rested on the RE guides to minimise casualties. They did this by guessing the intentions of the enemy gunners, by stopping or keeping moving, and by not losing the way, often in pitch darkness and on shell torn terrain.

At this time the 35th Division was commanded by General Landon and our Colonel Commanding the Royal Engineers at Divisional Headquarters was Colonel Skipwith.

In July 1917 we moved to the Epehy area which had previously been occupied by a dismounted cavalry corps employed as infantry. On 6 August the 105th Infantry Brigade, to which we were attached, was withdrawn to a rear area to prepare for an attack on "The Knoll" (a German position) which overlooked our line and was to be taken by surprise attack. All the prominent features of the area to be attacked were simulated on the ground (from air photographs) and the infantry practised the attack and their allocation to particular areas. I was taking part in this training as the leader of a party of one NCO and four sappers. I was to go over the top with the first wave with 650 yards of white tape and as soon as the position was captured I was to lay this tape along a pre-determined line on which the infantry would dig in and consolidate their position.

On 19 August the attack took place, beginning at daylight. On this occasion I was dressed as a private soldier with a private soldier's uniform and carried a rifle and bayonet, thus avoiding drawing attention to myself as an officer in case I should be picked out by a German sniper. The final assault was under a machine gun barrage, after intense HE shelling of the position. There was much hand-to-hand fighting before the enemy was driven out of his trenches. My party laid the tape; it was very difficult to recognize the features on the ground amid dense smoke and the noise of battle and we made a few mistakes, understandably, I consider. The infantry dug in on the tape laid out and my work was done for the time being. My Corporal was awarded the Military Medal for his work and later a VC was won by Lieutenant Parsons for a single-handed attack on a German Flamenwerfer party. Unfortunately "The Knoll" was counter-attacked four weeks later and recaptured with heavy losses to the Royal Scots. The pipers playing the lament *Flowers in the Forest* was heard nightly as the burying parties interred the bodies of those killed.

On 19 September my section was detached and I remained behind when the division moved north to the Arras area. The work consisted of laying out camp areas and erecting hundreds of Nissen huts to accommodate the troops who would subsequently be assembled in this area prior to the attack on the Cambrai sector being planned for the future. The labour force was a dismounted Yeomanry battalion from Yorkshire. All this was a pleasant change for me and my sappers, the weather being very fine. The job finished we entrained with all transport, general service wagons, tool carts, trestle and pontoon bridge gear and about twenty horses and mules. Very leisurely the French engine hauled us north. We stopped for one day near Calais and the drivers took the animals for a ride on the beach.

I rejoined our parent company, the 205th Field Company RE. At this time the Divisional Headquarters was at Cassel in Belgium. Cassel is on the top of a very high hill approached by a winding road. The Mont-des-Cats and Kemmel are similar hills in the area.

The Adjutant to the CRE (Colonel Skipwith) became ill and I was chosen to take his place. This was "promotion" for me but I did not have the full rank of Captain at once and I remained a Lieutenant wearing two pips. I had an office next to the CRE and was responsible for the administrative work of the office (movement orders, postings, etc. of the three Field Companies under the CRE) and lived in style at the largest hotel in the town.

Preparations were now going forward for the reinforcement by our division of the troops engaged in the third battle of Ypres which started so tragically in July 1917, tragic because the weather was the wettest for years and many of the attacks were abortive.

In October I was relieved at CRE Headquarters and returned to my unit and was reunited with 4 Section. Although it was now winter and very cold and wet we lived in bell tents in the open and the horse lines were a sea of mud. We were now fighting over the old Ypres area where the drainage was non-existent. The front which our

Brigade was occupying was the Houthulst Forest area, recently captured from the enemy. The area was a sea of mud and water-filled shell holes with no definite "line". The concrete ex-German pillboxes in our lines were sinking in the mud and canting at all angles. The entrances, naturally, now faced the enemy line and we had to build thick sandbag walls across them to protect ourselves from enemy shelling. The main job of the RE was the repair and maintenance of the wood duckboard tracks which were the only means of communication from the rear.

At this time, having a fair working knowledge of French, I was appointed as one of the Liaison Officers to the French 201st Regiment of Infantry and worked with their Engineer units in keeping duckboard track to their front line troops in a good state of repair. The enemy shelling destroyed large stretches every night; the track was called "Le Cou de Cygoine" by the French due to its winding route. Other tracks were known as Clarges Street and Hunter Street. Some weeks after this period I was awarded the Croix-de-Guerre for my work with the French Division.

At our horse lines our mules were being trained to carry "pack" loads of Royal Engineer material for the front line. The mules were led by the drivers as no wheeled vehicles could move in the mud and debris and all roads were constantly shelled. The Royal Field Artillery (RFA), often had to dismantle their guns to move to a new position, strapping the "pieces" to the mules to transport them. The infantry made constant but fruitless attacks almost nightly but were bogged down and suffered heavy casualties. Once I was sent with a small party to tape out the so-called "front line"; no-one knew where this line was and I found myself practically in the enemy lines being fired upon by the Germans, fortunately I was not hit. Before a raid could take place on enemy trenches it was necessary to cut the barbed wire entanglements in front of these trenches. The idea was to make a gap in the enemy wire so that the raiding party could pass through. The gap was made at night by going into no-man's-land and pushing a "Bangalore torpedo" through the wire. The torpedo was a long piece of 2in diameter steel tube filled with explosive. It was fitted with a wooden stop at one end and a detonator at the other. When the tube was placed in position we retreated to our own lines and using an exploder, which was connected to the torpedo by cable, we set off the explosive and so cut a hole or a gap through the enemy entanglements.

It was now about 11 November 1917. We were working in the Poelcapelle and Passchendaele areas and the enemy were using gas shells of every description. The gas remained at ground level long after the shelling had ceased. We marched to our tasks and worked in our gas masks for hours on end. Incessant rain now added to our difficulties and the small streams called the Steenbeck, Leterboterbeck and Broembeck became wide rivers and the front areas were cut off from the support or rear areas. The RE made many small bridges across these streams to enable supplies of small arms ammunition, food, etc to be taken forward by the carrying parties and pack transport.

The flooding was due to the destruction of the complete drainage system of dykes and canals and by the constant shelling of our repair work. All this time the RE Field Companies were suffering casualties in moving up and down the lines. If any of my men were killed I had the painful task of writing a letter of consolation to the relatives.

We now moved to the Vlamertinghe area, still in sight of the ruined town of Ypres. My section laid narrow gauge Decauville track from the rear areas to carry the RE material and the sappers sometimes operated the small locomotives. We moved forward once more and worked in the front areas putting up wire entanglements on the muddied ground and in no-man's-land. The Infantry Headquarters hereabouts were usually in old German dug-out shelters (the only places above the mud) but all had previously been partially destroyed by shell fire. The bodies of Germans still remained in the debris and the only cure was plenty of quick lime and disinfectant.

I think at this time I was becoming "nervy". The strain, the constant fear of

death or wounding, the responsibility for the work and for the sappers and the large working parties of infantry began to take their toll. When I reported to the Company or Battalion Headquarters on going out and on returning I would probably have a drink of whisky to help me on my way. One put off the moment when one had to leave with the runner and face the machine-gun bullets, the shells falling around and standing still when the enemy flares went up. (When moving from place to place in the front areas an officer always had a runner with him to take any messages short distances and report if the officer became a casualty.)

December 1917: at this time my mother was in France working at General Headquarters at St Omer. She had joined the QMWAAC and was doing "cypher" work I believe, as she spoke French and German fluently. I applied for three days' leave for Christmas and spent it with her in St Omer. I found difficulty in persuading my Commanding Officer that my mother was really in France; all sorts of excuses for leave had been given to him but never that one!

Back after this short leave to billets on the banks of the Boesinghe Canal. Much snow and ice were about but we continued work in the front areas including the building of reinforced concrete pillboxes. Although the sites were completely covered by camouflage nets we could not cover up our tracks in the snow, which led to enemy shelling at times.

It was now 1918 and the Division remained in the Ypres area until March but even when our Brigade was relieved the RE remained at work in the forward areas, siting strongpoints, draining trench systems etc. At about this time the Division was reorganized and was commanded by Major General A H Marindin DSO. The Royal Engineers were represented by the 203rd, 204th and 205th Field Companies, and the Infantry Brigades were the 104th Brigade (17th Lancashire Fusiliers, 18th Lancashire Fusiliers and 19th Durham Light Infantry), the 105th Brigade (15th Cheshires, 15th Sherwood Foresters and 4th North Staffordshire Regiment), and the 106th Brigade (17th Royal Scots, 12th HLI and 18th HLI).

And so to 21 March 1918, the date of the big German offensive in the Somme Area, the offensive planned to drive the BEF into the sea. The 105th Brigade and the 205th Field Company RE entrained for rail head at Mericourt l'Abbé in the battle area to relieve and support the troops rapidly retreating under German pressure. The British 5th Army commanded by General Hubert Gough was being attacked. From the rail head the roads were choked with French civilians and some retreating troops. My section with all the transport were ordered to the small town of Bray-sur-Somme. We had our limbers carrying quantities of explosive for demolition work on bridges, culverts etc, in order to delay the enemy advance.

As there was some looting and drunkenness amongst our own retreating troops I was ordered to send sappers into all the estaminets and bring out all the wine and beer and pour it down the drains, which we did. We set fire to dumps of stores and tried our best at the scorched earth policy in the limited time available. We were positioned at one of the river bridges waiting for the last of the retreating stragglers to cross, never knowing whether the next figure appearing through the darkness would be a German machinegun party. The last across actually was a sergeant from the Welsh Regiment, we put him under the tarpaulin in the limber on top of the gun cotton slabs!, and joined the retreating troops, the 5th Army Headquarters RE Unit blowing the bridge as we departed.

All our movements at this time seemed to have been observed by the many German observation balloons which were moved forward to keep pace with their advance. At one time these balloons were "towed down" by horses and I actually saw this happening from the forward area of "High Wood" earlier on in 1916. Actually orders had been given by GHQ to hold, at all costs, the Bray–Albert–Chipilly line but these orders, owing to the confusion at the time, were not carried out. During the whole of the retreat we were never bombed or "strafed" by enemy aircraft when great damage could have been done. The Royal Flying Corps kept the Germans over their own lines but we still felt that every move we made was being

observed from balloons and we were not sorry to see them shot down by our pilots.

We retreated from the Bray-sur-Somme area after the Germans had arrived and the bridges had been blown. We now moved back to Buire-sur-L'Ancre, the line taken up being behind the railway embankment. The Royal Engineers were employed on erecting barricades at road crossings and generally creating obstacles in an attempt to prevent a further German advance. However, due to the grand defence put up by our troops and especially by the 19th Northumberland Fusiliers (Pioneer Battalion) this was the limit of the great German offensive of 1918, at any rate on our front. In the village of Ribemont, some Australian troops paid us a visit and looted some wine shops and proceeded to dress up in borrowed plumes, even nightdresses and hats taken from the houses and shops nearby. They then mounted a large barricade, danced and sang ribald songs; all this in the bright moonlight with German shells falling all around and our troops engaged in a "back to the wall" fight about three quarters of a mile away: it was an eerie scene.

28 March 1918: about this time the Division was withdrawn from the battle, rested, and then on 8 April we moved to the Aveluy Wood area within sight of Albert and its church tower with the figure of the Virgin and Child leaning over. We were billeted in cellars (all that was left in the rubble) in the villages of Martinsart, Bouzincourt, Englebelmer and Senlis. The area was saturated with gas and we all felt ill with the effects. About this time a Lieutenant A M Gamble joined the Company from the Cadet School in England at the age of nineteen. He eventually became a schoolmaster, was in charge of the School House at Gresham's, became Headmaster of Denstone College and, after retirement, took Holy Orders and became Vicar of Cley, Norfolk.

We supplied guides and superintended large working parties digging, etc in the wood. The "drives" through the woods were very dangerous as enemy machine guns were on fixed lines and fired straight down them.

On 16 April our artillery shelled the church spire at Albert (to prevent its use as an observation post by the enemy) and in doing so finally dislodged the statue of the Virgin and Child. The local people used to say that the war would finish when it fell but this prophecy proved untrue. The figure itself had been held in position, although leaning over at an angle of ninety degrees, by the steel reinforcement bars within the concrete of the statue. A "character figure" in the shape of General Carton de Witt assumed command of 105th Brigade. He had been wounded seven separate times. It may be of interest that a number of official markings were sewn on to the sleeves of our tunics at this time; for each wound received which necessitated hospital treatment there was a vertical gold stripe; for anyone who came to France in 1915 there was a small red chevron with a blue chevron for each subsequent year in France.

In May 1918 the Division moved to the rear area around Toutencourt for rest, training and "spit-and-polish" parades. I was sent on a three weeks' course at the 4th Army Officers' School at Flixecourt, which was in reality quite a rest (and intended to be) for those of us who had been in France for long periods at a time, as all leave had been stopped for some months. The Padre at this School was the Reverend Studart Kennedy, generally known as "Woodbine Willie" by the infantry regiments as during his visits to the line his pockets were always bulging with cigarettes which he gave to the troops.

By now I think everybody realized that eventual victory was in sight despite the frequent large-scale attacks on our lines, particularly in the Ypres area. In June France was in the grip of an influenza epidemic and the troops were affected. This epidemic was said to have killed in one year, in Europe, more than all the war casualties. In July the Division was moved to the Locre area and once again I left the Field Company and assumed the duties of Adjutant to the CRE, relieving Captain Bost, MC. The Headquarters were on the Mont de Cats near Kemmel, the actual place being called Le Mort Homme—not very cheering. In August King George V visited France and reviewed 2nd Army under General Plumer, token detachments

being supplied by each unit. I was in charge of the small RE detachment.

The American troops were now arriving in France in great numbers and were "sandwiched" in with the BEF units for instruction mainly in the Voomezeele–Zillebeke area. We helped to instruct the American Engineer units in gas warfare and protection, especially of dug-outs. The amount of equipment, technical equipment that is, provided for these American engineer units amazed us. In early September things were hotting up for the great offensive, to finally roll the enemy back to Germany, and every trained combatant man was wanted in the fighting area. Gone was my "cushy" job as Adjutant to the CRE and I rejoined my Field Company and my own 4 Section. We were operating in the Zillebeke Lake area, building temporary shelters, repairing the beech plank roads and also removing the booby traps laid on the roads by the retreating enemy. These were causing many casualties to the men, guns and mules of the Royal Artillery as they went up to the front line. The common booby traps took the form of a tin filled with explosive, a spring-loaded lid, and with a plunger and detonator fitted inside. They were planted in a shallow hole in the road surface and covered over. The mule's feet would not explode them but immediately the wheels and the "piece" (the heavy barrel) came on to the lid up they all went. It was particularly dangerous to remove these traps when corroded as any movement might explode them. The traps were always dealt with by the RE officer.

Later on I had another tricky problem concerning the removal of some 10 cwt of liquid perdite in jars placed in a culvert, on the only main road leading to the front, over which the Division would have to move in their advance. The detonators were much rusted and I was relieved when all were disconnected and the explosive dumped in shell holes nearby by my sappers. Immediately I reported all clear the guns and wagons began to roar up the road towards the enemy positions.

We now come to 28 September, this was the day of the general advance of the 35th Division. About this time I visited my old battalion, the 20th Royal Fusiliers, near the ruins of the Menin Gate. My former Platoon Commander, Lieutenant Modera, was now Colonel Commanding the battalion. In preparation for the advance all our bridging equipment was overhauled and the pontoons, etc inspected. The area we had been advancing over for the last month had been fought over again and again since 1914 and was a sea of mud. On 29 September the Division having taken all objectives, reached the furthest point reached by the BEF in 1914, and from now on it was moving over practically virgin territory, unscathed by war, what a relief! Unfortunately the RE units were still living in tents in the Gheluvet area amid ruins and mud. Things improved when we moved forward in the rear of the infantry. Our advance was in the direction of Wervicq and the Lys River.

By 3 October the enemy were putting up stiff resistance and heavy shelling went on all day and night, especially on all roads and road junctions. We had a short rest for a few days and then forward once more. We were in open country once more, the only signs of war being felled trees, shell holes in the fields and destroyed bridges. In some cases the piers of these bridges would hold explosive charges set to explode days or even weeks after the Germans had left. The Heavy RE Bridging Companies spanned the river with new bridges then suddenly the charges exploded and all would be destroyed once more.

On 13 October I was detailed to make a reconnaissance of the bank of the Lys River on our Divisional front to find suitable places for the throwing across of a pontoon bridge. At night with two sappers I went forward towards the river. While crossing a large dyke we were fired upon at close range, about twenty yards, by a German outpost. I was evidently not the VC type and we laid low, and then took the measurements and details of the river approach which we required and gracefully retired! Subsequently 204th Field Company RE put a pontoon bridge over the Lys at this site.

As the fighting approached the villages the civilian population retired to the cellars. We often occupied these same cellars as billets as we had no other protection from the bitter cold and wet. Sometimes there were dead civilians awaiting burial in

these cellars. The next objective was the town of Courtrai which was occupied on 20 October after troops and guns had crossed the River Lys by the pontoon bridge, 60-pounder guns and teams of six to eight mules tested the bridge severely. Soon after this our Field Company crossed the river and marched into the town. The enemy had only just left the far side of the town and were still shelling the streets to hamper our advance.

The Company was complete with all transport and bridging equipment and was in the middle of the town when a large shell landed in the street, killing and wounding some of my men and several mules. The telegraph wires above were severed by it and twisted round my horse's legs but he remained calm and cool. The civilians, who were starving, cut the traces of the mules killed and dragged the bodies into the courtyards of the houses for food. The casualties were seen to and we reformed and marched on to the other side of the town. Our entry was triumphant; almost before the Germans had vacated the town banners appeared across the streets with flags on every suitable place. The banners were inscribed with the words "Bienvenu aux Liberateurs".

On 21 October the infantry battalions were held up by enemy resistance and were required to regroup and plan the next stage of the forward advance, so we returned to the town and occupied billets with the civilians in the meantime. A civilian family told me that all the metal objects had been taken away by the Germans for melting down to help their war economy, but when the raids were expected many items were buried and were now disinterred for our use.

I visited one textile factory and on the floor where the looms had been all that remained were the foundation bolts! The looms went back to Germany. On 25 October we had a victory celebration in the town. This was to celebrate its capture; the Divisional bands played and marched in the town square. The Division was now faced with the task of crossing the river Sheldt. The crossing and attack were timed for 5.30am on 31 October. Previous to this the RE Companies were working at night making footbridges to span the river, hiding these in the rushes growing near the banks. These bridges were made of bales of straw, canvas boats, barrels, oil drums, inflated bladders, and lashed together with the duckboards on top.

Before daylight on the morning of the attack these were swung across the river and a sapper ran across and made all fast on the opposite bank. We expected very stiff resistance and some sixty such bridges were made to allow for many of them being sunk. At one particular footbridge instead of the enemy machineguns expected a Belgian civilian popped up from the reeds on the opposite bank and ran across the bridge and handed me a small business card on which I read his name and trade, painter and decorator from the town of Renaix! (I still have the "visiting" card amongst my souvenirs.) But, on the revese side he had written very valuable information about the movements of the enemy; they had retired towards Audenarde and Renaix, hence the complete absence of any fighting at these river crossings. I immediately copied this information on a field message pad and sent it back to Brigade Headquarters.

The date 6 November and we were billetted in the village of Tenhove, living in the cellars, where a large road bridge over the river had been partially destroyed by the enemy; we repaired this and lashed duckboards to the steel work, where it was damaged by shell fire, to enable the infantry to get across. In reconnoitring for the temporary repair of this bridge one of our officers was shot and killed by a sniper from the opposite bank. I saw his body lying on the river bank. He had only recently joined the unit. This was to be the last casualty of the war which I was to see. During the preceding mid-week strong rumours of a possible armistice were floating around and a frantic effort was being made by the Divisional Command to occupy strategic positions in the event of the armistice terms not being accepted. On 11 November 1918 strong rumours of the acceptance and signing of an armistice were circulating and later in the day these were confirmed officially, and so the four and a half years of fighting and slaughter ended. It seemed unbelievable that the chances of survival

existed, that I should come through alive and not even having been wounded. As the end of the war came nearer one's personal anxiety increased and naturally one tried to avoid any unnecessary risks of being killed or wounded.

On 12 November orders were received that the 35th Division would not go forward to occupy the armistice line near the city of Cologne and soon after the whole division moved back to the St Omer district in France and fresh divisions went forward to occupy German territory. This caused hard feelings as we seemed to be deprived of some of the fruits of victory. By 28 November Divisional Headquarters including the CRE's office was established at Eperlecque Chateau with the RE units at Nordausques. Demobilization began and education classes were started. All units were being reduced to "Cadres", consisting of a small number of officers, NCOs and men, to collect and list all transport and equipment for eventual return to England. The miners were the first to go back for demobilization as we had many of the so-called "bantam" battalions in the division.

In early December on my return from leave I was given the acting rank of Captain and appointed again as Adjutant to the CRE to take charge of the Cadres of all the three Royal Engineer Field Companies, which amounted to forty men with horses, mules and transport required. My job was to wind up the CRE's office, clearing out unnecessary papers, and in doing so saved a few interesting air photographs and papers for my own keeping. We were allotted a prisoners of war camp of six hundred prisoners to act as labourers to clear the RE dumps, and recover valuable timber from the many tracks used by the Forestry Companies and we loaded this timber into barges on the canal.

Brigadier Sandilands was in charge of the headquarters of the Divisional Cadre. He was a keen golfer and asked me to layout a nine-hole golf course in the area previously used as a troop training area, which comprised many trenches in the bayonet fighting training area. This I did with a three-hundred-strong working party of German prisoners of war.

As I have said previously I was granted leave in "Blighty", as home and England was called. My mother was still working for a National Service organization and I stayed in the hotel in which she was living. This was an important time in my life. My cousin, Marjorie Blackburn, had tickets for the Zoo on a Sunday opening day, and asked me to go along, and she brought her great friend Angela Gill with whom she was nursing at Aubrey House, and so I met the girl who was eventually to become my wife.

The Division spent Christmas in the area of St Omer and celebrated this as best we could. In December there were riots in Calais where the troops were in an angry mood due to the long delays in demobilization, as I think the Government were taken by surprise at the quick ending of the fighting. Infantry regiments at weak strength were sent to Calais to restore and keep order. As most of the discontented men were from non-combatant troops they received some rough treatment and no sympathy. In April our work in clearing up the area was completed and all equipment packed for transport to England, and I took the RE Cadre unit and all equipment to Dunkerque. We spent two or three weeks there, leading a somewhat dissolute life I fear, and then in mid-April sailed in the transport to Hull, and thence by rail to Ripon in Yorkshire. It took some weeks to hand over all the stores and complete the necessary paper work before the actual demobilization papers could be completed. There were some hard-bitten cases at this camp; particularly the veterinary officer was a great character, and in a clandestine manner organized a "main" of cock-fighting, of all things. Eventually later in the month my own papers came through and believe it or not, the actual paper was signed by another officer of the name of Skelton.

The date was May 1919.

* * * * *

Memoirs

MAJOR GENERAL M W PRYNNE CB, CBE, MA

Born 1 April 1912, died 27 September 1977, aged 65

MICHAEL WHITWORTH PRYNNE, educated at Bedford, RMA and St John's College was commissioned to the Corps in 1932. The pedestrian account of his life can be read in any reference book. Such an account does not, indeed cannot, do justice to his remarkable versatility, his wide interests or his, at times impish, humour. He was a lucid writer, he read Russian novels, he preached in Gibraltar Cathedral, he discovered new species for the Royal Botanical Gardens, he was an expert on lutes. His wife, who was killed in the same car crash, was a distinguished professional woman in her own right and had only recently retired from the post of head of the Department of German at a major school.

JCW writes:

It was tragic that Mike and Jean Prynne were killed in a car accident as they still had much to give to the community in which they lived.

Mike and I were in the same Batch. His short stature and inability to play the usual team games well, may have handicapped him as a very junior officer when athletic prowess was considered an asset. Later in life, when other qualities were more highly valued, he soon made his mark. His brainpower was immediately evident, though he never flaunted it. He was a good and sympathetic listener and his clear headed common sense always discovered the essence of the subject under discussion. He was methodical, painstaking, very able and inevitably, soon after the outbreak of WW2, he was noticed as an outstandingly good staff officer. He served with distinction as such in North Africa, Italy and later South East Asia.

After the war Mike served in Moscow as Military Attaché and he and Jean both spoke Russian well. Jean taught languages at the Godolphin School for Girls and was prepared to teach almost any language for which a class could be formed.

He was not only an excellent staff officer. In Kenya, against the Mau Mau, he commanded with great distinction the Engineer Regiment that supported the military and civil forces. Later in his career Mike held a series of important staff appointments in Command Headquarters and at the War Office before retiring from the Active List and becoming Secretary of the Association of Consulting Engineers.

Throughout his life Mike had many interests. He was a keen sailor and was interested in the history of naval ship construction. His knowledge of nature and natural things was amazingly deep. He loved music. He was clever in the use of his hands. He took to growing stunted Japanese trees in his London garden.

A visit to the Prynne's house was always stimulating. Their hospitality was generous and spontaneous. No guest could feel out of his element as the whole family were interested in a wide range of subjects and conversation never flagged.

R W writes:

Major General Prynne joined 39 Corps Engineer Regiment in Wales, in time to take it to Kenya in 1953, the time of Mau Mau. As young officers we were very impressed by the rumours that our CO had been a Brigadier in Moscow. We were also impressed by the fact that he read Russian newspapers. He was a kind, loveable man. We collected chameleons for him and in fact believed that we had breeding pairs of every type of chameleon known in Africa. Feeding grasshoppers to the chameleons was a daily routine for some of us. The CO also had one of the first "Champs" to be issued to the Army and he became a familiar figure visiting Troop Camps in the forests, accompanied by a monkey he owned. The monkey (Mirandolina I believe) was brought back to UK but eventually went to a Zoo. The CO's Leopard Tortoise, which was also RHE, is still alive, very large and very well, twenty-four years later.

I had lots of dealings with Mike Prynne in the last few months in his appointment

of Secretary of the Association of Consulting Engineers (ACE). He was as pleasant, efficient and precise as always.

It was especially sad that he and his wife died just a few weeks after his retirement, and the day before the farewell lunch and probably a presentation of "a token of appreciation" from ACE. The loss of Mike Prynne is felt even more because of his recent close contact with the Corps. It was a tragic traffic accident, which removed the possibility of a rewarding long and happy retirement to which both Mike and his wife had looked forward for so long.

DCC writes:

(Extracts by permission of The Association of Consulting Engineers)

Major General M W Prynne CB, CBE was one of a number who applied for what at the time was the post of Assistant Secretary of the Association but with the intention, if found suitable, of taking over as Secretary on the retirement of the then Secretary, Rear-Admiral Peter Pelly. As one who was privileged to be a part of the three-man interviewing Committee of prospective applicants, I was never in any doubt that Mike was the right man. If not in physical stature, in personality and competence he stood head and shoulders above all others; and having been so closely associated with him, before, during and after my year as Chairman I became even more convinced that the Council had chosen the right candidate.

Having held a distinguished and senior position in the Royal Engineers it might have been thought that Mike would not be prepared to undertake the duties of Secretary to the Association, which at that time often involved mundane clerical duties, which in his former post would have been handled by Sappers. Any fears we may have had in this respect were soon dispelled, for he was always ready to take his coat off and work alongside his staff collating and dispatching notices and the like to members.

All those who served on Council or on Committees of the Association, during Mike's tenure of office, will, without question, admire and respect his indefatigable attention to his work and his quite remarkable ability of preparing papers, whether for consideration by Council or Committee members, the membership as a whole or more importantly for putting forward the Association's case to Government Departments and the like. He had a masterly command of the English language, which, whilst at times perhaps upsetting some members and some Civil Servants, was nevertheless used to good effect.

During my year as Chairman and in the immediate following year the Association's revised fee scales and Memoranda of Agreement were under investigation by the Committee, appointed by the Government, under Professor Reddaway, and I had the privilege of chairing the sub-committee and attending on Professor Reddaway's Committee. Throughout this time and after the publication of the Reddaway Report, Mike was a tower of strength, and even if some members may be disgruntled with the outcome, they have much for which to thank him for the clear and concise arguments he put forward.

Mike represented the Association on a number of organizations and his ability was as respected there as it was by those who worked with him on Association matters. He seemed to know everyone that mattered whether in Government or elsewhere and his ability to persuade distinguished persons to speak at the Annual Dinners was a clear indication of the esteem in which he was held far outside the circle of the Association.

When Mike retired in September, 1977, he had served the Association untiringly for ten years of which over eight were as Secretary. During that time ten Chairmen passed "through his hands", and it cannot be doubted that they were better Chairmen for his presence and guidance.

After so many years of unstinting and loyal service to the Association Mike was fully entitled to look forward to a long and restful retirement in the company of his wife, Jean, who had throughout given him devoted support in the carrying out of his

duties. By their tragic and untimely death they have not been able to enjoy the fruits of their labour, and if from this terrible event there is any solace, it is that they have departed this life together. To his family all members of the Association will extend their heartfelt sympathy. By his retirement members of the Association lost a loyal servant—by his death we have lost a true friend.

BRIGADIER E V BOWRA OBE, BA

Born 23 October 1896, died 11 September 1977, aged 80

EDWARD VALENTINE BOWRA was born in China where his father was in the Chinese Customs Service. At the age of six, he and his younger brother Maurice (later to achieve academic distinction as Sir Maurice Bowra, Warden of Wadham College, Oxford) were packed off to Japan with their mother while their father organized the defences of Newchwang against the Boxers with an enthusiasm which may well have given Edward his first interest in military engineering.

The Bowras were a Kentish family and Tonbridge was first considered as a boarding school, but Edward's father, who had enjoyed his military experience in the Boxer rebellion, decided that he should go into the Army—so the final choice was Cheltenham, then at the height of its fame for passing boys into top places at the Royal Military Academy, Woolwich. Edward duly passed eighth into the Royal Military Academy in November 1914. He was commissioned on 28 July 1915 and a year later was in France. After the war he read Engineering at Jesus College, Cambridge and then served for many years in India. His diaries at the Imperial War Museum covering the period 1931 to 1945 give an interesting account of the role of the military engineer in India in the last decade of British rule before independence. He retired in 1950 when Chief Engineer Malaya Command, an appointment involving responsibility for the re-building of the roads and railways after their destruction during the war, a task for which he was particularly well cast.

Edward had married in 1947 and he and his wife Pixie bought a house in Ightham —not far from his family home. In retirement he devoted his energies to the study of architecture and history of the churches of Kent and of the homes and families associated with them. He became an acknowledged authority on puritan graves which brought him recognition from as far afield as American Universities. His writing and lecturing gave great pleasure to many and his ability to impart his knowledge to others stemmed from a personality of charm and kindness, he was so obviously good and compassionate that he drew people of all ages to him.

To Pixie, our affection and sympathy.

PHH

Correspondence

Colonel S M Hollway OBE MC TD DL
Applecross
14 Kingsway
Heswall L60 3SW

MAJOR GENERAL SIR HENRY H C SUGDEN KBE, CB, DSO

Sir,—In the Memoir on General Sugden (September 1977 issue) there was no reference to his service with the Territorial Army.

In 1938, as a very senior Captain, he was posted to the 55th Divisional Engineers as Adjutant, with HQ at St Helens, Lancs, and there he very quickly made his mark. The CRE was a man who set high standards and who had been known to sack an officer who did not measure up. With this backing Suggy very soon made a good formation even better. He set good exercises, both in and out of camp, and the standard of officer training particularly was first class. He left the TA to go to the Staff College and his departure was a sad occasion.

I was fortunate to come under his control again in Italy when he was Chief Engineer XIII Corps and his knowledge and understanding smoothed what was frequently a very rough

path. He was always one jump ahead, and his presence at difficult times was ever a welcome morale booster. He was never rattled but always courteous and considerate and his manner was such that one would go to any lengths to meet his requirements. He understood his TA sappers and they certainly appreciated him.—Yours faithfully, S M Hollway.

Lieut-Colonel D L Mackay RE, C Eng, MI Mech E
RSME
Chatham
Kent

EARLY HISTORY OF SAPPER TUNNELLING

Sir,—I was most interested to read Colonel Clifford's "Early History of Sapper Tunnelling", particularly regarding Gibraltar, but feel that the wording he uses does not give Sergeant Ince all the credit which is due to him! We know a great deal about that first tunnel, which was called Ince's Gallery though Windsor Gallery has crept in. This, together with St George's Hall, Cornwallis Hall and the Holyland Tunnel, form a system known as the Upper Galleries. The story, which I believe to be true, is that the Governor Eliott talking to the Chief Engineer Green said that he would give 1000 dollars (say £175) to anyone who could show him how to put a gun on the "Notch". Ince stepped forward and suggested that they might "fire a gallery through the rock". Ince was rewarded for his services but there is no record of him ever receiving the 1,000 dollars. Work started on 25 May 1782 and Spilsbury records that by 4 July "13 men in about 5 weeks have cut about 82 feet long by 8 feet high and broad, in the solid rock". On 19 August he says "Serjt Ince got 165 feet into the rock, and has made two embrasures, but his people have got the disorder". At the end of the Great Siege the gallery was made to dip sharply down when it was decided to excavate St George's Hall instead of going for the top of the "Notch". Drinkwater records that "the success attending our progress in the gallery above Farringdon's Battery (Ince's), produced the idea of making a communication from the extremity of the King's to the Queen's Lines, and on 6 July 1782 a party of miners began this new subterranean passage". Ince had started something and it is hoped to have a display in the Museum of replicas of the early tunnelling tools they used, the tunnelling hammer, jumper, tamping bar and tunnelling needle, tunnel scraper and hand borer.

Colonel Clifford mentions that one of the things built during World War II in the rock was a power station. He was possibly thinking of Willis' Engine Room, a little jewel set in the Rock, but there are no engines in it now. You can imagine what it would have been like but what a pity the generating sets were ever taken out. After the War, one of the underground hospitals was opened out into Calpe Hole Power Station which came on load in November 1955. Some idea of this magnificent installation can be seen from the *RE Journal* March 1958. I was told that these technically interesting opposed piston 1938 English Electric Fullagar sets are to be sold for scrap. There will surely be little profit by the time they have been broken up, removed, brought down from the Rock and shipped out. I would agree that the TAVR "Exercise Re-volt" will probably not take place again in Calpe Hole but can no-one save Lady Samantha, her sisters and the remains of the gas turbine? By the time Gibraltar comes round to exploiting the tourist potential of this unique underground fortress, Calpe will be a lifeless shell like Willis's Engine Room.

All this began with Sergeant Ince's suggestion to "fire a gallery". Ince may have played a major part in the start of the Artificer Company as well, but when? On 6 March 1772 a Royal Warrant was signed at the Palace of St James which reached Gibraltar on, I think, the 14th May and Garrison Orders in June give a list of men transferring to the Artificer Company. They are mainly from the Queen's Regiment but Ince is not among them. We regard this Royal Warrant as the bold and far-sighted document from which the Corps as we know it was born and on 6 March 1972 we celebrated the 200th Anniversary, being given also the Freedom of Gibraltar. However, in King's Chapel, in the records of births there is an entry:

1772 *Feb 5th: Joseph, son of Henry Ince, Sergeant Artificer Company*

and the earliest Artificer Company entry is

1771 *Feb 7th: Lucy, daughter of Thomas Hannan, Artificer Company*

It would seem that the Royal Warrant of 6 March 1772 was simply the MOD of the day catching up with a situation which already existed!—Yours faithfully, D L Mackay

Brigadier A Prain CBE, B Sc
Sanjoby
Eype
Nr Bridport, Dorset

EARLY HISTORY OF SAPPER TUNNELLING

Sir,—The article by Colonel Clifford on Sapper Tunnelling has brought back for me some recollections of the experiences I had on the fringes of tunnelling. Although the article is on the subject of Sapper tunnelling, he might have appropriately mentioned in his historical survey something about the technique of Karez building. (*KAREZ*, a type of irrigation practised in Persia and Baluchistan, especially around Quetta; water is obtained from wells sunk at the foot of the hill slopes and conveyed to the fields through tunnels or conduits roofed with masonry to prevent loss by evaporation.—*Chambers Encyclopaedia*). The subject has been extensively written up elsewhere but many Sapper officers must have served sometime in Karez country and admired the tunnelling technique. I believe that the longest Karezs are to be found in Persia or Quetta and at the risk of having my figure corrected either upwards or downwards I venture to suggest that when I was commanding a Sapper unit on the East Persian cordon in 1919 I noted several over one mile long.

His mention of Russian saps reminds me that when I was with 61st Field Company in F (Brigade) Sector of the Line just south of Arras we dug several yards of Russian sap. Our design was somewhat different from the one Colonel Clifford describes. The roof of the sap was usually only just below the undisturbed ground level, the sides and roof inside were timbered and the floor had the usual duck board. My recollection is that we did not stay long enough in the sector to see our saps successfully completed and used.

There is one aspect of Sapper tunnelling not mentioned in the article. Doubtless some of your readers will remember Gloucester George who was a pleasantly amusing temporary officer stationed at Chattenden Barracks in the early days of the 1914–18 war and who was conducting War Office experiments on a mining machine. We called it "Pipe Pushing". The tactical idea was to produce a mechanical way of breaching the enemy trench defences by pushing an explosive charge underground in the nose of a pipe from our own trench across No-Mans-Land where it could be exploded under the target. The pipes were some 4in in diameter in 6ft lengths. They were pushed forward towards the enemy line by an hydraulic ram using the back of our own trench as a counter support. As a subaltern awaiting posting to BEF I was detailed to help Gloucester George in his experiments but I left Chattenden for my posting before I heard if he finally produced a successful prototype, but I seem to remember that the whole project was finally abandoned because it was found that the skin friction on the pipe from the soil was so great after an unpracticably short distance that the pushing power required was, at that time, prohibitively great for active service trench conditions. I realize that modern engineering practice has got over this difficulty, but the humble mole may have got there first.

Everyone must have seen a molehill in process of construction and noticed, while the mole is working, an upheaval of soil from the bottom of the molehill, which occurs every minute or so, depending on the kind of soil, and this addition of soil must have come up a vertical shaft some two feet deep. But this soil, or some of it, must also have come from the head of the run where Mole is digging. Mole loosens the virgin soil from the run face with his snout and then scoops it behind him as he advances. But it has still to be driven along his newly made tunnel till it gets to the bottom of the shaft, and then to the open air. I have never been able to work out how the excavated soil actually gets from the face of the mole run to the molehill, a distance sometimes of ten yards.—Yours faithfully, A Prain

Brigadier R S G Stokes CBE, DSO, MC, FIMM
Highfield
Lewesston
Sherborne, Dorset

MINE WARFARE

Sir,—In the December Journal, Colonel N D Clifford ably covers the history of "Sapper Tunnelling" with great thoroughness. It was only appropriate that in addressing his paper to the British Tunnelling Society, he should have featured those activities of particular concern to such a body of Engineers.

In amplification rather than criticism, I submit that, in the context of the 1914–1918 war,

his comment—"most of the initiative for mining and setting up of mining and tunnelling companies came from the civilian tunnelling industry", may lead to some misconception as to the character and composition of the great Sapper combat-force built up to counter the German underground offensive which opened in late 1914.

Officers and other ranks, even of the first five Companies, were almost exclusively drawn from coal and metal mining industries, with twelve Regular RE officers appointed to stiffen control. The miners brought with them the qualifications most needed at the time; above all, their innate sense of underground discipline, their team spirit and familiarity with cramped working places, hand-tools, ground movements and support, gas and explosives: even some experience in the interpretation of sounds through rock.

An over-estimation of indebtedness to civilian "tunnellers" is to be readily explained by the dominating influence and enterprise, in the early stages of organization, of one man, Major (later Colonel Sir John) Norton-Griffiths MP, a Civil Engineering contractor. Somewhat dramatically, he gained much attention and support by transferring a party of his "clay-kickers" from Liverpool to the Givenchy mining faces in little over a week-end; but his persistent and successful call was for miners and Mining Engineers. Norton-Griffiths' great personal achievements have received due recognition. Apart from the coalminer Sapper Hackett, who won his VC below ground, he is the only Tunneller to be mentioned by name in the Royal Engineer volume "Military Mining",—the classic written for the Corps by Lieut Colonel (later Major General) F G Hyland, himself a Tunneller from 1915 to 1918.

The unique character and magnitude of the mining force, consolidated under Royal Engineer command, has never been recorded in the Journal. At its peak in 1916, the Sapper strength reached about 18,000 men, excluding many thousands of permanently attached infantry. Of the thirty two companies in action, seven units were formed of metal-miners from Australia, Canada and New Zealand. These were detached, indefinitely and ungrudgingly, from their own national commands in recognition of the call for the utmost effectiveness and stability of the force as a single entity. Southern Africa also contributed 120 officers to British Tunnelling Companies.

Casualties were heavy. Some 185 officers were killed, including four commanding officers. A high ratio of officer fatalities reflected the frequent employment of small officer-led parties and surface raids on enemy shafts. Constant service in the forward trenches also brought an inevitable toll of casualties from mortar and gun-fire aiming to destroy our shaft-heads or otherwise obstruct mine progress.

At Messines, in June 1917, the German miners met their final defeat and Mine Warfare passed into history, never to be revived.—Yours faithfully, R S G Stokes (Controller of Mines, First Army. 1917/1918).

B T Boswell Esq, C Eng, MICE, MWI
Twemlow Green Cottage
Twemlow Green
Holmes Chapel
Cheshire

THE DEVELOPMENT OF WATER RESOURCES IN DISASTER SITUATIONS

Sir,—I was fascinated to read Peter Stern's excellent paper in the December issue of your Journal, since I worked very closely with him in Ethiopia, and was in charge from the end of 1974 until mid 1976 of the SIM CD unit based on Mekele, Tigrai, to which he refers.

I agree the desirability of having available experienced people, though this is hard to ensure in the early stages of a disaster. We had a marvellous team of dedicated youngsters, but with little experience of rural water engineering, and none of remote operations, in under-developed country—and this included their boss!—who knew even less about the four health clinics also under command.

One need was for really basic handbooks to be issued to field operators. The RE manuals which I had with me were of great help, but even these assumed a level of expertise and equipment that brought despair to a twenty year old ex-student with a bunch of villagers, with whom he communicated largely by signs, and a few picks and shovels for equipment. There was a lot of data, back in the reference libraries, but we had to write our own notes, learnt the hard way, out in the field. Simple, well illustrated pamphlets for spring capping, well digging, earth dams and storage systems, available on site, would have been of immense value.

Another lesson learnt was that hand pumps, storage tanks and similar equipment for installation, must be very rugged, maintenance free and light. Frequently, hand pumps are in use continuously sixteen hours every day; if they break down they are smashed in frustration; and often the sites could only be reached on foot, with all stores man carried. Because of the difficulty of transport the instruction pamphlets should show how to make maximum use of local materials—we had excellent native stoneworkers.—Yours faithfully, B T Boswell

Colonel T O'G Cochrane OBE MC B Sc
Field Corner
Buckland, near Aylesbury
Bucks HP22 5HY

BRIGADIER R H REYNOLDS OBE, BA

Sir,—I have recently read the Memoir of Brigadier Reynolds in the September issue which refers to his time as OC 1 Field Squadron, and, as one of his subalterns at that time would like to add a small personal tribute.

Ronnie Reynolds had the gift of combining high professionalism with great personal charm, a blend which invariably led to the achievement and maintenance of high standards by those who worked with him. When, in the summer of 1941, he arrived to take over 1 Field Squadron our comparatively tranquil world was sharply stirred into a crescendo of action before our departure for the Middle East a month or two later. As events turned out, a German mine robbed us of him after a mere six months, but long enough to make a bunch of genial but moderately idle young subalterns reach for standards I suspect they never entirely forgot. For me, it started a friendship which lasted until he died last year.—Yours faithfully, T O'G Cochrane.

Book Reviews

PLAN FOR PROMOTION: ADVANCEMENT AND THE MANAGER

TOM WATLING

(Published by Business Books, London. Price £8.00)

MAJOR T F WATLING, MBE retired from the Corps in 1962 after nearly eighteen years service; he is the co-author of five very good books related to management and business and has held several management posts in the computer industry.

This solo effort is well written and is illustrated in a light-hearted style by cartoons; it is a tactical guide to managerial career advancement. It is for people concerned about planning their working life and for all those managers concerned to obtain the best results from all the people who work for them.

The author draws on both his military and civilian experience and although all good management books tend to relate the obvious (certainly to those brought up in the Services), he does it extremely well in a very readable style. It is essentially a *practical* book and reminds one that even the obvious has to be applied effectively.

The book will be of interest to all Members; though at £8.00 (and worth it), it is a bit "pricey".

EEP

GATE BELT CONVEYORS

TRAINING MANUAL-NATIONAL COAL BOARD

(Obtainable from Purchasing & Stores Department, NCB, Hobart House, London SW1X 7AE. Price £0.95)

As an opening question the reader might well ask what is a Gate Belt Conveyor?, and having been told, ask what on earth has this book to do with military engineering?

In a coalmine coal is generally won at a "face", is passed along the face to "roadways" known as "gates" or "gate roads". The conveyors which carry coal along these roadways, away from the face towards the consumer, are known as gate belt conveyors. What has the

book to do with military engineering? Simply that it is an excellent exposition on conveyors, their upkeep, repair and maintenance—and we do use conveyors. It also includes some very useful information on fluid couplings, ratchet lever joists, "Tirfor" and ratchet jacks.

Mining engineering probably demands the highest known standards and the book reflects this—these are the standards we should be trying to attain.

EEP

ARMY UNIFORMS OF WORLD WAR I

ANDREW MOLLO
(Published by Blandford Press. Price £3.50)

THIS is virtually a pocket book on the uniforms of the armies, including the air branches, of those nations involved in the First World War. The author is a well-known authority who has eleven other books on military uniforms to his credit. In addition he acknowledges help from an impressive international list of experts.

The book has three main sections. First there are 245 coloured drawings of uniforms, badges, helmets and equipment. This includes 191 extremely life-like drawings of officers and soldiers displaying a wide cross-section of the uniforms in good colours. The second part is a series of notes on the uniforms of each country describing the main trends up to and during the war. Finally there are detailed notes explaining the uniforms shown in the first part. The book includes an international bibliography and an introduction which briefly reviews the way the war caused changes in uniforms.

This is a very well prepared compendium of interesting and useful information on the uniforms of the period. The drawings are very detailed and are in themselves a mine of information. Many of the drawings of uniforms have been taken from photographs of individuals identified by name. For a change, the examples include some of those wartime uniforms that were never worn on a parade ground. The detailed notes in the third section have to be read in conjunction with the drawings as they give explanations which are necessary for complete understanding. It is a pity that a way could not have been found to print them alongside the drawings to which they refer. The general notes in the second section are necessarily brief but give much useful and interesting information. They include details on badges, including badges of rank, and tables listing the variations in headdress, colours of uniforms and facings, etc.

This is an excellent little book. It is ideal as a pocket reference book but as such has inevitable limitations in its scope. It covers most of the European Countries involved in the war as well as Russia and USA, but Turkey a major participant, is not included. The comprehensive bibliography gives a useful lead to further research and references. A very well produced guide.

CTPH

THE BUSINESS OF TANKS 1933–1945

G MACLEOD ROSS (in collaboration with
MAJOR GENERAL SIR CAMPBELL CLARKE)

(Published by Arthur H Stockwell, Ilfracombe 1976. Price £4.00)

"THE Business of Tanks" is based on the author's experiences in tank design from 1933 to 1945. It gives his suggestions why there was no battleworthy British tank available in adequate numbers when war broke out in 1939 and why the success of the Matilda tank was never repeated. Brigadier MacLeod Ross spent the whole period, apart from a brief respite rebuilding Quetta in 1938 and 1939, dealing with the design and production of tanks. Up to 1937 he was Assistant and then Deputy Superintendent of Design at Woolwich. After a tour as Chairman of the Tank Development Board in India he returned to Woolwich in 1940 again as Deputy Superintendent of Design. In 1942 he went to the USA as British Technical Liaison officer to the American tank production effort where he spent the rest of the war.

He assures us that the events he records are taken from his diary which was dictated on the same day they occurred. To set the scene the book opens with a brief summary of the development of the tank from 1916 to 1945 and gives some basic information on the problems of tank design and the organization involved. Then follows a series of chapters commenting on aspects of the way this organization and its members functioned. These are based mainly on the experiences of the author but include chapters written by Major General Sir Campbell

Clarke who was the author's predecessor as Deputy Superintendent of Design. The last part of the book deals with the author's experiences in the USA.

The book is an interesting portrayal of the frustrations experienced by many in the inter-war period forty to fifty years ago and will doubtless bring nostalgic memories to those who also battled against bureaucracy and the "establishment" in the struggle to bring the Army up-to-date. The author's restlessness and energy are well evident and give the book a lively style. However, a number of short, disjointed and confusingly arranged chapters with some repetition make the story difficult to follow after the opening chapters. Amongst the reasons given for the failure to produce an adequate British tank are: the failure of the General Staff both to look ahead and to formulate clear-cut staff requirements; the failure to collect together and retain an adequate design team; the lack of an adequate experimental workshop; the failure to appreciate the proper relationship between the tank and the gun; the lack of suitable engines. Though the author clearly found more congenial company in the USA he is often as scathing about the American tank policy, especially in regard to the failure to appreciate the need to up-gun the Sherman.

There is much of interest in the book with forthright judgments and condemnations. As a record of the events as seen by one of the players it is fascinating and it may well be of value to anyone researching into the reasons why. There is no attempt to consider all the factors and provide any deep analysis to support the conclusions. In some ways the book defeats its own object by the many denigratory insinuations and, often, conclusions appear to have been based on trivial happenings.

As a record of the views and personal conclusions of one who was deeply involved in the not very successful business of producing British tanks the book is of interest and value. It certainly gives a horrifying picture of apparent incompetence, hostility to fresh ideas and lack of any sense of urgency at that time. It perhaps might have been of some influence had it been published when post-war procedures were being moulded.

CTPH

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